

# KENNEDY SPACE CENTER'S ANNUAL REPORT FY2007



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The moon makes an appearance above Earth's cloud-covered limb.





# Center Director's Message



In 2007 Kennedy Space Center celebrated its 45th year as NASA's launch operations center. Throughout the year, the dedicated work force launched space shuttles and expendable launch vehicles, worked toward completion of construction of the International Space Station and began moving forward in preparation for the Constellation Program.

During the year, Kennedy launched three space shuttle missions delivering critical elements to the International Space Station. A new set of solar power arrays and a connecting module were added to the space station. The Launch Services Program processed four expendable launch vehicles and spacecraft for launches. The program continued to work 34 active missions throughout the year as well. A milestone was reached in April, when the Launch Services Program celebrated the 50th successful expendable launch vehicle since assuming the lead for the agency in 1998.

Work for the Constellation Program really began moving forward this year. Kennedy supported the agency with preparations for the test flight of the Ares I-X, scheduled for 2009.

Kennedy employees also excelled in applied technology, strived for environmental leadership and strengthened partnerships while providing outreach and educating the community. The employees reached out into the communities and supported local charities through the Combined Federal Campaign.

In its 45th year, Kennedy made these and many more significant contributions to the rich history of the space program. I am proud to lead such a dedicated and exceptional work force. I encourage you to read more about the accomplishments of 2007.

Sincerely,

William W. Parsons  
Center Director

# Significant Events



## **1. STEREO Launch**

**Oct. 25, 2006**

NASA's twin Solar Terrestrial Relations Observatories mission, known as STEREO, successfully launched at 8:52 p.m. EDT from Cape Canaveral Air Force Station. The spacecraft is making observations to help researchers construct the first three-dimensional views of the sun. The images show the star's stormy environment and its effects on the inner solar system, vital data for understanding how the sun creates space weather.

## **2. Award-winning Invention**

**Oct. 26, 2006**

A groundwater treatment process, known as the Emulsified Zero-Valent Iron technology, was recognized as NASA's 2005 Government Invention of the Year and Commercial Invention of the Year. The technology, developed by researchers from Kennedy Space Center and the University of Central Florida in Orlando, cleans up environmental contaminants in groundwater around industrial areas like rocket launch pads.



## **3. Discovery Launch**

**Dec. 9, 2006**

Space shuttle Discovery and its seven-member crew lifted off from Kennedy at 8:47 p.m. EST and traveled to the International Space Station. During the STS-116 mission, the crew installed the P5 truss to the station.

## **4. Discovery Landing**

**Dec. 22, 2006**

At 5:32 p.m. EST, space shuttle Discovery and its crew returned home after a 13-day journey of more than 5.3 million miles in space. Discovery's STS-116 mission successfully reconfigured the International Space Station's power and cooling systems from a temporary setup to a permanent mode and added a new piece to the station's backbone.

## **5. New Center Director**

**Jan. 4, 2007**

William W. Parsons assumed the role as Kennedy's ninth director, succeeding former director James W. Kennedy.



# Significant Events

## 6. Constellation Program Facility

**Jan. 30, 2007**

A special ceremony commemorated the Operations and Checkout Building high bay's new assignment to support the Constellation Program. Originally built to process space vehicles in the Apollo era, the building will serve as the final assembly facility for the Orion crew exploration vehicle. Orion is America's human spaceflight vehicle of the future.

## 7. THEMIS Launch

**Feb. 17, 2007**

NASA's THEMIS mission successfully launched at 6:01 p.m. EST from Pad 17-B at Cape Canaveral Air Force Station. THEMIS, which stands for the Time History of Events and Macroscale Interactions during Substorms, is NASA's first five-satellite mission launched aboard a single rocket. The mission will help resolve the mystery of what triggers geomagnetic atmospheric events visible in the Northern Hemisphere.

## 8. Hailstorm Damage

**Feb. 27, 2007**

After space shuttle Atlantis suffered hailstorm damage, NASA officials decided to roll Atlantis off its launch pad and back inside the Vehicle Assembly Building at Kennedy. The severe thunderstorm caused between 1,000 to 2,000 divots in the external tank's foam insulation and minor surface damage to about 26 heat shield tiles on the shuttle's left wing.

## 9. Station Module Named

**March 15, 2007**

Thanks to students from across the United States, the International Space Station Node 2 module is now also known as "Harmony." The name was chosen from an academic competition involving more than 2,200 kindergarten through high school students from 32 states. The challenge required students to learn about the space station, build a scale model and write an essay explaining their proposed name.

## 10. Technology Leaders

**April 12, 2007**

Two Kennedy employees, Jacqueline Quinn and Kathleen Brooks, were inducted into the Space Technology Hall of Fame for their work in developing a method that reduces groundwater contamination.



# Significant Events

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## 11. Suborbital Flights

**April 17, 2007**

Kennedy hosted the first of a series of suborbital Pathfinder flights at the Shuttle Landing Facility. A privately operated F-104 jet aircraft from Starfighters Inc. of Clearwater, Fla., will perform flights to help in assessing suborbital space launch trajectories and pave the way for future commercial space tourism and research flights from the facility.

## 12. AIM Launch

**April 25, 2007**

NASA's Aeronomy of Ice in the Mesosphere, or AIM, spacecraft launched from Vandenberg Air Force Base, Calif., at 1:26 p.m. PDT. AIM is the first mission dedicated to the exploration of mysterious ice clouds that dot the edge of space in Earth's polar regions. The Orbital Sciences L-1011 aircraft released a Pegasus XL rocket carrying AIM at a drop point over the Pacific Ocean about 100 miles offshore west/southwest of Point Sur, Calif.

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## 13. Atlantis Launch

**June 8, 2007**

Space shuttle Atlantis and its seven-member crew launched mission STS-117 from Pad 39A at 7:38 p.m. EDT to continue construction of the International Space Station. The crew delivered and installed the S3/S4 truss segments and a new set of solar arrays.

## 14. Atlantis Landing

**June 22, 2007**

Due to inclement weather, Atlantis landed at Edwards Air Force Base, Calif., at 3:49 p.m. EDT after completing a 14-day journey of more than 5.8 million miles in space.

## 15. Center's 45th Anniversary

**July 1, 2007**

Kennedy Space Center celebrates its 45th anniversary as a launch operations center. In 1962, with a mandate to build a launch center, NASA and Kennedy's first director, Dr. Kurt H. Debus, set out to build an infrastructure to support the biggest rockets ever constructed.

# Significant Events

## 16. Lightning Protection System

**July 27, 2007**

NASA selected Ivey's Construction Inc. of Merritt Island, Fla., to build a new lightning protection system for Kennedy's Launch Pad 39B. The system will support launches of the Constellation Program's Ares I rocket.

## 17. Phoenix Launch

**Aug. 4, 2007**

NASA's Phoenix spacecraft launched aboard a Delta II expendable launch vehicle from Cape Canaveral Air Force Station at 5:26 a.m. EDT on a mission to Mars. The spacecraft arrived at the Red Planet in late May 2008 to closely examine the surface of the planet's northern polar region.

## 18. Endeavour Launch

**Aug. 8, 2007**

Space shuttle Endeavour and its seven-member crew lifted off from Launch Pad 39A at 6:36 p.m. EDT on mission STS-118. Crew members delivered the S5 truss segment to the International Space Station, and tested a new system that enables docked shuttles to draw electrical power from the station to extend visits to the orbiting outpost. It was the first flight for Endeavour in more than four years, after an extensive modification period.

## 19. Endeavour Landing

**Aug. 21, 2007**

Endeavour and its crew touched down at Kennedy's Shuttle Landing Facility at 12:32 p.m. EDT, completing a 13-day journey of more than 5.2 million miles in space.

## 20. Dawn Launch

**Sept. 27, 2007**

NASA's Dawn spacecraft began its 1.7-billion-mile voyage on a Delta II rocket from Launch Pad 17-B at Cape Canaveral Air Force Station at 7:34 a.m. EDT. Dawn will study asteroid Vesta in 2011 and dwarf planet Ceres in 2015, both located in orbit between Mars and Jupiter.





# Launch Vehicle Processing

**D**uring Fiscal Year 2007, the Launch Vehicle Processing team prepared NASA's three orbiter vehicles—Atlantis, Discovery and Endeavour—for their journeys to deliver U.S. and international partner elements to the International Space Station. At the same time, the team also began work on Launch Complex 39 facilities to prepare for the Ares I-X test flight, scheduled for April 2009.

Three space shuttle launches from Launch Pad 39A carried 21 astronauts and several critical payloads to the station. The space shuttles traveled a combined total of approximately 20 million miles during missions that delivered permanent power to, and expanded the size and capability of the station.

The processing team overcame pre-flight challenges by developing innovative tools and procedures to complete the work necessary to ensure successful launches.

## **Mission STS-116/Discovery**

Space shuttle Discovery launched on Dec. 9, 2006, at 8:47 p.m. EST, on mission STS-116, to deliver the P5 truss segment to the station. The shuttle also carried 5,800 pounds of much-needed supplies and equipment in a Spacehab single logistics module in the orbiter's payload bay. It was the 20th shuttle flight to the space station and the first nighttime launch in more than four years. After a 13-day mission, Discovery landed at Kennedy's Shuttle Landing Facility on Dec. 22, 2006 at 5:32 p.m. EST.

## **Mission STS-117/Atlantis**

Originally scheduled for launch in March, Atlantis' external tank thermal protection system foam insulation was damaged by hail from a strong thunderstorm that passed over the Launch Complex 39 area on Feb. 26, 2007. After initial damage assessments, the shuttle was returned to the Vehicle Assembly Building, where unprecedented scaffolding and temporary platform access were assembled quickly and safely around the external tank.

Assessments revealed thousands of damaged areas on the tank that violated acceptance criteria for flight. NASA and contractor repair teams took on the challenge to develop and implement repair methods. Additionally, a hail damage database was created to collate and evaluate the damage information. A Web site was created that allowed the team to understand the progress of the immense repair efforts.

The processing team worked tirelessly to complete all repairs, contributing to a successful launch of Atlantis on mission STS-117 on June 8, 2007, at 7:38 p.m. EDT. After a 14-day mission, At-

lantis landed safely at Edwards Air Force Base, Calif. on June 22, 2007, at 3:49 p.m. EDT.

## **Mission STS-118/Endeavour**

After nearly five years, NASA and contractor workers completed the Orbiter Major Modifications, or OMM, to Endeavour. The processing team completed 195 modifications and 205 special tests on the vehicle. Nearly 150 miles of wiring was inspected and many components were removed to gain access to the vehicle's airframe for inspection.

Endeavour received a new multi-functional electronic display system, also called the "glass cockpit." A Global Positioning Satellite system was added and the cockpit's outermost windows on each side were replaced with thicker window panes.

More than 2,000 tiles were removed and replaced and 72 Boeing Reusable Insulation tiles were installed in critical areas on wing leading edges, and main and nose landing gear doors. All wing leading edge reinforced carbon-carbon panels were removed and inspected using thermography and CT scans. A record-breaking 2,000 thermal control system insulation blankets were removed from inside the vehicle and either refurbished or replaced.

Major components removed, inspected and reinstalled included the remote manipulator system, forward reaction control system, orbital maneuvering system pods, orbiter docking system/airlock and the dome-mounted heat shields that surround the main engines. Every orbiter system was inspected and tested, including hydraulics, electrical and main propulsion systems.

When the OMM and post-Columbia accident safety modifications were completed in June 2007, the team had inspected, repaired, replaced, modified or upgraded practically every piece of the orbiter's components.

Space shuttle Endeavour launched on Aug. 8, 2007, at 6:36 p.m. EDT, and landed safely at Kennedy on Aug. 21, 2007, at 12:32 p.m. EDT, completing a nearly flawless 13-day mission.

The first flight of the Station-to-Shuttle Power Transfer System took place aboard Endeavour. The system allowed the shuttle to remain docked for a longer period by drawing power from the station.

## **ARES I-X Preplanning and Ground Modification Efforts**

NASA's Ares I-X flight test vehicle will use some shuttle-derived flight hardware, including a five-stage solid rocket booster. The test vehicle will consist of a single, four-segment solid rocket booster and a fifth inactive segment and will require a variety of facility



Emerging from the billows of smoke below, space shuttle Endeavour hurtled into the sky from Launch Pad 39A on mission STS-118, on Aug. 8, 2007, at 6:36 p.m. EDT. The 13-day mission was the 22nd flight to the International Space Station.



In High Bay No. 1 inside the Vehicle Assembly Building, technicians sand away the red dye that was applied to the external tank to help expose cracks or compression dents. A severe thunderstorm with golf ball-sized hail caused visible divots in the tank's foam insulation and minor surface damage to about 26 heat shield tiles on the shuttle's left wing, as space shuttle Atlantis sat on the pad for mission STS-117.

and ground support equipment modifications. As the prime space flight operations contractor for NASA, United Space Alliance will provide design solutions to minimize the extent of the modifications, manage the modification work with both in-house and fixed price contractor support and integrate Ares I-X and Constellation modifications into shuttle processing activities. Several Kennedy facilities are currently undergoing modifications, or soon will be, in order to accommodate Ares vehicle processing and launch.

### Launch Pad 39B

Access for the Ares I-X flight test vehicle will be provided at three locations and will originate from the existing fixed service structure and the rotating service structure. The upper stage and interstage access will be provided by modifying the gaseous oxygen vent arm to provide entry to the upper stage simulator and permit servicing of the interstage roll control system. The gaseous oxygen vent arm rotation will be accomplished using existing mechanisms and controls at the pad. A new platform will be mounted on the rotating service structure to provide access to the forward skirt/forward assembly access door.

Conditioned air purge will be provided to the flight test vehicle at the new forward skirt/forward assembly for avionics and instrumentation thermal conditioning. The existing T-0 umbilical will use a simple lanyard/reel for duct retraction. Conditioned air will be provided to the upper stage simulator for personnel comfort and safety during launch pad processing operations.

A new lightning protection system will be similar to the existing space shuttle-derived system. The lightning mast and/or fixed service structure's height will be extended to encompass the taller vehicle and will require new down cables to accommodate the taller structure. Demolition of the abandoned in-place hammer head crane assembly will be necessary because of the taller mast.

### Mobile Launchers

Additional cleats and water bags will be installed to close off the area between the hold-down post in the right solid rocket booster hole to help ensure that the shock wave from the ignition of the boosters and exhaust during initial ascent do not affect the flight test vehicle.

### Vehicle Assembly Building

Modifications to the Vehicle Assembly Building will be implemented for the Ares I-X flight test vehicle to support access and environmental control design. Access to the test vehicle will be provided by the existing solid rocket motor field joints through existing high bay platforms. Temporary scaffolding will be used as necessary to reach correct heights.

Upper stage and interstage access will be provided by a staircase projecting off of existing shuttle platforms. The upper most shuttle access platform on the north side will be removed to provide access for the flight test vehicle. Access to the hypergolic servicing panel will be provided by a new staircase/platform or modified module.

A conditioned air purge to the upper stage access hatch for the avionics bay will be provided. Conditioned air will be provided by a mini-portable purge unit.

### Hypergolic Maintenance Facility

Assembly and validation of the Ares I-X roll control system servicing and de-servicing design was accomplished at the Hypergolic Maintenance Facility. The plan for propellant servicing/contingency de-servicing will utilize existing ground support equipment within the facility test cell.





Endeavour was lifted into the upper levels of the Vehicle Assembly Building for stacking in High Bay 1 with the external tank and solid rocket boosters. Mission STS-118 was Endeavour's first flight in more than four years.



# International Space Station and Spacecraft Processing

Preparing several key U.S. and international partner elements for delivery to the International Space Station made for an exciting year at Kennedy's Space Station Processing Facility. During fiscal year 2007, several payloads underwent extensive final checkout, assembly and processing before flight.

With the delivery of numerous elements, NASA expanded the space station to 240 feet long and 330 feet wide, with a weight of more than 516,000 pounds, or 258 tons, in orbit. After the addition of the Harmony node in October 2007, the Expedition crew's pressurized living space was 15,000 cubic feet, or about the size of a large three-bedroom house.

## **Mission STS-117**

The S3/S4 truss segment was delivered to the space station on mission STS-117 in June 2007, marking the first construction on the starboard side of the station's integrated truss structure since 2002. The truss weighed 17.5 tons, giving it the distinction of being the heaviest single element delivered to the complex orbiting outpost. When station assembly is complete, the S3/S4 truss will provide one-fourth of the combined power from the U.S. solar arrays.

The truss will supply the power necessary to launch space station assembly into the next major phase which includes the addition of the international science laboratory modules during the next two years.

## **Mission STS-118**

Kennedy workers completed the physical integration and testing of the S5 truss segment and four orbital replacement unit integrated assemblies. These items, along with a Spacehab single cargo module and the external stowage platform 3, were successfully integrated and launched aboard Endeavour on mission STS-118 on Aug. 8, 2007.

## **Mission STS-120**

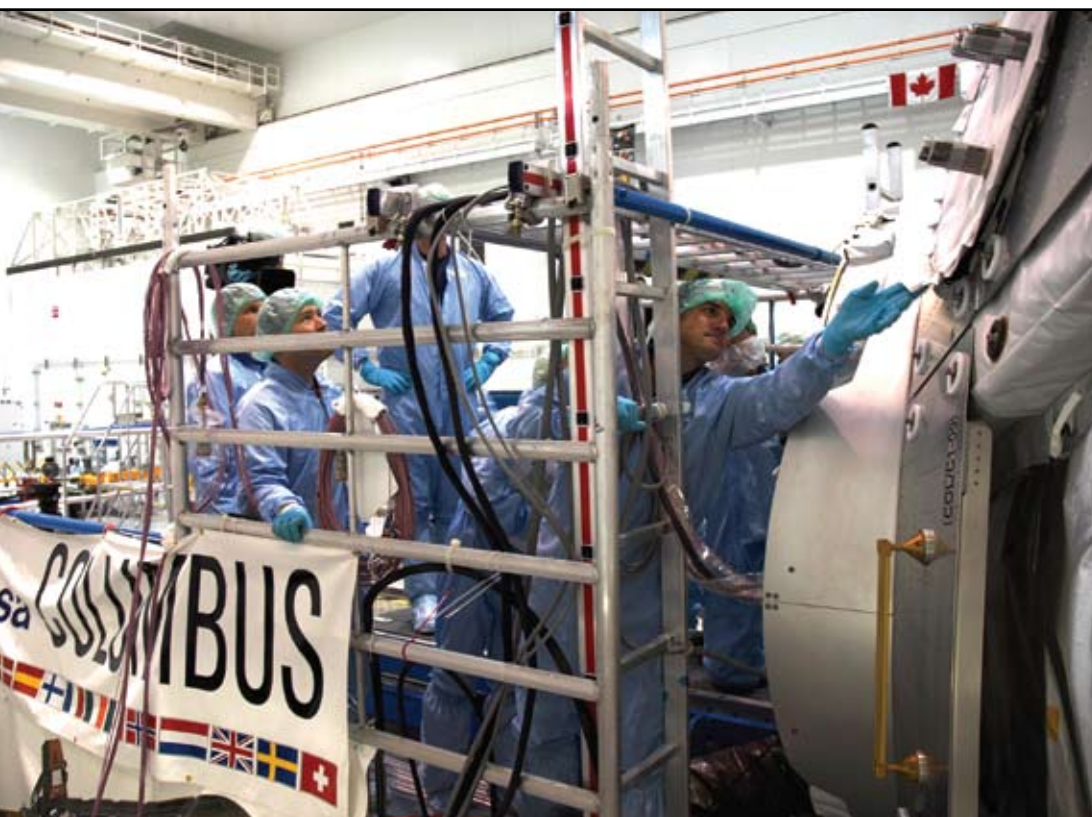
The mission processing team completed the ground processing of the Harmony node and it was successfully launched and delivered to the orbiting station on Oct. 23, 2007, during the STS-120 mission. It was permanently attached to the U.S. Destiny Laboratory and will serve as the docking station for the Japanese Aerospace Exploration Agency module Kibo and the European Space Agency module Columbus.

## **Columbus module**

Mission processing workers assisted the European Space Agency, or ESA, in preparing the Columbus laboratory module and the integrated cargo carrier containing two European payloads: SOLAR and EuTEF. Both experiments were attached to the Columbus exposed payload facility and are comprised of a variety of solar and engineering technology experiments.

Ground processing tasks included an element leak test of the module

Members of the STS-122 crew look over the Columbus Research Laboratory in the Space Station Processing Facility. The Columbus Lab is the European Space Agency's largest contribution to the construction of the space station and will support scientific and technological research in a microgravity environment.





Inside the Space Station Processing Facility, an overhead crane lifts the U.S. Node 2 module, known as Harmony node from its stand. The crane was used to transfer the Italian-built module to the payload canister for delivery to Launch Pad 39A, for mission STS-120.

customer with troubleshooting problems, delivered both cargo elements and vertically installed the payload data grapple fixture onto a sidewall carrier at Launch Pad 39A.

## FUTURE STATION ELEMENTS

### JAXA Missions

The Japan Aerospace Exploration Agency, or JAXA, delivered the experiment logistics module-pressurized section to Kennedy in March 2007. After arrival, the ELM-PS underwent eight months of integration and testing to prepare it for flight on mission STS-123 aboard Endeavour, which launched on March 11, 2008. The module carried eight system, storage, and experiment racks to orbit for future use in the JAXA Kibo pressurized laboratory module.

JAXA and its contractors continued launch site preparations of the pressurized module for its flight on the STS-124 mission. In October 2006, an end-to-end test was performed involving the transmission of commands from the JAXA Space Station Control Center at the Tsukuba Space Center in Japan to the module at Kennedy, and return of telemetry from the module to Tsukuba. The test served to successfully validate flight hardware, the control system and procedures.

inside the Operations and Checkout Building vacuum chamber; and testing Columbus' common berthing mechanism and flushing, then filling Columbus with new water coolant. The nitrogen tank assembly, which is a space station orbital replacement unit, was loaded with high-pressure gaseous nitrogen, integrated onto its flight support equipment, and delivered to the Spacehab facility for installation onto the integrated cargo carrier.

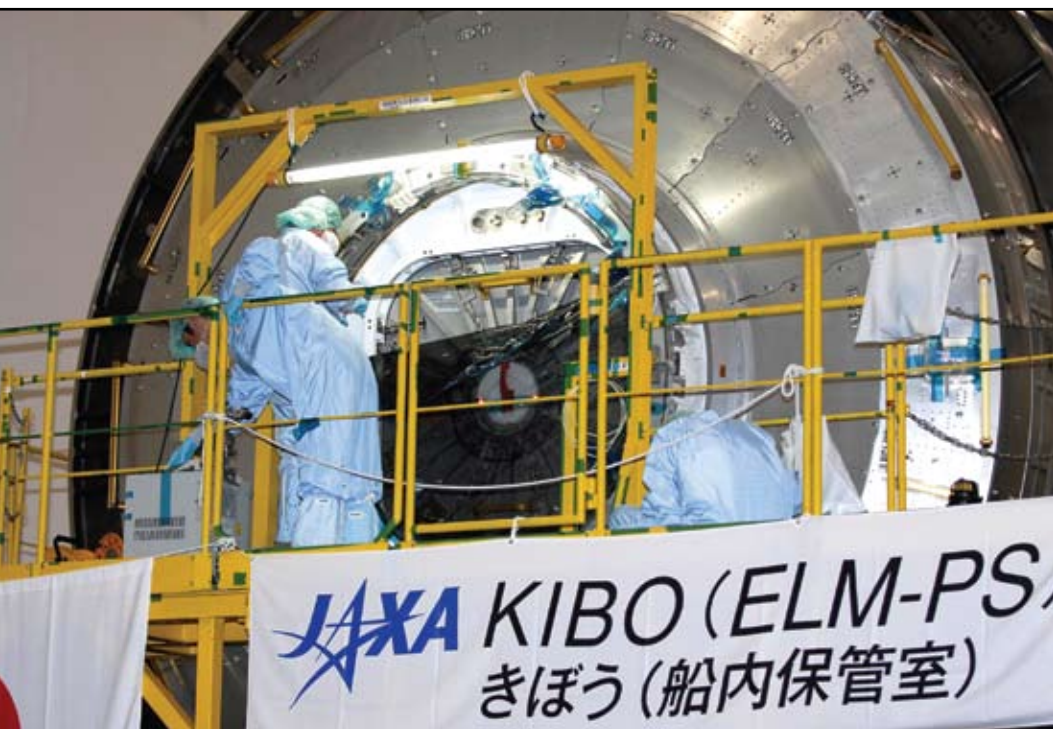
The space station and payload processing team assisted the ESA

In January 2007, the pressurized module remote manipulator system arrived at Kennedy from Tsukuba and was installed onto the module. At the close of the year, final module flight configuration was under way in preparation for launch.

### Canada's Dextre robotic manipulator

The Canadian Space Agency special purpose dexterous manipulator, also called Dextre, arrived at Kennedy in June 2007. After a





Technicians monitor the Japan Aerospace Exploration Agency's Kibo experiment logistics module pressurized section inside the Space Station Processing Facility. The logistics module was the primary payload for space shuttle Endeavour's STS-123 mission.

brief period of post-delivery testing, it was integrated on top of a Spacelab pallet for flight on mission STS-123.

### S6 truss segment

As the last truss segment to fly, the S6 will be the final addition to the space station's power and support structure. Since the segment arrived at Kennedy in December 2002, the processing team has worked diligently to ensure the S6 is ready for launch. Future processing work includes battery replacement, installation of one of the solar array wings and around-the-clock testing of the segment's batteries and coolant systems. The S6 truss is scheduled to be delivered to the station on mission STS-119 in early 2009.

### Cupola

The Cupola is currently in the Space Station Processing Facility high bay awaiting launch. The ultimate observation deck and control tower for robotics in space will provide astronauts with a spectacular view of the universe, as well as to the station through its 360-degree windows. When Node 3 arrives from Italy in July 2009, the Cupola will be joined to the node for launch in mid-2010.

## FACILITIES

### Operations and Checkout Building

Construction is well under way to transform the Operations and Checkout Building high bay into a world-class Orion spacecraft assembly facility. By the end of 2007, facility system designs were nearly complete and the Lockheed Martin-led construction team had removed Spacelab and Apollo-era systems and begun installing new infrastructure to support future Orion factory work. Lockheed Martin plans to have the spacecraft clean room ready for tooling installation by November 2008. The first Orion flight hardware to be processed through the building will be the crew module hardware arriving in April 2009.



Technicians adjust the Canadian Space Agency's special purpose dexterous manipulator, known as Dextre, into position on a pallet inside the Space Station Processing Facility.



STS-116 Mission Specialist Robert L. Curbeam Jr. prepares to replace a TV camera on the exterior of the International Space Station during the mission's first spacewalk.





# Launch Services Program

**N**ASA's Launch Services Program at Kennedy processed five expendable launch vehicles and spacecraft for successful launches, while working 34 active missions and preparing for future launch capability by engaging with entrepreneurial launch companies.



The Solar Terrestrial Relations Observatory, or STEREO, was processed at Astrotech Space Operations in Titusville, Fla. STEREO is two observatories and is the first mission to take measurements of the sun and solar wind in 3-D.

The program continued supporting the Constellation Program by providing expendable launch vehicle expertise, information and guidance for ground operations and requirements development. It also supported NASA's Commercial Orbital Transportation Services effort by providing launch vehicle expertise in an advisory role.

In April 2007, the Launch Services Program celebrated the 50th successful expendable vehicle launch since taking the lead for the agency in 1998. Among those 50 missions were some of the nation's most important scientific and planetary spacecraft that continue to study Earth and the solar system today.

Historic spacecraft launched by the program include the Mars exploration rovers, the MESSENGER spacecraft currently journeying to the planet Mercury and the Deep Impact spacecraft that arrived at the comet Tempel 1. The Launch Services Program also launched the New Horizons spacecraft on its way to Pluto, the Mars Reconnaissance Orbiter, the National Oceanic and Atmospheric Administration's GOES weather satellite system and the Tracking and Data Relay Satellite communication series.

The program also seeks to inspire and motivate the next generation of scientists, engineers and space explorers. During fiscal year 2007, more than 100 schools and more than 45,000 students in 28 states and five countries received educational material on NASA's robotic space exploration missions.

## MISSIONS

### STEREO

The Solar Terrestrial Relations Observatory, or STEREO, launched Oct. 25, 2006, aboard a Delta II rocket from Cape Canaveral Air Force Station. STEREO is a two-year mission of two nearly identical observatories: one ahead of Earth in its orbit and the other trailing behind to provide 3-D measurements of the sun and its flow of energy. The information gathered by these observatories will enable scientists to study the nature of coronal mass ejections and help understand why they happen.

### THEMIS

The Time History of Events and Macroscale Interactions during Substorms, or THEMIS, spacecraft launched aboard a Delta II on Feb. 17, 2007, from Cape Canaveral Air Force Station. THEMIS is a two-year mission that uses five identical microspacecraft, or probes, to track the colorful, "dancing" lights in Earth's upper atmosphere. These eruptions are linked to energy releases in Earth's magnetosphere called substorms. THEMIS' five probes, aligned



At Cape Canaveral Air Force Station, clouds of smoke formed around the Delta II rocket with NASA's THEMIS spacecraft aboard as it lifted off Pad 17-B on Feb. 17, 2007, at 6:01 p.m. EDT.



over the North American continent, will measure three aspects of substorms and help scientists develop a better understanding of how auroral eruptions are triggered.

### AIM

NASA launched the Aeronomy of Ice in the Mesosphere, or AIM, satellite using a Pegasus XL launch vehicle from Vandenberg Air Force Base, Calif. on April 25, 2007. The satellite will orbit Earth for at least two years to study the highest clouds in the planet's atmosphere which are only visible from the ground at night. AIM's three instruments will provide the basis for study of long-

term variability in the mesospheric climate and its relationship to global changes, to solve the mysteries of these clouds. The overall goal of the AIM experiment is to resolve why polar mesospheric clouds form and why they vary.

### Phoenix

The Phoenix Mars spacecraft launched Aug. 4, 2007, aboard a Delta II launch vehicle from Cape Canaveral Air Force Station. Phoenix is the first in NASA's Scout Program and is part of NASA's Mars Exploration Program. Phoenix will land on the icy northern pole of Mars and explore the surface by deploying its robotic arm

to dig trenches up to 1.6 feet deep through the protective top soil layer to the water-ice below, and bring both soil and ice to the lander-based instruments for scientific analysis. The results from the analysis of the soil and ice will help scientists assess whether the environment beneath the surface has ever been a favorable habitat for microbial life.

### Dawn

The Dawn spacecraft launched aboard a Delta II on Sept. 27, 2007, from Cape Canaveral Air Force Station. The spacecraft will investigate two of the largest protoplanets in the main asteroid belt: Vesta and Ceres. Vesta is the source of 5 percent of the meteorites found on Earth. Ceres, like Pluto, is now classified as a dwarf planet and Dawn will be the first mission to explore this interesting class of objects. Ceres has a primitive surface and evidence of water content, which has led scientists to suspect the presence of frosty polar caps. Vesta's physical characteristics reflect those of the inner planets, whereas Ceres resembles the icy moons of the outer planets. By comparing these two protoplanets, scientists will develop an understanding of the transition from the rocky inner to the icy outer regions of the solar system. Dawn will be the first spacecraft ever to orbit two targets after leaving Earth, allowing the same instruments to be used to gather comparative data on both protoplanets on a single voyage.



On Launch Pad 17-A at Cape Canaveral Air Force Station, the first half of the fairing is moved into place around the Phoenix Mars Lander for installation.



Launch Services Program leaders  
concentrate on launch operations in  
support of the STEREO mission.





# Constellation Ground Operations

Kennedy Space Center's Constellation Project Office supported NASA's Constellation Program as the agency prepared for the test flight of the Ares I-X, scheduled for 2009. The year was filled with several exciting accomplishments as the team worked hard to fulfill its role in providing the nation with the next generation of space vehicles.

Kennedy's Ground Operations Project continued to mature and make notable progress this year in establishing a capability to assemble, test, launch and recover flight vehicle components for the

Constellation Program. The key elements associated with this capability include the following:

- Spacecraft processing
- Solid rocket processing
- Vertical integration
- Mobile launcher
- Launch pad
- Recovery and retrieval
- Command, control and communications
- Operations support

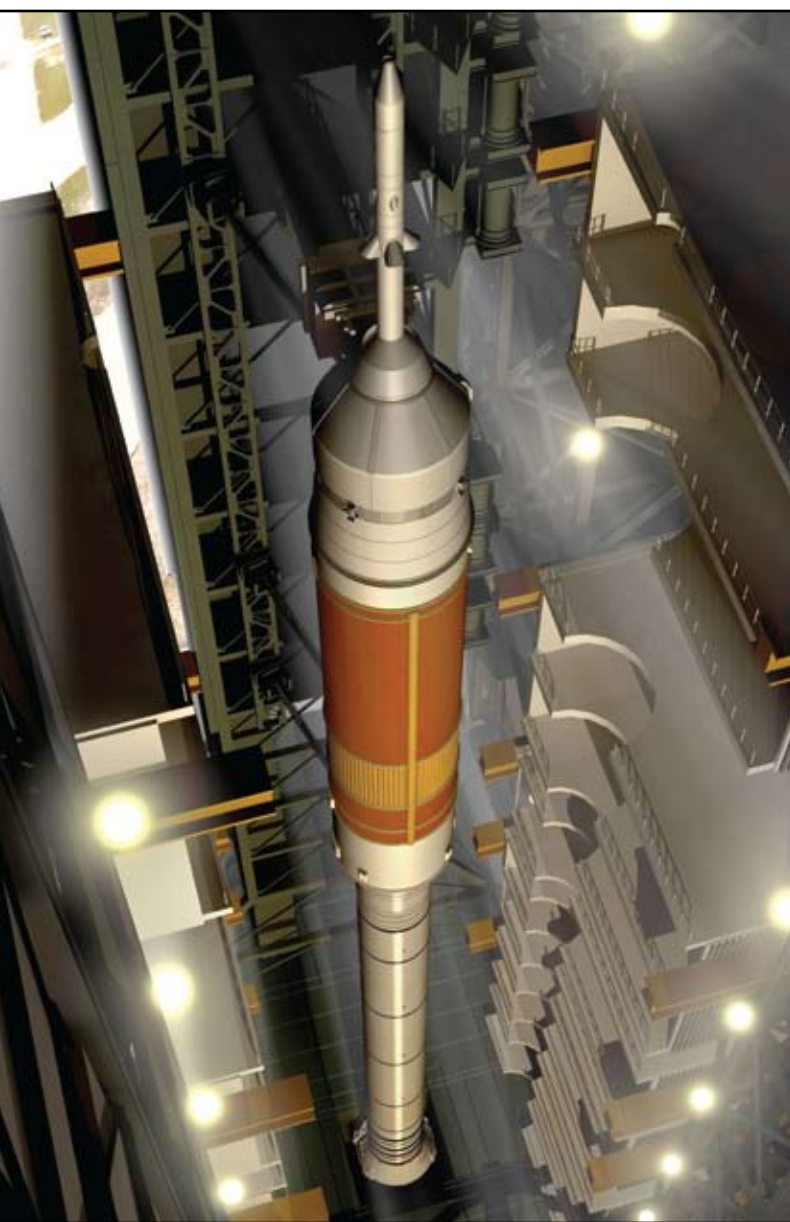
The Ground Operations Project also passed a significant milestone in May 2007 with the completion of the systems requirements review. This review was necessary to ensure that the project plans and requirements will meet program expectations, establish initial flight capability and support missions to the International Space Station.

In preparation for Ares I-X, the project completed the preliminary designs for modifications to a shuttle mobile launcher platform, Vehicle Assembly Building (VAB) high bay, Launch Pad 39B, Launch Control Center firing room and Hangar AF. The initial execution of these designs began when a construction contract was awarded to modify Firing Room 1 in June.

Kennedy also initiated key design efforts to support the flights following Ares I-X. These designs included an additional VAB high bay, Launch Complex 39 and Multi-Payload Processing Facility modifications, a new mobile launcher, a launch control system, a vehicle motion simulator and ground support equipment. The implementation of these designs began with the initiation of the first phase of construction of a lightning protection system at Launch Pad 39B in August 2007.

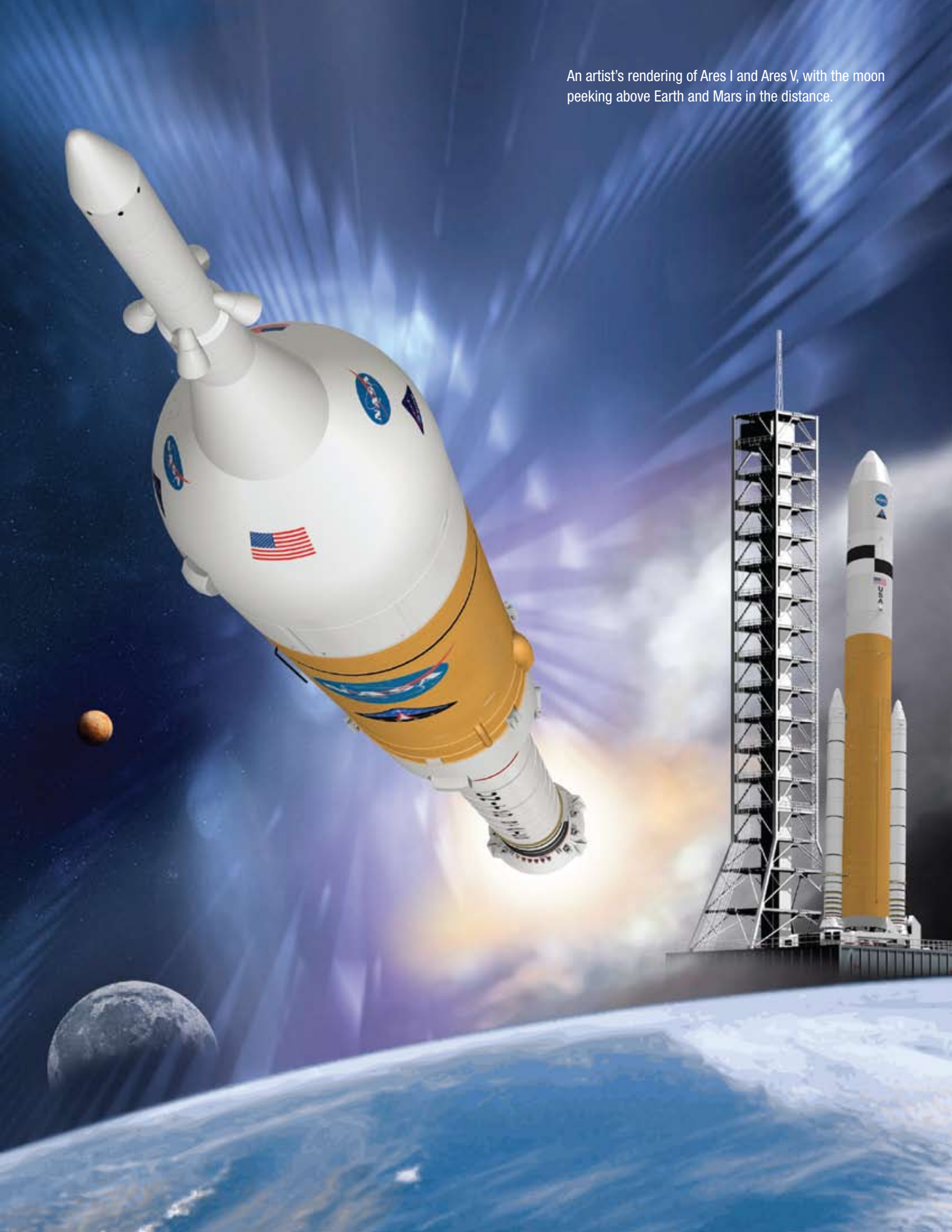
In addition to the design activities, Kennedy continued to work with the Crew Launch Vehicle (Ares) and Crew Exploration Vehicle (Orion) teams to refine requirements, identify vehicle interfaces, and support the early formulation of concepts and requirements for the Ares V launch vehicle, lunar lander (Altair), Mars exploration missions and extra-vehicular activities.

As the project continues to progress through the design and development phase of the program, Kennedy workers will continue to enthusiastically develop and procure the products and services required to support the Constellation Program needs, goals and objectives.



An artist's concept of Ares I-X processing inside the Vehicle Assembly Building.

An artist's rendering of Ares I and Ares V, with the moon peeking above Earth and Mars in the distance.





# Applied Technology

**T**echnology experts at Kennedy Space Center solved difficult problems, ensured space shuttle safety and developed techniques to support sustained moon missions.

Kennedy's cryogenics test bed team quickly resolved critical issues related to the STS-122 space shuttle mission. Problems

arose with Atlantis' engine cutoff sensor and delayed the launch. In response, the team worked with engineers to rapidly and safely evaluate the performance of a connector that was thought to be breaking contact at cryogenic temperatures. Test bed investigations, in cooperation with Marshall Space Flight Center tests, traced the

fault to a lubricant which was hardening at low temperatures and causing vibration-induced loss of contact. The availability of Kennedy's expertise and test bed capabilities provided essential support in identifying and fixing this difficult problem, allowing the shuttle to safely fly again.

Kennedy researchers continue to play a strong role in developing technology for the In-Situ Resource Utilization, or ISRU, program supporting exploration. ISRU is the technique which will enable sustained missions on the moon by producing needed resources from the lunar soil. Kennedy leads the oxygen production portion of the project and is developing a prototype system for demonstration. Due to Kennedy's successful involvement, the team earned responsibility for ISRU lunar systems

involving the development of systems for moon operations.

Using technology developed for fostering plant growth, a light-emitting diode light panel was developed at the center as well. The LED panel is a drop-in replacement for fluorescent light panels used on the International Space Station today. The advantages to the new panel are reduced cost and reliability. The panel will be flown to and evaluated on the space station in late 2008.

The center's technology experts will continue to rely on their cutting-edge expertise and facilities to positively affect current and future programs.



A team member works in the cryogenics testbed to resolve critical issues.

# Partnerships

**K**ennedy Space Center continued strengthening its external partnerships with space-related industry leaders, state and local economic development entities, elected officials and community leaders to accomplish agency and center goals. Key partners included the Florida governor and lieutenant governor, Space Florida, the Economic Development Commission of Florida's Space Coast, Enterprise Florida Inc., Florida High Tech Corridor Council, Brevard County Commission, Florida legislature, Florida Congressional Delegation, chambers of commerce and various key civic associations local to Kennedy.

The center hosted members of Congress, state legislators, local elected officials and congressional and state legislative staff members who were on hand to learn about Kennedy and view expendable vehicle and space shuttle launches. Kennedy supported extensive activities to maintain and enhance legislative relationships with local, state and federal elected officials. Briefings were given to members of the Brevard County Commission, Florida legislature, Florida Governor's Office and Florida congressional delegation, focusing on NASA's mission and other initiatives involving the center. Senior management participated in events marking the annual Florida Space Day in Tallahassee. Kennedy also supported NASA's Office of Legislative and Intergovernmental Affairs in the annual "Days on the Hill" in Washington, D.C.

Center leaders continued providing outreach to a diverse group of economic organizations. The center provided input to the Economic Development Commission of Florida's Space Coast quarterly Space Committee meeting to help in prioritizing Brevard County's space initiatives. A notable success was the August 2007 Supply Chain Conference, in which NASA prime con-

tractors were brought together with third- and fourth-tier contractors interested in business opportunities. The center was active with the Brevard Workforce Development Board as a member of the Aerospace Career Development Committee that provides input on work force transition tools.

Kennedy's partnerships with charitable organizations in Brevard, principally United Way of Brevard, served as a vehicle for employees to contribute to the healthy and growing local community, as well as numerous charities across the nation. This year's theme was "Federal Hearts at Work," and employees voluntarily contributed just under \$431,662 in donations through the 2007 Combined Federal Campaign.



Inside an orbiter processing facility, Florida Lt. Gov. Jeff Kottcamp examines the reinforced carbon-carbon panels of Discovery during a tour of the center.



# Environmental Leadership

The Kennedy Space Center work force is successfully reducing its carbon footprint on the world, ensuring the safety of workers and preserving the historic properties unique to the center.

In 2007, Kennedy workers recycled 430 tons of office paper and cardboard, and 1,250 tons of scrap metal. The proceeds from these recycling activities fund additional recycling and pollution prevention efforts, including installation of a new fence at the Kennedy Child Care Facility. The new fence is made of recycled content and will require far less maintenance than the previous wooden fence. Another example is the crushing of waste concrete generated from the demolition of unnecessary center structures. The crushed concrete will be used in an upcoming Kennedy project to repair the existing seawall along the NASA Causeway, thereby avoiding the cost of purchasing new materials and also diverting concrete from disposal in a landfill.

Through the use of cutting-edge cleaning methods, Kennedy's environmental specialists saved the government more than \$6 million during a clean-up project. Based on current knowledge and technology, workers identified and removed soil contaminants from 15,000 cubic yards of center property. A chemical was used to stabilize the soil, and the renewed site will be available for recreational use by employees.

An alternative waste management process, which protects workers as well as the environment, was also implemented at the center. The process provides a method to manage inorganic zinc paint wastes, which ensures worker safety by allowing the material to safely dry prior to disposal. Environmental regulations require such wastes to be completely containerized before disposal, but the paint wastes continue to undergo chemical reactions and release gases that can cause closed containers to explode. Therefore, Kennedy experts developed the safe process, and the Florida Department of Environmental Protection approved it for limited use at the center. Kennedy leaders are working with the department to expand the use of this process at the center to obtain the maximum worker and environmental benefits offered by this unique management process.

Kennedy workers also led an agency-wide effort to identify criteria to define the historic value of shuttle-related property. NASA staff will use the specific standards to determine which of these properties should be managed as historic ones. Developing these criteria well before the retirement of the Space Shuttle Program will speed up transition efforts and ensure consistent protection and management of historic properties that exemplify significant achievements of the program.



This young alligator climbs on the railroad tracks where a train carrying solid rocket booster motor segments was approaching Kennedy Space Center.

# Outreach to the World

Whether they were looking toward the airways to see rockets, watching TV broadcasts, visiting interactive NASA Web pages or meeting employees who work in a true space-age setting, everyone from children to retirees got a better understanding of NASA's impact on the world during the fiscal year.

## KSC Visitor Complex

The Kennedy Space Center Visitor Complex effectively spread NASA's message to more than 1.5 million guests from across the globe. Attendance for 2007 grew 9.3 percent over the previous year due to the opening of the highly anticipated Shuttle Launch Experience mid-year. This new attraction effectively immerses guests in the sights, sounds, feelings and excitement of a simulated space shuttle launch with educational pre- and post-show elements.

Actual launch viewings from the Space Coast continued to draw enthusiastic tourists and residents from the central Florida marketplace to Kennedy. The Visitor Complex hosted thousands of guests for three space shuttle and three expendable launch vehicle missions that began with liftoffs from the spaceport during the fiscal year.

Several other construction projects also improved the Visitor Complex's guest experience. The central plaza was refurbished for

better appearance, safety and flow for foot traffic. New weather protection was added, along with a large NASA logo for photo opportunities and reader boards that enable current events and messages to be prominently displayed. The bus boarding-loop received a total renovation, which improves safety and loading efficiency. A new Constellation Program-themed children's playground was built for the younger audience to enjoy, along with a one-of-a-kind floating granite ball showcasing our constellation, a hugely popular bonus for the guests. The NASA and concessioner team continue to evaluate, refine and invigorate the guest experience through a 10-year master development plan.

The Orlando International Airport retail stores continued to thrive, providing exposure to NASA and offering space-related products to millions of travelers commuting through one of the top-10 busiest airports in the country. Additionally, the complex's educational programs maintained great success toward educating and inspiring the next generation of explorers. Overall, 88,000 students participated in programs including Camp KSC, Overnight Adventures, the Astronaut Training Experience and student fieldtrips. Included was the continued partnership with Brevard Schools hosting more than 11,000 sixth- and seventh-grade students through the formal curriculum developed for two programs:



A videographer takes footage of the center following recent high definition television upgrades.





Former astronauts enjoy the newest Visitor Complex attraction, the Shuttle Launch Experience. It includes a simulated launch with the sights, sounds and sensations of launching into space.

Brevard Space Week and Brevard Learns About Science and Technology. The Visitor Complex sponsored the 2007 Florida Association of Science and Teachers conference, hosting more than 350 science teachers from around the state. Additionally, the complex participated in NASA's education conference and tours for educators from across the country during the STS-118 mission activities. Payload Specialist Barbara Morgan's involvement added to the excitement. Morgan, an educator-astronaut, traveled to space as part of the mission's crew.

Special events continued to be an effective way to reach thousands of people with the NASA story. Highlights this year included the induction of the fifth class of space shuttle astronauts to the U.S. Astronaut Hall of Fame and weeklong festivities to celebrate the grand opening of the Shuttle Launch Experience. This included 40 veteran astronauts who were the first riders of the new attraction and two concert nights with the highly acclaimed Mannheim Steamroller band. Netflix and the Visitor Complex partnered for a Bruce Willis concert and a special showing of the movie "Armageddon" in the Rocket Garden, followed by the first Visitor Complex Fall Concert Series. Most notable is the World Space Expo event which featured the first aerial demonstration over Kennedy in 30 years. The expo was coupled with an evening gala commemorating Project Mercury's 45th anniversary, special exhibits including a Vostok capsule, and special educational programs that reached more than 3,500 Florida students and Girl Scouts. Soaring through the Kennedy airspace for three days were the world-renowned U.S. Air Force Thunderbirds, as well as the F-22 Raptor and F-15 Strike Eagle, the U.S. Navy F-18 Super Hornet, U.S. Army Golden Knights, and a 920th Rescue Wing astronaut recovery demonstra-

tion. Thousands of Kennedy employees joined a multitude of central Florida residents and tourists to enjoy this unique event.

2007 marked the 40th anniversary of the Visitor Complex which was successfully developed, operated and maintained with non-appropriated funds. Unlike many museums around the country who do receive tax payer funding, the Visitor Complex is a self-supporting entity funded solely through admission, retail and food sales.

### Guest Operations

Kennedy's Guest Operations staff enabled more than 17,000 guests of NASA and its center partners to participate in behind-the-scenes Kennedy tours, including educational briefings provided by center engineers and operational experts. Additionally, the center hosted thousands of the agency's invited guests to participate in launch briefings and up-close viewing opportunities for three NASA space shuttle and three expendable launch vehicle liftoffs. Guests included members of Congress, business and agency leaders, astronaut families, medical and legal professionals, veterans, teachers, students and the public.

### Exhibits

Kennedy's Display Management Team and Integrated Display Staff supported 25 events, both locally and nationally reaching out to about 530,000 people. Most events were held in the southeast region of the U.S., particularly in Florida, extending from as far south as Miami to north as Tallahassee. Types of events ranged from air shows to technical conferences. The program also supported some national events with other NASA centers including NASA Headquarters. The majority of events were open to the public, with

several focused on minority groups such as African-Americans, Puerto Ricans and Hispanics, as well as student groups, scientific/technical groups and the government.

Exhibits included an astronaut mannequin photo opportunity, and interpretive displays of NASA programs including the Space Shuttle, International Space Station, Launch Services, and Constellation programs. Displays and handout materials featured the benefits of space, spin-offs and NASA's mission.

### Speakers Bureau

The Speakers Bureau reached more than 45,000 people at 151 events during 2007, including two international (Mexico and Columbia) and four national events (three in Georgia and one in New York). There were 47 Speaker's Bureau events in Brevard County and 98 held elsewhere in Florida. A variety of Kennedy speakers participated, along with NASA astronauts. The group also used the Delaware North Spaceman for three events.

Using resources such as new presentations on NASA's Constellation Program, and several other updated presentations, Kennedy speakers brought the NASA message to educators, scientists, government representatives, special interest groups, industry officials and others throughout the world.

Speakers presented to library, university and retirement community groups, women leadership programs, girls in math and science programs, minority groups, engineering and science organizations, aerospace groups, education and business conferences, church and scouting groups and numerous corporations.

### Kennedy Web site

As the public turns to the Internet for direct access to news, the worldwide audience of the Kennedy Web site continues to keep the Kennedy pages ranked in the NASA top-10 among the more than one million pages of NASA.gov. The center's home page had more than 6.35 million visits this fiscal year. In addition to products like feature stories, videos and podcasts, the Web team added high-definition videos in Quicktime format for all shuttle launches.

The live "Ask the Astronaut" webcasts for each shuttle mission remained a favorite, as astronaut guests conducted show-and-tell

segments and answered questions submitted by the public from across the globe. Interactive Flash-based products gave the Web audience a chance to build a rocket, test their knowledge, and take a look inside the Space Station Processing Facility to see the station components being prepared for launch.

During the year, the Web team covered the liftoff of four expendable launch vehicles, including the high-profile Phoenix Mars mission, and three space shuttle launches and landings. In addition to Web site updates, features and videos leading up to launch day, the NASA launch blog provides minute-by-minute account of each countdown, keeping the Internet audience engaged in the excitement of the launch process. The blogs drew more than 129,000 visits for the STS-117 launch, about 83,520 for the STS-118 liftoff and nearly 77,560 for the STS-120 launch.

The Kennedy Web content kept the space shuttle and space station program developments prominently featured for the public, while beginning to build interest in Constellation's next generation of launch vehicles and the changes already under way at Kennedy to support the new program.

### Media Services

The Media Services Division at Kennedy's NASA News Center increased public awareness and support of space programs by interfacing with the world's media and public audience through a wide variety of avenues. This included a television affiliate for NASA TV broadcasting all NASA launches, a Web operation which included live webcasts and received nearly 396,000 hits on its Multimedia Gallery, television streams and on-demand videos, and a full-service Public Affairs Office catering to all forms of professional journalists. Furthermore, more than 170,000 multimedia products were produced, including fact sheets, news releases, video news releases, live and radio phone-in interviews, still photographs, video footage, tapes, CDs and DVDs.

The closeout crew helps STS-118 Mission Specialists Barbara Morgan, left, and Tracy Caldwell, prepare to enter space shuttle Endeavour. As an educator astronaut, Morgan's participation in the mission fueled excitement for local residents, tourists and educators.





# Education

Through its innovative learning opportunities for educators and students, Kennedy Space Center's Education Programs and University Research Division enjoyed high-flying success this year.

NASA's education program celebrated when Payload Specialist Barbara Morgan traveled to space as part of the STS-118 crew. As an educator-astronaut, Morgan helped develop several successful education projects built around the flight. Kennedy also hosted the agency-wide "Innovative Strategies for Cultivating the STEM Work Force" conference, which included panelists and speakers from academia, government and industry, and encouraged developing the nation's future technical work force. STEM stands for science, technology, engineering and mathematics. Kennedy's Deputy Director Janet Petro explained the important roles teachers play for the future work force, and representatives attended from The National Academies, Google, Microsoft, Lockheed Martin, Boeing, many universities and informal education agencies.

## Agency-wide Project Management

In 2007, NASA Headquarters selected Kennedy to manage several agency-wide projects, including the Interdisciplinary National Science Program Incorporating Research and Education Experience, known as INSPIRE. INSPIRE provides students from ninth grade through the freshman year of college, and their parents, an on-line community, as well as opportunities to compete for the chance to participate in hands-on research experiences during the summer months at a NASA center. INSPIRE will provide students opportunities to explore STEM careers and to be better prepared for the rigors of college. In addition, INSPIRE will be developing and supporting NASA's future aerospace work force needs.

Kennedy was also assigned to manage the agency-wide Minority University Research and Education Program's small programs project, too. Included in the effort is the Pre-Service Teacher Conference, which provides opportunities to enhance knowledge and skill for teaching mathematics and science. Another facet is the

"Achieving Competence in Computing, Engineering and Space Science" program, which provides a 10-week paid internship at NASA centers for undergraduate and disabled graduate students who have strong backgrounds in science.

Kennedy also was selected to co-lead the agency project Motivating Undergraduates in Science and Technology, also known as MUST. Each year, the project supports approximately 100 undergraduate students with a one-year competitive scholarship of up to half of tuition, not to exceed \$10,000. Students meeting the required grade point average are eligible for a paid internship at a NASA center or other research facility. Additionally, students will benefit year-round from tutoring, lecture series and mentoring. MUST is open to all U.S. students and is particularly focused on engaging students from underserved and underrepresented groups to enter STEM fields.

## K-12

NASA's Space Operations Mission Directorate partners with Kennedy on teacher professional development and student workshops through the NASA Education Exploration Team. Operated by the University of Central Florida and the Florida Space Grant



During a visit by an aerospace specialist, pre-kindergarten students learned about the solar system. Here, they are demonstrating Earth's rotation and the role that plays on day and night.

Consortium, the team provides STEM-related professional development workshops for educators, hands-on classroom activities for students and educational information to the general public. The team interacted with 8,248 educators, including taking part in professional development workshops for 4,826 teachers. The team also partnered with Delaware North and Brevard County schools during Space Week, which welcomed Brevard's sixth-graders to the center.

In 2007, at Kennedy, the NASA Explorer School program, which focuses on educators and students in the fourth through ninth grades, added three teams from Florida and Georgia for partnership. A week-long, joint orientation professional development experience was provided for the 20 Explorer teachers from the Kennedy and Stennis Space Center regions. Center staff also hosted a two-day virtual student research symposium via the Digital Learning Network for five teams from Florida, Georgia and the U.S. Virgin Islands.

Among the significant program accomplishments: two Explorer middle school experiments flew in the reduced gravity airplane; Collier County was selected for an International Space Station downlink experience; Conyers Middle School was recognized by the state of Georgia as a "Lighthouse School to Watch" and was awarded the Intel Schools of Distinction Award for excellence in middle-grades' science; hundreds of students from 12 schools were invited to attend space shuttle launches and launch attempts.

Kennedy supported the Florida regional "For Inspiration and Recognition of Science and Technology" robotics competition. This competition was held at UCF and involved 53 teams. The center sponsored two teams, and Center Director Bill Parsons kicked off the competition.

General Electric's Foundation College Bound District Program partnered with Kennedy's NASA Education Office, through the NASA Education Exploration Team, for a one-day professional development workshop for 300 educators. The program seeks to increase the number of college-ready students through a rigorous math and science curriculum, professional development for teachers and administrators, in-depth evaluation, strengthening of a district's management functions and the collaborative engagement of various districts.

The Aerospace Education Services Project supported Kennedy's region of Florida, Georgia, Puerto Rico and the Virgin Islands, providing programs for 22,600 educators, K-12 students and family groups, with 2,012 workshops specifically for teachers. The specialists supported NASA Explorer Schools, the Florida Association of Science Teachers, Georgia Association of Science Teachers, Georgia Partnership for Reform in Science and Mathematics, and Kennedy NASA Educator Resource Center.

### **Higher-Education Programs**

During the summer, the center hosted more than 100 student interns, representing 59 different universities and 19 states. Each student was mentored by an employee and assigned mission-related projects. These opportunities afford the students chances to gain early insight into their chosen career areas. According to one men-

tor, his student's extraordinary responsibilities resulted in a significant increase in the project's scope and quality.

During the fiscal year, the Exploration Systems Mission Directorate Space Grant Faculty Project was initiated. Five faculty members were competitively selected and paired with two NASA centers to identify student internships and senior design projects relative to Exploration in support of the directorate's space grant program. The efforts yielded an additional 128 directorate internship opportunities (a 95-percent increase) and 84 further opportunities (a 115-percent increase) for senior design projects related to NASA directorate's work.

### **Minority-Focused Programs**

In September, the Advancing Minorities' Interest in Engineering conference was held at Tennessee State University in Nashville with a focus on "Pathways to Stronger Partnerships." This presented an excellent opportunity for interaction with 11 deans of historically black colleges and universities with accredited engineering programs, and numerous private industry representatives from Chrysler, The Boeing Company, General Motors, Hewlett-Packard, the U.S. Army Corps of Engineers, and Raytheon. Kennedy education specialists also attended presentations of research projects by the university's engineering students.

### **Electronic Education Projects**

KSC's Digital Learning Network, or DLN, connected NASA scientists, engineers and education specialists with teachers and students through interactive videoconferencing. The network interacted with 7,000 students and 2,500 educators in 35 different states. It delivered educational modules, community programs, family nights and special events, such as live space shuttle launch briefings.

### **Informal Education**

A DVD called "Launching Dreams," which focused on mission STS-118 and featured an educator astronaut and several fourth-through seventh-grade students, was produced and distributed to museums, science centers, planetariums and schools nationwide. The video highlighted the crew, which included Mission Specialist Barbara Morgan, an educator astronaut, and gave the students the opportunity to simulate a launch countdown in a mock-firing room and space shuttle.

The NASA Education Exploration Team welcomed 120 Boy Scout and 500 Girl Scout leaders and volunteers from central Florida as they completed the "train-the-trainer" workshop. The team also provided educational workshops to 401 central Florida home-schooled students, partnered with Delaware North Park Service's education office, and provided workshops during the Homeschool Days and the "Salute to Girl Scouts and Boy Scouts" at the Visitor Complex. They also greeted and assisted 8,500 people who came to experience the Exploration Station at the Center for Space Education.



# KSC Business Report

## Chief Financial Officer

2007 was a successful year for the financial operation of Kennedy Space Center in many ways, including sustained budget growth with the evolving Constellation Program; continued improvements to the financial systems; and demonstrated progress toward a clean financial opinion for NASA through implementation of an improved Property, Plant and Equipment (PP&E) valuation process and establishment of an Internal Controls Office. All of these initiatives contributed to the efficient operation of the Center and achievement of the President’s Management Agenda.

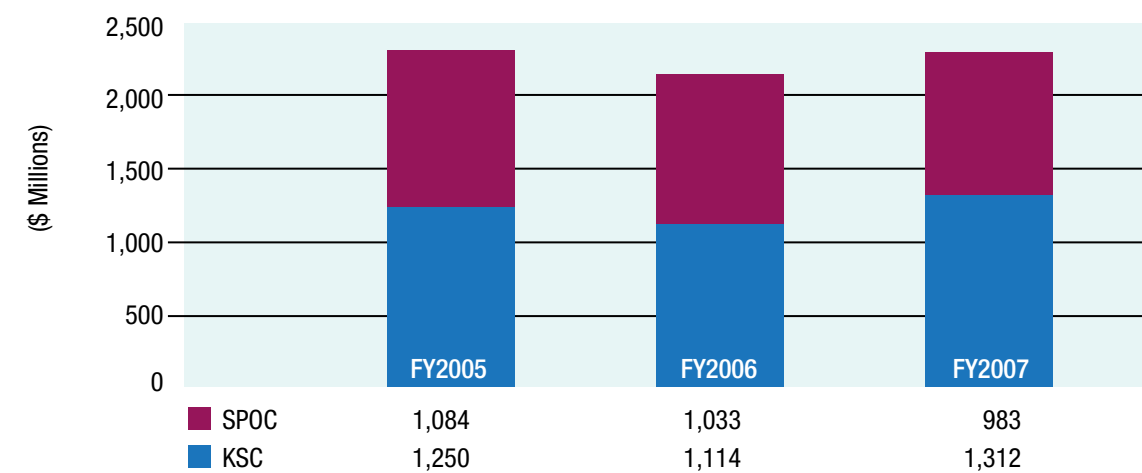
## Kennedy Budget

The center budget in FY 2007 totaled \$1.312 billion and nearly \$2.3 billion when the Johnson Space Center-managed Space Program Operations Contract (SPOC) work performed at Kennedy is included. In addition, the center performed \$121 million in reimbursable work with other commercial and government entities.

Specifically:

- The Space Shuttle Program executed a nearly \$1.2 billion budget (including SPOC) with three successful missions during FY 2007 and prepared for six flights scheduled in FY 2008.
- The FY 2007 Launch Service Program (LSP) \$412 million budget successfully supported five launch missions as well as preparations and analyses for six missions manifested in FY 2008.
- International Space Station \$110 million budget allowed for fulfillment of commitments to international partners in completing the ISS assembly, which included the delivery and integration of a major structural element and additional solar arrays.
- The FY 2007 Exploration budget of \$190 million supported continued preparations for the ground operations, launch, landing and recovery of the Ares launch and the Orion crew exploration vehicles for the Constellation Program, and planning of ground operations and launch of the lunar lander and components of the lunar outpost.
- The Kennedy Center Management & Operations budget provided \$322 million in FY 2007 to maintain the center’s infrastructure and business operations in support of its programs.

NASA/KSC BUDGET AUTHORITY SUMMARY  
FY 2005 — FY 2007 (\$ Millions)



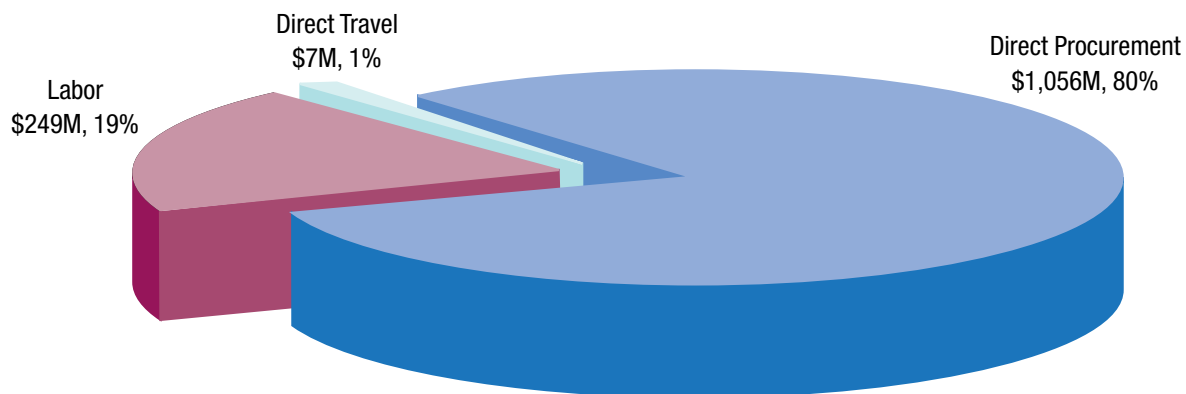
The space shuttle processing work is managed by Johnson Space Center and performed at Kennedy Space Center under the Space Program Operations Contract (SPOC) by United Space Alliance (USA).

## KENNEDY SPACE CENTER FY 2007 BUDGET AUTHORITY\* (\$ Millions)

Space Shuttle	\$194
Space Station	\$110
Launch Service	\$412
Exploration/Constellation	\$190
Center Management & Operations	\$322
Other	\$84
<b>Total KSC</b>	<b>\$1,312</b>

*\* excludes the Johnson Space Center-managed SPOC (space shuttle) contract*

## FY 2007 KSC BUDGET BY ELEMENT



80 percent of the Kennedy budget is spent through the purchase of goods and services from commercial providers. The SPOC (space shuttle) contract is excluded here. Its inclusion would increase the percentage of procured services to 89 percent.



## Financial Systems

Continuing to centralize and improve NASA's financial management, Kennedy implemented two new modules under the Integrated Enterprise Management Program (IEMP) in 2007, and developed two others for 2008 operations.

The SAP Version Update (SVU) is an upgrade to the current SAP-developed core financial system which enhances and improves the processes and functionality of the current system. The center implemented this significant system change without incident, becoming fully operational within five days of the start of the new fiscal year.

The Contract Management Module (CMM) was implemented in conjunction with the SVU upgrade at the beginning of FY 2007. CMM, an initiative led by Kennedy's Procurement Office, provides a new tool to support contract writing, contract administration, procurement workload management, and data reporting to facilitate and expedite the NASA procurement processes.

Preparations for the 2008 implementation of the next IEMP modules – eTravel and Integrated Asset Management (IAM), continued throughout 2007. eTravel is one of five eGovernment initiatives launched in response to the President's Management Agenda, and will provide end-to-end travel services for government personnel. The IAM module will improve the methods and tools the center uses to manage, track, value and account for NASA-owned personal property and equipment.

## Business Development

Commercial business within the gates of Kennedy is rapidly becoming a growth industry, as businesses seek out NASA expertise to provide goods or services on a reimbursable basis, and the center attempts to make greater use of its unique, world-class facilities and infrastructure. In FY 2007, Kennedy had 135 active reimbursable

agreements, which generated \$120.6 million in commercial work for other federal and non-federal entities; 63 of those agreements were new in FY 2007. The most significant of these activities were the provision of expendable launch services to the National Oceanic and Atmospheric Administration and the Department of Defense.

Kennedy's legal authority to execute enhanced use leases encompasses 10 active agreements for media organizations at the press site and communication towers. Following the success of a pilot program, Kennedy renewed its commercial partnerships with Zero-Gravity Corporation and two auto racing teams for utilization of the Shuttle Landing Facility, with great potential for additional customers in 2008. Through the efforts of Kennedy's state partner, Space Florida, Lockheed Martin Corp. agreed to conduct manufacturing of the Orion spacecraft at Kennedy. This major economic success employed 100 people by the end of FY 2007 to make modifications to the Operations and Checkout Building. It is anticipated that more than 300 will be employed in this non-traditional manufacturing activity at Kennedy by mid-2009. Space Florida has an aggressive agenda to soften the impact of the retirement of the Space Shuttle Program on the area, which includes seeking lunar lander manufacturing work at Kennedy and re-exploring the development of Exploration Park within Kennedy boundaries. The center continues to seek opportunities to assist the Commercial Orbital Transportation Services program, and currently supports the SpaceX, Falcon 9 launch site development on Launch Complex 40 at Cape Canaveral Air Force Station, Fla.

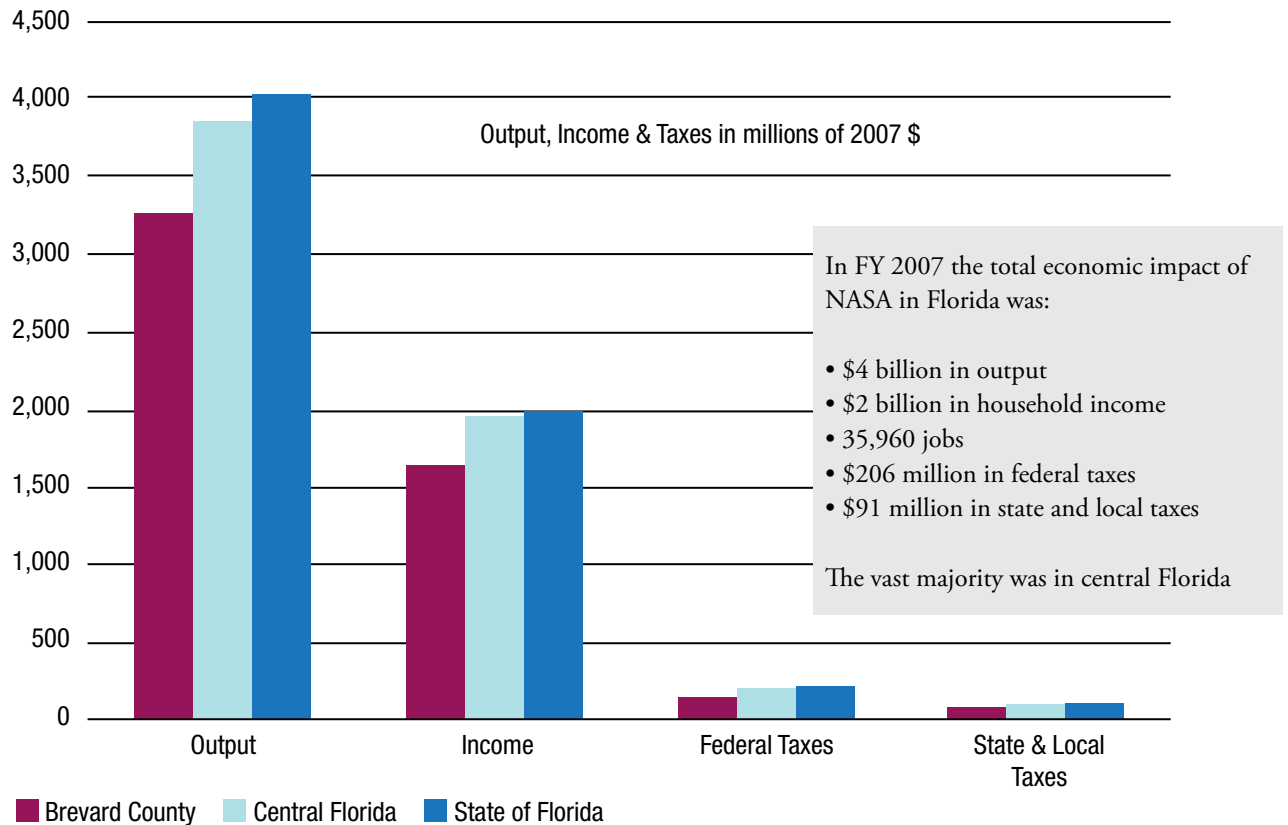
The center, together with state of Florida partners, continues to seek out and secure commercial and business arrangements as a permanent part of the future state of Kennedy. Increased commercial and enhanced use lease opportunities for the center could be of great future value to Kennedy, creating a revenue stream to help offset center operating costs, maintain a skilled workforce, and make center investments, which would further commercial cooperation.

# Economic Impact

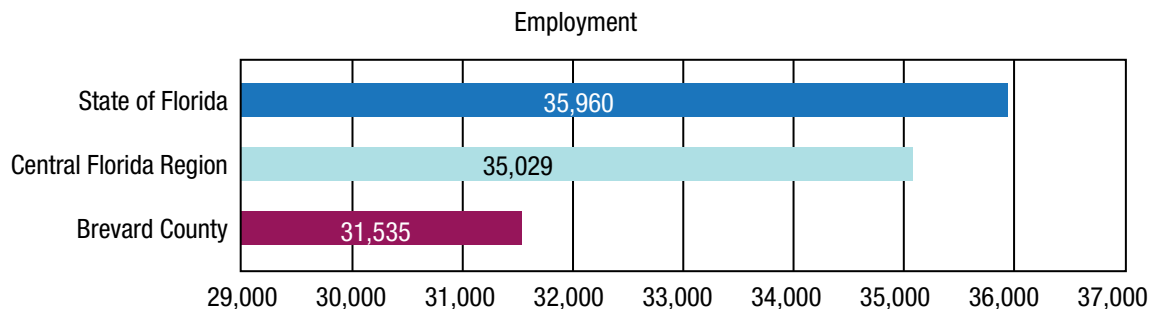
To fulfill its mission, NASA and its contractors require a range of goods and services, both technical and non-technical, ranging from expendable launch vehicles, propellants and computer systems, to motor vehicles, office supplies and tools. In meeting NASA's demand, local contractors employ workers, produce products, fund payrolls and generate output. These workers and contractors generate additional impacts as they spend their incomes and place orders with other local or regional firms for materials and services. Salaries paid to employees create and generate business for the communities where they live. In addition, further economic activity is generated through visitors to the KSC Visitor Complex and business travel to the region. Each round of spending recirculates NASA's initial demand among Florida's businesses and households, multiplying the direct impact on the economy.

Kennedy annually conducts an economic impact analysis to measure NASA's effect on the economy at the local, regional and state levels. The assessment found that in FY 2007, of the \$16.3 billion NASA budget, Kennedy and other NASA centers injected \$1.1 billion in wages and \$700 million in purchases into the local and state economies of Florida, which induced a total economic impact of \$4 billion and 35,960 jobs in the state of Florida. The report concludes that every space-related job and each NASA dollar spent within the state is multiplied throughout the economy, resulting in more than double the overall economic benefit. Kennedy remains by far the major economic driver in Brevard County and a significant contributor to the economic health of the state of Florida.

## FY 2007 TOTAL ECONOMIC IMPACT OF ALL NASA ACTIVITIES IN FLORIDA BY GEOGRAPHIC AREA



Area of Economic Impact	Millions of 2007 \$			
	Output	Income	Federal Taxes	State & Local Taxes
Brevard County	3,271	1,636	141	66
Central Florida Region	3,867	1,961	200	85
State of Florida	4,006	1,983	206	91



For every job at Kennedy, an additional 1.49 jobs are created elsewhere within the state of Florida, each dollar of wages was multiplied into \$1.82 in total income and each dollar of total direct spending for commodity purchases and wage payments was multiplied into \$2.22 of output production.



# Work Force Diversity

Kennedy Space Center is the most broadly based, complex and successful launch center in the world. Both NASA and contractor personnel working at the center are essential to the success of Kennedy.

The work force is a diverse group of people dedicated to supporting the nation's space program and NASA's exploration mission. To accomplish the various missions expected of the space center, these individuals fulfill a multitude of tasks.

At the end of each year, the center takes a "snapshot" of its work force. This picture includes all federal and contract employees char-

tered to work for Kennedy. Other organizations, such as international partners and Patrick Air Force Base, have roles here but are not reflected in these numbers.

As of Sept. 30, 2007, the total Kennedy population was 14,950. This includes 2,197 full-time and other-than-full-time NASA civil servants including students and 10,937 total on-site and near-site contractor employees. The civil servant skill mix includes scientific and engineering, administrative, technical, and clerical workers. There are 602 construction employees, and 1,214 tenants at the center.

## KENNEDY SPACE CENTER WORK FORCE PROFILE (through 9/30/07)

<b>Total Civil Servants</b>	<b>2,197</b>	<b>*</b>
<b>Civil Servant Skill Mix</b>		
Scientific & Engineering	62%	
Administration	27%	
Technical	7%	
Clerical	4%	
On-Site Contractor Employees	10,235	
Off/Near-Site Contractor Employees	702	
<b>Total Contractor Employees</b>	<b>10,937</b>	<b>*</b>
<b>Total Construction Employees</b>	<b>602</b>	<b>*</b>
<b>Total Tenants</b>	<b>1,214</b>	<b>*</b>
<b>TOTAL KSC POPULATION</b>	<b>14,950</b>	

\* Includes students

# Procurement Report

## **Industry Partners at a Glance**

The companies listed below were Kennedy's top support contractors or launch services contractors in terms of dollars obligated in FY 2007. Following is a brief description of their work for the agency:

### **Space Gateway Support (SGS)**

SGS, a joint venture of Northrop Grumman Corp. and Wackenhut, provides base operations support for Kennedy and Cape Canaveral Air Force Station. SGS is responsible for such activities as roads and grounds maintenance, facilities maintenance, custodial, fire, security, calibrations and propellants handling.

### **The Boeing Company**

Boeing Space Operations Company, a wholly-owned subsidiary of The Boeing Company, is the prime contractor for the Checkout, Assembly and Payload Processing Services (CAPPS) contract. Its primary purpose is to support payload processing for the International Space Station, space shuttle, and expendable launch vehicles. Boeing performs all aspects of payload processing, including the planning and receiving of payloads, maintenance of associated payload ground systems, integration of payloads with the space shuttle, launch support and space shuttle post-landing payload activities.

### **InDyne, Inc.**

InDyne, Inc. provides communication services under the Kennedy Space Center Integrated Communications Contract (KICS) supporting the space shuttle, payload carriers and launch services, and the International Space Station. InDyne provides hardware and software integration and development for voice, video and data communications. InDyne also provides motion picture, still photographic, digital and video products and services for NASA, commercial expendable launch vehicle (ELV) and Department of Defense customers, and the operation, administration and maintenance of the administrative telephone system in support of all KSC employees.

### **Analex, Corp.**

Analex is the prime contractor on the ELV integrated support contract. The contractor is responsible for performing and integrating the overall programmatic ELV business and administrative functions, including program/project planning, risk management, evaluation and information technology. Services provided include the management, operation, maintenance and sustaining engineering of the NASA ELV communications and telemetry stations located at CCAFS and Vandenberg Air Force Base; engineering services/studies and technical services for various ground/flight ELV systems, missions and payloads. Analox also provides management, operation, maintenance and sustaining engineering of assigned NASA facilities, systems and equipment at VAFB.

### **Artic Slope Research Corporation (ASRC) Aerospace**

ASRC Aerospace provides research and engineering services and technical support to the Kennedy Spaceport Engineering and Technology organization and other center operational customers. The support ranges in scope from providing research, engineering development, and management of complex research and development and technology projects, to engineering and technical support of various KSC laboratories and test beds. ASRC Aerospace utilizes a consortium of affiliated universities in performing applied research and technology development efforts. ASRC Aerospace also provides technology outreach to foster awareness and utilization of Kennedy's unique capabilities.

### **Dynamac Corp.**

The Life Sciences Services Contract provides a broad range of life sciences services to NASA. These include medical operations for shuttle and station programs, environmental compliance and stewardship, life sciences payload operations, support to the agency's Occupational Health Program, biological science, life sciences payload development, work force protection, fitness and musculoskeletal rehabilitation and education outreach.

### **The Boeing Company**

Delta Launch Services, Inc. provides the agency launch services using its Delta II vehicle. Boeing is the contractor for one of three existing NASA launch services multiple award Indefinite Delivery Quantity task order contracts. Principal location for the Delta II vehicle assembly is Decatur, Ala. The Delta II vehicles launch from CCAFS and VAFB.

### **Lockheed Martin Corp.**

Lockheed Martin Commercial Launch Services provides the agency launch services using its Atlas vehicle. Lockheed is the contractor for one of three existing NASA Launch Services multiple award Indefinite Delivery Quantity task order contracts. Principal location for the Atlas vehicle assembly is Denver, Colo. The Atlas vehicles launch from CCAFS and VAFB.

Lockheed Martin Information Technology performs the Outsourcing Desktop Initiative (ODIN) for NASA. Lockheed became the prime contractor after acquiring the OAO Corp. which was performing the contract. The ODIN contract is an agency-wide long-term outsourcing arrangement which transfers the responsibility and risk for providing and managing the vast majority of NASA's desktop, server and intra-center communications assets and services. Such services include desktops, servers, mobile BlackBerry devices, WebEx web conferencing, Kennedy Unified Dialup Access (KUDA) and e-mail.



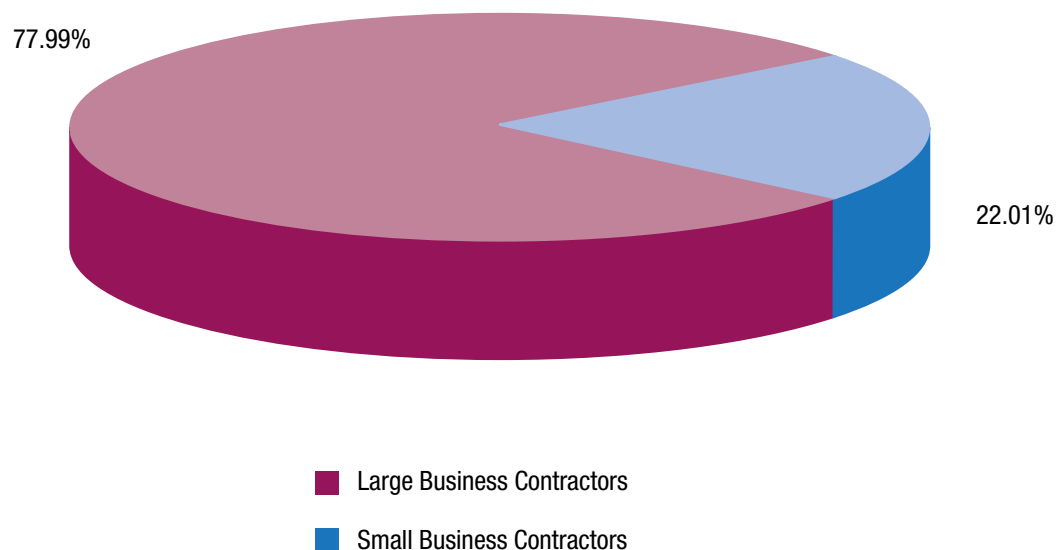
### Orbital Sciences Corp. (OSC)

Orbital Sciences Corp. provides the agency launch services using its Pegasus and Taurus small expendable launch vehicles launched from CCAFS, VAFB, Wallops Flight Facility in Virginia, and equatorial launch ranges. OSC is the contractor for one of three existing NASA Launch Services multiple award Indefinite Delivery Quantity task order contracts. Additionally, OSC provides Pegasus and Taurus vehicles to the agency under a second contract, the Small Expendable Launch Vehicle contract.

### United Space Alliance (USA)

Under a Johnson Space Center contract, USA is the prime contractor for the Space Flight Operations Contract. USA's primary purpose is to ensure mission success for the Space Shuttle Program. Kennedy is the primary point of responsibility for launch and landing of the space shuttle. USA supports ground operations and orbiter logistics elements of the Space Shuttle Program at Kennedy.

## FY 2007 KSC DOLLARS OBLIGATED TO LARGE AND SMALL BUSINESS



Kennedy obligated 22.01 percent of its dollars directly to small businesses during FY 2007, which represents a nearly 3 percent increase over FY 2006.

# YOUR PROCUREMENT DOLLARS AT WORK

## GEOGRAPHICAL DISTRIBUTION BY STATE

### (FISCAL YEAR 2007 OBLIGATIONS)

STATE	TOTAL DOLLARS
ALABAMA	317,822.23
ARIZONA	41,378,955.26
ARKANSAS	52,404.40
CALIFORNIA	4,963,888.04
COLORADO	1,130,705.11
CONNECTICUT	10,013,215.16
DELAWARE	825,162.98
DISTRICT OF COLUMBIA	213,411.20
FLORIDA	953,696,316.37
GEORGIA	92,363.58
ILLINOIS	421,828.69
INDIANA	21,005.13
IOWA	46,049.20
KENTUCKY	169,341.64
MAINE	3,300.00
MARYLAND	1,933,980.79
MASSACHUSETTS	3,408,973.51
MICHIGAN	1,254,733.74
MINNESOTA	860,056.30
MISSISSIPPI	12,544,952.04
MISSOURI	253,214.36

STATE	TOTAL DOLLARS
NEVADA	26,600.00
NEW HAMPSHIRE	278,612.21
NEW JERSEY	156,604.68
NEW MEXICO	141,801.68
NEW YORK	520,308.80
NORTH CAROLINA	55,608.53
NORTH DAKOTA	21,902.60
OHIO	1,341,687.10
OKLAHOMA	569,547.02
OREGON	82,427.37
PENNSYLVANIA	637,690.34
RHODE ISLAND	65,190.00
SOUTH CAROLINA	26,561.11
TENNESSEE	631,930.34
TEXAS	1,348,041.25
UTAH	48,953.86
VERMONT	17,760.00
VIRGINIA	3,588,173.44
WASHINGTON	154,315.25
WISCONSIN	1,408,338.63
<b>TOTAL</b>	<b>1,049,374,125.97</b>



## TOP 25 KSC BUSINESS CONTRACTORS FOR FY 2007

Contractor	Number of Contracts/Orders	Dollars
SPACE GATEWAY SUPPORT	1	277,787,280.22
DELTA LAUNCH SERVICES INC	1	168,783,325.00
LOCKHEED MARTIN CORPORATION	2	111,611,177.00
THE BOEING COMPANY	2	97,239,979.00
ASRC AEROSPACE CORPORATION	1	58,484,945.00
INDYNE INCORPORATED	1	53,916,402.12
ORBITAL SCIENCES CORPORATION	2	41,238,549.00
ANALEX CORPORATION	1	33,892,611.88
IVEYS CONSTRUCTION INCORPORATED	3	28,071,474.00
OA0 CORPORATION	3	21,402,856.33
DYNAMAC CORPORATION	1	14,160,785.80
REYNOLDS SMITH AND HILLS INCORPORATED	2	10,588,450.00
SPEEGLE CONSTRUCTION II INCORPORATED	1	9,274,881.69
AIR LIQUIDE LARGE INDUSTRIES US LIMITED PARTNERSHIP	1	8,724,523.92
ASTROTECH SPACE OPERATIONS INCORPORATED	3	7,207,912.07
AIR PRODUCTS AND CHEMICALS INCORPORATED	3	6,894,615.24
PRAXAIR INCORPORATED	12	6,534,418.00
CANAVERAL CONSTRUCTION COMPANY INCORPORATED	3	5,474,615.00
RUSH CONSTRUCTION INCORPORATED	7	4,691,799.00
SAUER INCORPORATED	8	3,539,532.50
CENDANT MOBILITY SERVICES CORP	1	3,523,881.04
BRPH ARCHITECTS ENGINEERS INCORPORATED	6	3,032,679.00
C AND C INTERNATIONAL COMPUTER AND CONSULTANTS INC.	2	2,592,225.00
JONES EDMUNDS AND ASSOCIATES INCORPORATED	36	2,571,725.00
INTERCONN RESOURCES INC	1	2,412,136.00
<b>TOTAL</b>	<b>104</b>	<b>983,652,778.81</b>

National Aeronautics and Space Administration

**John F. Kennedy Space Center**  
Kennedy Space Center, FL 32899

[www.nasa.gov](http://www.nasa.gov)