

Kennedy Space Center's Annual Report FY2010

Table of Contents

2	Vision, Mission & Core Competencies
3	Center Director's Message
6	Significant Events
10	Launch Vehicle Processing
14	International Space Station & Spacecraft Processing
20	Launch Services Program
24	Constellation Ground Operations Project
26	Center Planning & Development
28	Engineering & Technology
34	Research & Technology Achievements
38	Environmental Leadership
42	Education
46	Outreach to the World
50	Kennedy Business Report
	CFO Report
	Economic Impact
	Work Force Diversity
	Procurement Report

KSC Vision, Mission & Core Competencies

KSC Vision

KSC is the world's preeminent launch complex for government and commercial space access, enabling the world to explore and work in space.

KSC Mission

KSC safely manages, develops, integrates and sustains space systems through partnerships that enable innovative, diverse access to space and inspires the nation's future explorers.

KSC Core Competencies

- **Acquisition and management of launch services and commercial crew development**
- **Launch vehicle and spacecraft processing, launching, landing and recovery, operations and sustaining engineering**
- **Payload and flight science experiment processing, integration and testing**
- **Designing, developing, operating, and sustaining flight and ground systems, and supporting infrastructure**
- **Development, test and demonstration of advanced flight systems and transformational technologies**
- **Developing technology to advance exploration and space systems**

Located in the Orion Arm of the Milky Way Galaxy, the California Nebula is so named because it appears to echo the outline of California on the west coast of the United States.

Center Director's Message



Robert D. Cabana

In fiscal year 2010, Kennedy Space Center forged ahead in its efforts to be the world's preeminent launch complex for access to space. The highly skilled work force remained focused on processing and launching space shuttle missions and expendable launch vehicles, while also preparing for the next chapter of spaceflight. We continued to inspire, engage and inform through enriching education opportunities. We also continued to design, develop and construct the launch site processing infrastructure to support exploration.

During the year, Kennedy launched four shuttle missions, working toward completion of the International Space Station. Mission accomplishments included processing and delivering the Tranquility node and cupola to the space station, as well as the Russian-built Mini Research Module.

The Launch Services Program processed and launched three missions, including NASA's Solar Dynamics Observatory, the first-of-its-kind mission to reveal the inner workings of the sun in unprecedented detail.

Among the major milestones of the year was a visit by President Barack Obama to Kennedy on April 15, 2010, where he outlined details for the new course the administration is

charting for NASA and the future of U.S. leadership in human spaceflight.

The year also saw changes in organizations as well as the landscape of Kennedy. A new Center Planning and Development Office was established to enhance the economic vitality of Kennedy, and the Space Transportation Planning Office was formed to support the agency's new direction.

Work in Applied Sciences and Engineering continued to flourish. New partnerships were formed and existing ones strengthened. In 2010, a groundbreaking ceremony was held for Exploration Park at Kennedy, a new technology and commerce park being developed by Space Florida on Kennedy property.

In Kennedy's "green space" initiatives, Florida Power & Light's Space Coast Next Generation Solar Energy Center at Kennedy was commissioned, providing a 10-megawatt, solar power facility that will provide electricity to more than 1,000 Florida homes and reduce annual carbon dioxide emissions by more than 227,000 tons.

These are just a few highlights of the many accomplishments that were achieved by the outstanding work force. I invite you to take a few minutes to read more and look back on what made 2010 such an exciting year at Kennedy.

Birds flock to warmer water in the Launch Complex 39 area at Kennedy Space Center. In the background is the Vehicle Assembly Building. Kennedy coexists with the Merritt Island National Wildlife Refuge, habitat to more than 310 species of birds, 25 mammals, 117 fish and 65 amphibians and reptiles.



In the Operations and Checkout Building at Kennedy Space Center, President Barack Obama addresses the participants of the Conference on the American Space Program for the 21st Century on April 15, 2010. In his remarks, he outlined the new course his administration is charting for NASA and the future of U.S. leadership in human spaceflight.



Significant Events

1. Oct. 9, 2009: LCROSS impacts moon

Kennedy Space Center workers watched a live broadcast of NASA's Lunar Crater Observation and Sensing Satellite, or LCROSS, and its Centaur rocket impact the moon at about 7:30 a.m. EDT. The collision was designed to send up a plume of debris that could have indicated water ice and was monitored by various telescopes, including NASA's Hubble Space Telescope.



2. Oct. 28, 2009: Ares I-X test rocket launches

NASA's Ares I-X test rocket lifted off at 11:30 a.m. EDT from Kennedy Space Center's Launch Pad 39B. The flight test lasted about six minutes until splashdown of the booster stage nearly 150 miles downrange of the Space Coast.

3. Nov. 9, 2009: NASA awards ISSC contract

NASA selected C&C International Computers and Consultants Inc. of Hollywood, Fla., to provide institutional support services at Kennedy Space Center.

4. Nov. 16, 2009: Atlantis launches on STS-129 mission

Space shuttle Atlantis and its six-member crew began an 11-day delivery flight to the International Space Station at 2:28 p.m. EST from Launch Pad 39A. Atlantis transported spare hardware to the station and returned a station crew member to Earth.



5. Nov. 19, 2009: Kennedy solar farm commissioned

Representatives from NASA, Florida Power & Light and SunPower Corp. formally commissioned a one-megawatt facility at Kennedy Space Center. It is NASA's first large-scale solar power generation facility.

6. Nov. 20, 2009: Tranquility node transferred to NASA

The European Space Agency transferred ownership of the Tranquility node to NASA during a ceremony at Kennedy Space Center's Space Station Processing Facility. Tranquility, a pressurized module, was delivered to the space station during shuttle Endeavour's STS-130 mission.



7. Nov. 27, 2009: Atlantis completes STS-129 mission

Space shuttle Atlantis and its returning crew of seven astronauts ended an 11-day journey of nearly 4.5 million miles with a 9:44 a.m. EST landing at Kennedy Space Center's Shuttle Landing Facility.

8. Dec. 14, 2009: WISE spacecraft launches

NASA's Wide-field Infrared Survey Explorer, or WISE, launched aboard a Delta II rocket at 9:09 a.m. EST from Vandenberg Air Force Base in California. The rocket placed WISE into a polar orbit 326 miles above Earth.



9. Feb. 8, 2010: Endeavour launches on STS-130 mission

Space shuttle Endeavour lit up the predawn sky above Florida's Space Coast with a 4:14 a.m. EST launch from Launch Pad 39A on a mission to deliver the Tranquility node and cupola to the International Space Station.

10. Feb. 11, 2010: Solar Dynamics Observatory launches

NASA's Solar Dynamics Observatory, or SDO, launched aboard an Atlas V rocket at 10:23 a.m. EST from Launch Complex-41 at Cape Canaveral Air Force Station in Florida. SDO is a first-of-its-kind mission to reveal the sun's inner workings in unprecedented detail.



11. Feb. 12, 2010: NASA awards concession agreement for Kennedy Visitor Complex

NASA selected Delaware North Companies Parks & Resorts Inc., of Buffalo, N.Y., to provide concession services for the operation of the Kennedy Space Center Visitor Complex in Florida. The new agreement began May 1, 2010.

12. Feb. 21, 2010: Endeavour glides home

Space shuttle Endeavour and six astronauts ended a 13-day journey of more than 5.7 million miles with a 10:20 p.m. EST landing at Kennedy Space Center's Shuttle Landing Facility. The STS-130 mission delivered the last major U.S. portion to the International Space Station.



13. March 4, 2010: GOES-P satellite launches

NASA's latest Geostationary Operational Environmental Satellite, or GOES-P, lifted off aboard a Delta IV rocket at 6:57 p.m. EST from Space Launch Complex-37 at Cape Canaveral Air Force Station, Fla. The latest National Oceanic and Atmospheric Administration (NOAA) satellite joined four other similar spacecraft to improve weather forecasting and monitoring of environmental events.



14. April 5, 2010: Discovery launches on STS-131 mission

Space shuttle Discovery launched about 45 minutes before sunrise, at 6:21 a.m. EDT, from Kennedy Space Center's Launch Pad 39A, on a mission to deliver science experiments, equipment and supplies to the International Space Station.

15. April 8, 2010: Solar power facility commissioned

NASA, Florida Power & Light, or FPL, and political leaders commissioned FPL's Space Coast Next Generation Solar Energy Center at Kennedy Space Center. The 10-megawatt solar-power facility will provide electricity to more than 1,000 Florida homes and reduce annual carbon dioxide emissions by more than 227,000 tons.



16. April 15, 2010: President visits Kennedy Space Center

President Barack Obama visited Kennedy Space Center and delivered remarks on the bold new course the administration is charting for NASA and the future of U.S. leadership in human spaceflight. The president's visit preceded NASA's Conference on the American Space Program for the 21st Century, held at the center's Operations and Checkout Building and Visitor Complex.



17. April 20, 2010: Discovery completes STS-131 mission

Space shuttle Discovery and seven astronauts ended a 15-day journey of more than 6.2 million miles with a 9:08 a.m. EDT landing at Kennedy Space Center's Shuttle Landing Facility.

18. May 14, 2010: Atlantis launches on STS-132 mission

Space shuttle Atlantis launched at 2:20 p.m. EDT from Kennedy Space Center's Launch Pad 39A on the STS-132 mission to deliver the Russian-built Mini Research Module, cargo and critical spare parts to the International Space Station.



19. May 26, 2010: Atlantis returns to Earth

Space shuttle Atlantis and six astronauts ended a 12-day journey of more than 4.8 million miles with an 8:48 a.m. EDT landing at Kennedy Space Center's Shuttle Landing Facility.

20. May 27, 2010: Final shuttle solid rocket boosters arrive

The final space shuttle solid rocket booster segments arrived by Florida East Coast Railway and were interchanged at the NASA Railroad located north of Titusville, Fla., for delivery to Kennedy Space Center. The segments will be used for shuttle Atlantis on what currently is planned as the "launch on need," or potential rescue mission for the final shuttle flight, Endeavour's STS-134 mission.



21. May 28, 2010: Kennedy hosts first Lunabotics Mining Competition

NASA's first Lunabotics Mining Competition, hosted by Kennedy Space Center's Education Programs and University Research Division, drew more than 20 university teams to design and build remote controlled or autonomous excavators, called lunabots.

22. June 2, 2010: Secretary of Labor pledges work force assistance

Secretary of Labor Hilda Solis announced that the U.S. Department of Labor awarded a \$15 million grant to assist workers in Florida who will be affected by the end of NASA's Space Shuttle Program.



23. June 4, 2010: NASA and Department of Commerce present Space Industry Task Force update

Central Florida business and industry leaders participated in a town hall meeting in Orlando, Fla., to hear NASA Administrator Charlie Bolden and Secretary of Commerce Gary Locke present an update on the Presidential Task Force on Space Industry Work Force and Economic Development. The task force will determine how a \$40 million, multi-agency initiative for regional economic growth will be used to prepare space industry workers for future opportunities.

24. June 5, 2010: Astronaut induction ceremony at Kennedy's Visitor Complex

Four former astronauts were inducted into the U.S. Astronaut Hall of Fame for 2010 during a ceremony at the Kennedy Space Center Visitor Complex in Florida. Inducted were Guy Bluford Jr., the first African-American to fly in space; Ken Bowersox, pilot of the first maintenance mission to restore NASA's Hubble Space Telescope; Frank Culbertson Jr., commander of the first space shuttle night landing at Kennedy; and Kathy Thornton, a mission specialist during the first three-person spacewalk flight.



25. June 25, 2010: Exploration Park Groundbreaking

A groundbreaking ceremony for NASA and Space Florida's new technology and commerce park, known as Exploration Park at Kennedy Space Center, was held outside the Space Life Sciences Laboratory.



26. July 1, 2010: Kennedy Space Center hosts U.S. Naturalization Ceremony

NASA helped welcome more than 100 people as new U.S. citizens during a naturalization ceremony at the Kennedy Space Center Visitor Complex. U.S. Citizenship and Immigration Services administered the Oath of Allegiance to candidates representing 36 countries.

27. July 11, 2010: Sea turtle hatchlings released along Kennedy shoreline

Kennedy Space Center helped with the unprecedented effort to save wildlife from the effects of the BP Deepwater Horizon oil spill in the Gulf of Mexico. The first group of hatchlings from endangered sea turtle eggs, 22 Kemp's ridley turtles, was released into the Atlantic Ocean off Kennedy's Central Florida coast.

28. July 14, 2010: Final external fuel tank arrives at Kennedy Space Center

The last newly manufactured external fuel tank, ET-138, for Atlantis's STS-135 mission, arrived at Kennedy Space Center aboard the Pegasus barge from NASA's Michoud Assembly Facility in Louisiana.



29. July 29, 2010: Kennedy hosts Community Leaders Breakfast

Kennedy Space Center hosted its annual Community Leaders Breakfast at the Kennedy Space Center Visitor Complex. Center Director Bob Cabana provided an overview of space center operations and a look ahead at upcoming missions and activities.

30. Aug. 10, 2010: Robonaut 2 arrives at Space Station Processing Facility

Robonaut 2, or R2, designed by NASA and General Motors, arrived at Kennedy Space Center's Space Station Processing Facility for processing and packing. R2 was delivered to the International Space Station on space shuttle Discovery's STS-133 mission.



31. Aug. 20, 2010: Kennedy to support new Center of Excellence

The Federal Aviation Administration, or FAA, announced that Kennedy Space Center will support the new Center of Excellence for Commercial Space Transportation, a university-led consortium sponsored by the FAA. The new center will perform research and development to help build a safe and strong U.S. commercial space industry.

32. Aug. 26, 2010: Alpha Magnetic Spectrometer arrives at Kennedy Space Center

The Alpha Magnetic Spectrometer-2, or AMS, arrived at Kennedy's Shuttle Landing Facility aboard an Air Force C-5 aircraft for processing at the Space Station Processing Facility. The particle physics detector will fly aboard shuttle Endeavour's STS-134 mission, targeted to launch Apr. 19, 2011.



33. Sept. 16, 2010: NASA awards Launch Services Contract

NASA announced the award for its Launch Services (NLS) II Contract, managed by Kennedy Space Center. The award will provide a broad range of launch services for NASA's planetary, Earth-observing, exploration and scientific satellites.

34. Sept. 20, 2010: Discovery makes planned trip to launch pad

Space shuttle Discovery made its trip from the Vehicle Assembly Building to Launch Pad 39A, in preparation for the STS-133 mission to the International Space Station.



35. Sept. 28, 2010: External fuel tank makes last move to Vehicle Assembly Building

The last delivered external fuel tank was transported from the barge that carried it from Louisiana to the Vehicle Assembly Building for processing. The tank, designated ET-122, will support space shuttle Endeavour's STS-134 mission to the International Space Station.

Launch Vehicle Processing

During Fiscal Year 2010, Kennedy Space Center's Launch Vehicle Processing Directorate and ground operations processing team prepared Atlantis, Discovery and Endeavour for four missions to the International Space Station. Several challenges were overcome and process efficiencies were initiated in order to achieve four successful space shuttle launches from Launch Complex 39, all while implementing personnel reductions as the team prepares for the end of the Space Shuttle Program in 2011.

The ground processing team received and processed the final external fuel tank and solid rocket booster segments for the STS-135 mission, the final shuttle flight. The team also helped plan and prepare for the retirement of the Space Shuttle Program by assisting in key areas of shuttle transition and retirement.

Mission STS-129/Atlantis

The processing team surpassed several resource obstacles as Atlantis was prepared for its STS-129 mission. One challenge was the fact that the Ares I-X integrated flow on Launch Pad 39B coincided with the STS-129 integrated flow at Launch Pad 39A. Processing required that many of the same personnel and equipment resources were shared between the two pads, which required constant coordination between multiple elements and programs. Another challenge for STS-129 was a late requirement to add instrumentation to the mobile launcher platform and the shuttle vehicle to help understand the main engine acoustic environment that was believed to be the cause of an anomaly on a previous mission.

Atlantis launched on Nov. 16, 2009, at 2:28 p.m. EST, on its 31st flight, after achieving a record low number of problem reports during prelaunch processing in its orbiter processing facility. It was the 129th space shuttle mission and the 31st flight to the International Space Station.



In the Rotation, Processing and Surge Facility (RPSF) at Kennedy Space Center, workers perform the propellant grain inspection of the final solid rocket booster segments, which is a required safety analysis, June 8, 2010. The segments will be used for what currently is planned as NASA's final space shuttle flight, STS-135.

On its third day of flight, Atlantis docked with the space station and delivered the ExPRESS (Expedite the Processing of Experiments to the Space Station) Logistics Carrier (ELC-1) and the ELC-2. The crew also carried the repaired S-band Antenna Sub-Assembly (SASA) to the station that was returned to Earth on a previous mission. Mission specialists performed three spacewalks, bringing the total number of space station assembly spacewalks to 136. The STS-129 mission also marked the last crew rotation mission for the Space Shuttle and

International Space Station programs.

Atlantis touched down at Kennedy's Shuttle Landing Facility on Nov. 27 at 9:44 a.m. EST after traveling nearly 4.5 million miles in orbit.

Mission STS-130/Endeavour

During Endeavour's STS-130 mission processing flow, the team implemented several weight-saving modifications in support of the future STS-134 mission. Also, several upgrades to the vehicle were implemented to enhance flight safety. The space shuttle remained in the Vehicle Assembly Building (VAB) during the holidays and rolled out to the pad during a cold weather spell in early January 2010.

Endeavour began the STS-130 mission with a spectacular early morning launch Feb. 8 at 4:14 a.m. EST. The first launch attempt the day before was scrubbed due to clouds over the Launch Complex 39 area. After a flawless ascent into orbit, Endeavour arrived at its destination, the International Space Station, on Flight Day 4. Carried into orbit were the Tranquility module and the cupola.

Mission specialists helped attach Tranquility to the space station. The cupola, a robotic control station with six windows around its sides and another in the center to provide a 360-degree panoramic view around the station, was attached to its berth on the Tranquility module. Mission specialists performed three spacewalks to further complete the outfitting and assembly of the station.

After 217 orbits around Earth, Endeavour safely landed at Kennedy's Shuttle Landing Facility. The 130th space shuttle mission ended with a nighttime touchdown Feb. 21 at 10:20 p.m. EST.

Mission STS-131/Discovery

The original plan to move Discovery to the VAB on Feb. 12, 2010, was delayed due to cold weather at Kennedy. With improved weather conditions, Discovery began its journey to the Vehicle Assembly Building on Feb. 22. After the shuttle was attached to the external fuel tank and twin solid rocket boosters, space shuttle Discovery rolled out to Launch Pad 39A on March 3.

Discovery's predawn launch, on April 5 at 6:21 a.m. EDT, began its 38th flight into space. The crew of the International Space Station welcomed the shuttle crew upon their arrival April 7. The following day, the 27,270-pound multi-purpose logistics module Leonardo was unberthed from the payload bay and attached to the space station. Throughout the course of the 11-day docked portion of the mission, supplies aboard Leonardo were transferred to the space station and three spacewalks were completed.

After traveling more than 6.2 million miles in orbit, Discovery completed the 131st space shuttle mission by touching down at Kennedy's Shuttle Landing Facility on April 20 at 9:08 a.m. EDT. Landing had been scheduled for the day before, but was waved off due to poor weather conditions.



A panoramic image shows space shuttle Discovery in Orbiter Processing Facility-3 at Kennedy Space Center in Florida, as the shuttle is prepared for "rollover" to the Vehicle Assembly Building on Sept. 9, 2010.

Mission STS-132/Atlantis

The STS-132 mission was significant in that it concluded a very busy year in ground processing. Atlantis' trip from its orbiter processing facility to the Vehicle Assembly Building on April 13, 2010, was historic in the fact that it occurred exactly 25 years to the date of its first arrival at Kennedy Space Center. Once there, Atlantis was attached to its external fuel tank and twin solid rocket boosters and then rolled out to Launch Pad 39A. Engineers and technicians achieved a smooth processing flow and actually set a new record low for the number of problem reports during prelaunch processing.

A flawless countdown led up to Atlantis' smooth climb into orbit, May 14 at 2:20 p.m. EDT, on its 32nd flight. The shuttle and payload weighed more than 4.5 million pounds.

Atlantis docked with the space station on May 16 and its mission specialists conducted three spacewalks to deliver the Russian Rassvet module, which eventually was connected to the space station. Rassvet means "dawn" in Russian. Atlantis also carried a picture of Sir Isaac Newton along with a 4-inch-long wood sample of Newton's apple tree. The piece is from the original tree that supposedly inspired Newton's Theory of Gravity.



A mobile gantry crane lifts one of the solid rocket boosters used during space shuttle Atlantis' STS-132 launch in May 2010 from a hoisting slip at the Solid Rocket Booster Disassembly Facility at Hangar AF on Cape Canaveral Air Force Station in Florida.

After orbiting Earth 186 times and traveling more than 4.8 million miles in orbit, Atlantis landed at Kennedy's Shuttle Landing Facility on May 26 at 8:48 a.m. EDT.

LAST SHUTTLE HARDWARE DELIVERIES TO KENNEDY

External Fuel Tank Element

NASA's last delivered external fuel tank, ET-122, built for the Space Shuttle Program, arrived aboard the Pegasus Barge from the agency's Michoud Assembly Facility in New Orleans to Kennedy on Sept. 27, 2010. The tank, originally damaged during Hurricane Katrina in 2006, was completely repaired and is slated to fly on Endeavour's STS-134 mission.

Solid Rocket Boosters and Motor Segment

The final motor segment arrived from the ATK solid rocket booster plant in Promontory, Utah, to Kennedy on May 27, 2010.

The final booster segments were transported from ATK, using the Florida East Coast Railway for the final leg of the trip to the center. In the Rotation, Processing and Surge Facility, workers performed

the propellant grain inspection of the booster segments, which is a required safety analysis.

The booster segments were transferred from the Assembly and Refurbishment Facility to the Vehicle Assembly Building for stacking. The right and left forward assemblies were refurbished and processed at Kennedy. They are comprised of three components, the nose cap, frustrum and forward skirt. They were stacked and will be joined to an external fuel tank and space shuttle Atlantis for what



Space shuttle Atlantis appears to stand upright but actually is suspended vertically by crane well over the floor of the transfer aisle in Kennedy Space Center's Vehicle Assembly Building, Oct. 6, 2009.

currently is planned as the final STS-135 mission to the International Space Station.

Space Shuttle Transition and Retirement

The Launch Vehicle Processing Directorate and ground operations embarked on the first significant steps for transition and retirement of NASA's space shuttle fleet and the infrastructure that supports launch processing operations. Launch Pad 39B served as a pathfinder for transitioning a complex set of facilities while continuing to safely launch shuttles from Launch Pad 39A. After cryogenic and other hazardous systems were successfully safed and decommissioned, the 48 facilities that comprise Launch Pad 39B were transferred to the Constellation Program. A contract was signed to demolish the pad, paving the way for future launch opportunities.

The Mobile Launcher Platform-1 (MLP-1) served as a test case for transitioning complex ground support equipment. More than 100 spare hardware items were removed from the MLP to be maintained for shuttle support. After all of the hazardous systems were successfully safed and decommissioned, MLP-1 was transferred to the institution for demolition. The team also is finalizing the requirements to decommission

the shuttles upon completion of the last flight, and prepare them for display in museums.

Ares I-X Flight Test

The Launch Vehicle Processing Directorate and the Ground Operations contractor were at the forefront of efforts to prepare, integrate, test and successfully launch the Ares I-X test vehicle. Several modifications were successfully designed, certified and tested to support the launch.

After various segments of the flight hardware were integrated into the launch vehicle, the Ares I-X test rocket underwent a thorough checkout using newly developed and integrated test procedures designed to satisfy unique test requirements and ensure flight readiness. The test team created a new launch countdown procedure specifically for Ares I-X. The team also used several rigorous simulations to exercise and enhance the procedure as well as provide valuable training for the launch team.

The team's efforts culminated with a successful launch of the Ares I-X vehicle from Launch Pad 39B, on Oct. 28, 2009, at 11:30 a.m. EDT. The flight test lasted about six minutes until splashdown of the booster stage nearly 150 miles downrange of the Space Coast.

International Space Station & Spacecraft Processing

For more than a decade, Kennedy Space Center's International Space Station and Spacecraft Processing Directorate has played an integral role in constructing one of the largest scientific and technical collaborations in space. During Fiscal Year 2010, the directorate processed some of the final assembly components for the U.S. portion of the station, as well as a multitude of research experiments.

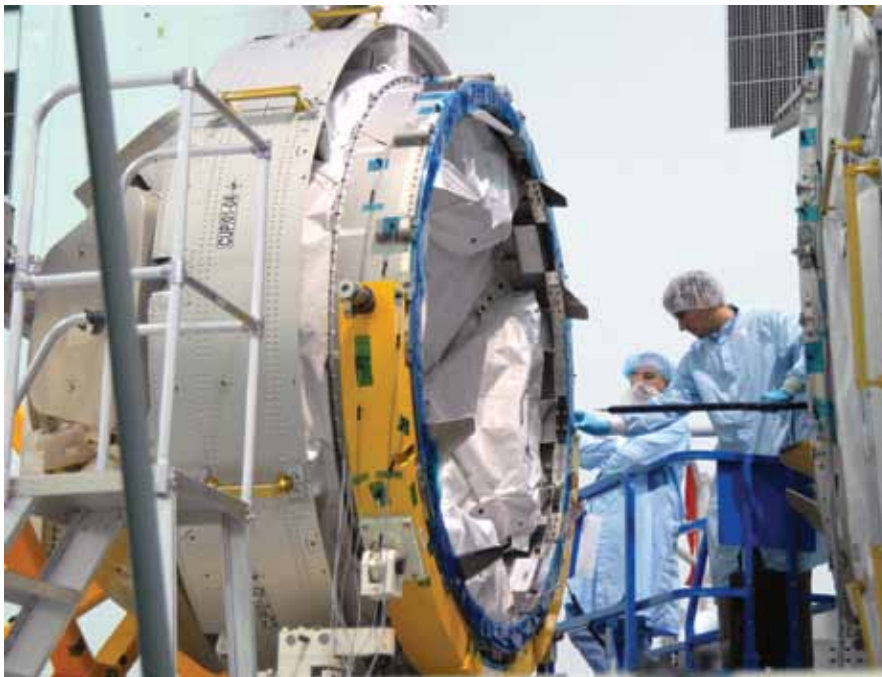
Known as the "Stocking the Station" mission, STS-129 delivered 14 tons of critical spare parts for the station's electrical, plumbing, air conditioning, communications and robotics systems in November 2009. In the Space Station Processing Facility (SSPF), Kennedy's team mounted the parts and one research payload to two ExPRESS Logistics Carriers bound for the orbiting outpost. During the mission, both carriers

were deployed to parking locations on the station's integrated truss assembly.

The SSPF then hosted the European-built Node 3 module called Tranquility. Kennedy's team worked with the Italian Space Agency and the prime contractor, Thales Alenia Space based in Turin, Italy, to get the module ready to fly aboard the STS-130 mission in February 2010. Technicians also processed a station structure that astronauts hail as one of the best -- the cupola -- providing a seven-windowed, 360-degree view of the universe.

Next, technicians modified the Leonardo multi-purpose logistics module (MPLM) and loaded it with several experiments, supplies, food and a new crew quarters for the station. Another major component processed in the SSPF was an 1,800-pound orbital replacement unit (ORU) -- the ammonia tank assembly -- which was installed on the outside of the station during STS-131 in April 2010.

The team then collaborated with Boeing's Checkout Assembly and Payload Processing Services (CAPPS), NASA's Johnson Space Center, Rocket and Space Corporation Energia (RSC Energia), and the European Aeronautic Defense and Space Co. (EADS Astrium) to process two major station payloads for the STS-132 mission. The Russian-built Mini Research Module (MRM-1) and the Integrated Cargo Carrier were readied for their May 2010 trip to space in the Astrotech payload processing



Workers check the cupola, at left, being aligned with the Tranquility module, at right, during processing inside Kennedy Space Center's Space Station Processing Facility, Aug. 31, 2009, for the STS-130 mission to the International Space Station.



Inside Kennedy Space Center's Orbiter Processing Facility-3, technicians install a DragonEye proximity sensor, developed by SpaceX, in space shuttle Discovery on July 28, 2010. DragonEye is a laser imaging detection and ranging sensor that was tested on Discovery's docking operations with the International Space Station during the STS-133 mission.

facility at Port Canaveral, Fla. Technicians in the SSPF focused their attention on the mission's flight support equipment and the space-to-ground antenna (SGANT) that provides two-way data, voice and video communications for station residents.

Work continues for the remaining scheduled space shuttle missions. In August 2009, technicians began processing STS-133's ExPRESS Logistics Carrier-4, which is filled with external payloads and experiments. They modified MPLM Leonardo to become the Permanent Multipurpose Module (PMM), which will be left aboard the station for future microgravity experiments in fluid physics, materials science, biology and biotechnology. SSPF technicians also got up close and personal with a human-like experiment -- Robonaut 2, also known as R2 -- a dexterous humanoid astronaut that could one day help with tasks outside the station.

In December 2009, ExPRESS Logistics Carrier-3 arrived for its STS-134 mission to the station. It is slated to carry two spare S-band communications antennas, a high-pressure gas tank, additional spare

parts for the station's two-armed robot named Dextre and micrometeoroid debris shields. In August 2010, technicians began processing the Alpha Magnetic Spectrometer-2 (AMS), a state-of-the-art particle physics detector that will use the unique environment of space to study the universe and its origin by searching for dark matter.

Space station elements took the team international, as well. In August 2010, the team shipped tools and flight support equipment for six ORUs, including the flex hose rotary coupler, to the Japan Aerospace Exploration Agency's (JAXA) launch complex on the island of Tanegashima. The ORUs are scheduled to lift off in January 2011 atop JAXA's H-IIB launch vehicle for delivery to the station aboard an uncrewed HTV-2 transporter.

As the current space station effort reaches its critical "Assembly Complete" milestone, the U.S. portion of the station is rapidly emerging as a National Laboratory and major platform for research and discovery.



In Kennedy Space Center's Space Station Processing Facility, May 11, 2010, technicians disconnect the remaining racks from the inner walls of multi-purpose logistics module Leonardo after its return from the STS-131 mission to the International Space Station.

International Space Station Research Processing and Development

The International Space Station and Spacecraft Processing Directorate's Research Processing and Development Team at Kennedy Space Center was instrumental in performing preflight testing and integration on an array of space station research payloads. It also helped enable the successful operation of those payloads in space and the return of significant scientific findings to Earth.

Throughout processing, the center worked to develop and refresh critical civil service engineering skills for future programs, such as collaboration with government and commercial entities interested in sending experiments to the space station's National Laboratory.

Kennedy's ISS Research Processing and Development Team readied the General Laboratory Active Cryogenic ISS Experiment Refrigerator (GLACIER) for several space shuttle missions to the

orbiting outpost during Fiscal Year 2010. It provided a double, middeck-locker-size freezer/refrigerator for a variety of experiments that required temperatures ranging from 39 degrees to -301 degrees F.

Engineers and technicians in the SSPF also prepared the Materials International Space Station Experiment (MISSE) for missions STS-129 and STS-131. MISSE is a series of external exchangeable test beds located on the European Space Agency's Columbus External Payload Facility and NASA's Express Logistics Carriers. During STS-134, MISSE-8 will be attached to the outside of the station and evaluated for the effects of atomic oxygen, vacuum, solar radiation, micrometeorites, direct sunlight, and extremes of heat and cold.

Following is a synopsis of some of the major biological research payloads that Kennedy developed, flight certified, and directed in-orbit operations and associated ground controls.

The Advanced Biological Research System

(ABRS) was the first of 50 successful biological flight experiments developed at Kennedy to permanently reside on the space station. ABRS is a single-locker, closed system with two growth chambers. Each chamber is capable of independently controlling temperature, illumination and atmospheric composition to grow a variety of biological organisms, including plants, microorganisms, and small insects and spiders.

The LADA Vegetable Production Unit Plants, Protocols, Procedures and Requirements was developed and managed as a collaboration between the Space Dynamics Laboratory (SDL) at Utah State University and the Russian Institute for Biomedical Problems. LADA utilized an existing garden to advance the technology required for plant growth in microgravity, studied related food safety issues and investigate the non-nutritional value of astronauts developing plants in space.

Work for future shuttle missions to the station is ongoing in the SSPF.

The Space Test Program-Houston 3 (STP-H3) was mounted on ExPRESS Logistics Carrier-3 (ELC-3) for the STS-134 mission and consists of several components.

One component, called Canary, will test concepts in low Earth orbit for future long-duration spaceflight missions by investigating the interaction of ions with the background plasma environment around the space station.

Another named Massive Heat Transfer Experiment (MHTEX) is expected to achieve flight qualification of an advanced capillary pumped loop system.

Also included in the STP-H3 is the Variable Emissivity Radiator Aerogel Insulation Blanket Dual zone thermal control Experiment suite for Responsive space (VADER). It will test a robust, reconfigurable thermal control system geared primarily toward small responsive space missions but can be applied to a wide range of missions and satellite classes. It also will test a new form of multilayer insulation using Aerogel material as the thermal isolator.



On the International Space Station, astronaut Timothy Creamer harvests genetically modified Arabidopsis plants grown in the Advanced Biological Research System (ABRS) sub-rack facility using a green fluorescent protein imaging system and fixation tube Feb. 26, 2010. The imaging system and fixation tube were developed at Kennedy Space Center's Space Life Sciences Lab.

The canister containing the payload for space shuttle Atlantis' STS-129 mission to the International Space Station is lifted toward the Payload Changeout Room at Kennedy Space Center's Launch Pad 39A on Oct. 30, 2009.



Canaveral Air Force Station in Florida for its launches and Kennedy shared technical lessons learned.

Kennedy also received funding from the American Recovery and Reinvestment Act (ARRA) initiative to support upgrading LC-40's lightning towers, power substation, facilities and conductive floor in an effort to enable commercial space partners. The funds also allowed the center to initiate a new effort that enables commercial providers to request and acquire center services and capabilities to support commercial space development.

The Falcon 9's first stage was tested with all nine engines in McGregor, Texas, prior to shipment to Kennedy for the Pathfinder mission. After a planned hot fire on the pad, SpaceX successfully demonstrated the Pathfinder launch on June 4, 2010. This launch has paved the way for SpaceX to perform its COTS 1 Demonstration mission in December 2010. This is the first of three demonstration flights with the last flight destined for the International Space Station in late 2011.

Through the NASA Commercial Resupply Services (CRS) contract, SpaceX and Orbital Sciences Corp. are among other providers making resupply missions to the station with food, water and spare parts after the Space Shuttle Program is retired.

Commercial Orbital Transportation Services

In Fiscal Year 2010, the International Space Station and Spacecraft Processing Directorate provided support to NASA's Commercial Orbital Transportation Services (COTS) program.

SpaceX, which was awarded procurement for three demonstration flights under COTS, continued to develop Launch Complex-40 (LC-40) at Cape



A United Launch Alliance Atlas V rocket carries NASA's Solar Dynamics Observatory into orbit from Launch Complex-41 at Cape Canaveral Air Force Station, Feb. 11, 2010, at 10:23 a.m. EST.

Launch Services Program

During Fiscal Year 2010, NASA's Launch Services Program (LSP), managed at Kennedy Space Center, had a busy year as the team prepared launch vehicles and overcame challenging processing requirements for spacecraft for two launches, along with mission integration

activities for 14 missions on contract. LSP provided advance planning of more than 35 future expendable launch vehicle missions for the Exploration Systems, Science, and Space Operations mission directorates.

The office supported NASA's Science Mission Directorate during its announcement of opportunities for the Discovery 12, and Explorers and New Frontiers programs.

LSP strengthened its partnerships with the U.S. Air Force and the National Reconnaissance Office, while seeking new partnership opportunities. It also served in an advisory capacity for the Commercial Crew Program and supported NASA's 21st Century Space Launch Complex with programmatic planning and lessons learned.

Wide-field Infrared Survey Explorer

NASA's Wide-field Infrared Survey Explorer (WISE) launched on a Delta II rocket, on Dec. 14, 2009, at 9:09 a.m. EST from Vandenberg Air Force Base (VAFB) in California. The spacecraft was launched into polar orbit about 326 miles above Earth.

During processing at VAFB, the team met the challenge of keeping the WISE satellite cooled to a required temperature by using solid hydrogen. Modifications were made to vent stacks at the Astrotech facility and Space Launch Complex-2 in order to accommodate delivery of the liquid hydrogen

In the White Room at Space Launch Complex-2 at Vandenberg Air Force Base in California, the Delta II payload fairing begins to surround NASA's Wide-field Infrared Survey Explorer (WISE) on Nov. 25, 2009.



in a special cryostat container. The container was cooled during a two-week period in order for the liquid hydrogen to reach a solid state.

Kennedy worked with NASA's Goddard Space Flight Center in Greenbelt, Md., and the Jet Propulsion Laboratory in Pasadena, Calif., to develop a system that reduces launch vehicle loads at the spacecraft to launch vehicle interface. The center worked with JPL and United Launch Alliance to use in-house analytical tools for the complicated flow at the launch pad.

Highlighting its in-house capabilities, LSP performed a considerable amount of trade studies in the coupled-loads area in the design of the isolation system for the WISE spacecraft. The unique LSP capability allowed the WISE team to perform the design and manufacturing of the isolation system in a short timeframe without impacting the launch date.

The satellite is now surveying the entire sky in a portion of the electromagnetic spectrum called the mid-infrared with far greater sensitivity than any previous mission or program ever has. The WISE survey will eventually consist of millions of images from which hundreds of millions of astronomical objects will be cataloged, providing a vast storehouse of knowledge about the solar system, the Milky Way and the universe.

Solar Dynamics Observatory

NASA's Solar Dynamics Observatory (SDO), launched aboard a United Launch Alliance Atlas V rocket, on Feb. 11, 2010, at 10:23 a.m. EST from Launch Complex-41 at Cape Canaveral Air Force Station (CCAFS) in Florida.

During processing at the Astrotech facility in Titusville, Fla., the telescope had several very stringent contamination requirements for its high-resolution optics. In order to fulfill these requirements and simultaneously maintain SDO at 78 degrees F, Astrotech purchased a large laminar flow enclosure for the sensitive telescope and increased the capability of its air conditioning system. To reduce the heat generated by equipment and workers during the daytime, the work flow was switched to evenings, when outside temperatures were typically lower.

SDO was the first mission launched for NASA's Living with a Star (LWS) Program and is designed to understand the causes of solar variability and its impacts on Earth. SDO will take a closer look at the



Rising above the pad's fixed service tower, a Delta IV rocket soars into the sky with the GOES-O satellite aboard. Liftoff was at 6:51 p.m. EDT June 27, 2009, from Launch Complex-37 at Cape Canaveral Air Force Station in Florida.

sun and help develop the ability to better understand its influence on the Earth and near-Earth space by studying the solar atmosphere. Understanding the sun and how it works better will allow scientists to better predict and forecast the weather out in space and provide earlier warning to protect aircraft, satellites and astronauts.

LSP also supported a commercial mission, the Constellation of Small Satellites for Mediterranean Basin Observation (COSMO-4), which launched on Nov. 5, 2010, from Space Launch Complex-2 West at VAFB. The launch was the 350th Delta II launch and the last manifested commercial launch from SLC-2 West. LSP was able to test new ground support equipment that it installed on the pad to prevent damage to the launch vehicle during direct load of



At Space Launch Complex-2 at Vandenberg Air Force Base in California, the first of three solid rocket boosters for the Delta II rocket for launch of NASA's Wide-field Infrared Survey Explorer (WISE) is positioned next to the rocket's first stage in the pad's mobile service tower, Oct. 21, 2009.

will launch aboard a European Space Agency Ariane rocket; and the Global Precipitation Measurement (GPM) spacecraft, another Goddard mission that will launch aboard a Japan Aerospace Exploration Agency J-II rocket.

Also in this advisory role, LSP proposed support for six tasks on the Crew Resupply Services contract, led by Johnson Space Center. One of these tasks is to perform an independent analytical verification and validation of guidance, navigation and controls on SpaceX's Falcon 9, and Orbital Sciences' Taurus II, rockets. For the first time, the office served in an advisory capacity to the International Space Station Program for its Crew Resupply Services, by providing technical evaluations of the CRS vehicles' major systems and subsystems, performing independent verification and validation and

hypergolic propellants. The ground support equipment may be beneficial for future Department of Defense and polar-orbiting missions.

Advisory Services

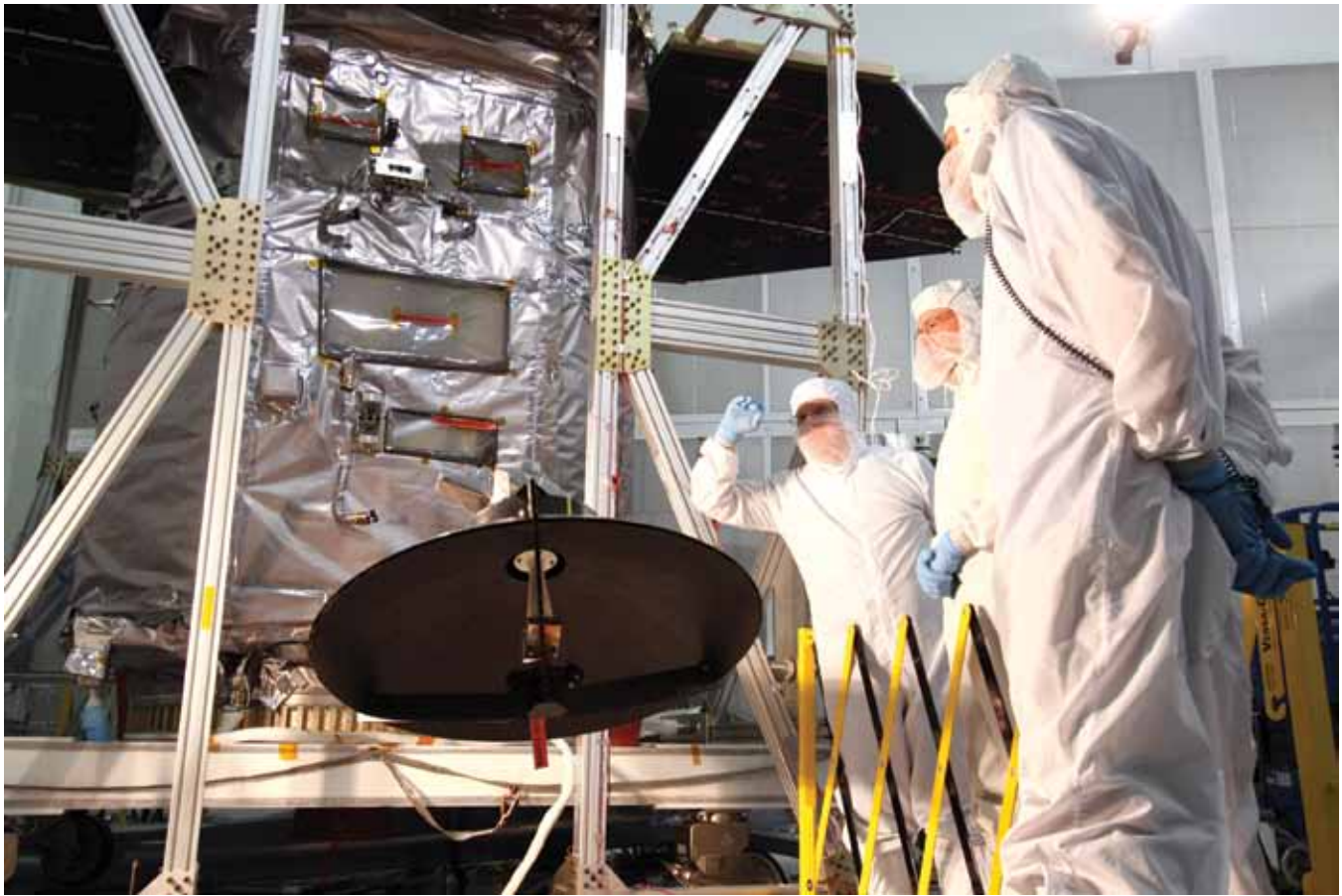
In addition to traditional end-to-end launch services, the program also provided advisory support for future NASA missions, including the Lunar Atmospheric and Dust Environment Explorer (LADEE), developed by Ames Research Center and bound for the moon on a Minotaur V in 2013; the James Webb Space Telescope (JWST), a spacecraft developed by Goddard Space Flight Center in Greenbelt, Md., that

providing risk evaluation data.

LSP also supported studies for Orion flight and re-entry tests, the International Space Station docking node, NASA's Flagship Technology Demonstration Program for the Exploration Systems Mission Directorate and Project M, a mission to launch a Robonaut to the moon.

Major Acquisition Activities

In September 2010, NASA's Launch Services (NLS) contract was extended by the agency for 10 years, through 2020, with the award of four Indefinite Delivery/Indefinite Quantity contracts. The expendable



At the Astrotech Space Operations facility in Titusville, Fla., technicians observe the range of motion of the high-gain communications antenna on NASA's Solar Dynamics Observatory (SDO) on Nov. 18, 2009.

launch vehicles that NASA will use for its science, Earth-orbit and interplanetary missions are United Launch Alliance's Atlas V, SpaceX's Falcon 1 and 9, Orbital Sciences Corp.'s Pegasus and Taurus XL, and Lockheed Martin Space Systems Co.'s Athena I and II. NLS II will continue to provide the agency with competitive, commercial launch services to address customers' needs.

Also, the program awarded an Indefinite Delivery/Indefinite Quantity contract to Astrotech in Cape Canaveral, Fla., for payload processing services from Jan. 2, 2011, through Dec. 31, 2014, or for processing a maximum of five missions, whichever comes first.

Infrastructure Management

In an effort to decrease infrastructure and costs, LSP's Infrastructure Management Office returned Processing Facility 1610 back to the U.S. Air Force. The facility had been used for processing a number of NASA missions, including the entire National Oceanic and Atmospheric Administration (NOAA) series of

spacecraft, Gravity Probe-B and Earth Observer-1. Rehabilitation projects to NASA Building 836 at VAFB and the Payload Hazard Servicing Facility in the Industrial Area at Kennedy are nearing completion. The program also completed the permitting process of Launch Complex-17 at CCAFS to NASA for the last east coast Delta II launch, which will be the Gravity Recovery and Interior Laboratory (GRAIL) mission to the moon in 2011.

Constellation Ground Operations Project

The brilliant fire and thunder of the Ares I-X flight test helped usher in a time of change for NASA, the Constellation Program and the Kennedy Space Center as the Ground Operations Project made great strides to make sure the Florida spaceport will remain at the leading edge of space launch technology.

Launched on Oct. 28, 2009, during the first quarter of Fiscal Year 2010, the Ares I-X was the first test mission under NASA's Constellation Program. The first stage, a space shuttle solid rocket booster, lifted an instrument-laden upper stage and Orion spacecraft simulator. The launch met all its mission objectives with a suborbital flight to record the first stage performance of a rocket designed to carry astronauts into space. The flight also tested Kennedy's ability to adapt to support new rockets and spacecraft after the agency retires the shuttle.

Although NASA is resetting its goals for spaceflight after the shuttle era closes, the Constellation Program with its Ares, Orion and Ground Systems development work are expected to heavily inform future decisions and designs by providing real-world test knowledge and flexible hardware.

The Ground Operations Project added to the Kennedy skyline during the fiscal year with the completion of a new mobile launcher's primary structure and systems on Aug. 2, 2010. Towering beside the Vehicle Assembly Building, it is the tallest launch tower NASA has built since those constructed for the Saturn V moon rockets. One of the same crawler-transporters that carried those Saturns to the pad also moved the mobile launcher from its construction stand at the West Park Site, known as Park Site 1, to the East Park Site, or Park Site 3, so workers could fit more of the launcher's systems into place. This is a testament to the commitment and dedication of the employees here at the space center to continue on as planned even though changes are evident.

The launch tower may be called into service

as Kennedy moves toward becoming a spaceport responsive to needs of a variety of rocket, spacecraft and mission designs.

Work also began this fiscal year to remove the fixed service structure (FSS) and rotating service structure (RSS) from Launch Pad 39B. Both of the gantry-like structures were built for the unique needs of the shuttle fleet and are not expected to be necessary for future launch vehicles currently envisioned. Instead, with the flame trench and new lightning towers in place, the pad's "clean" look can support launches of several types, potentially those using the new mobile launcher.

The RSS was rotated to the intermediate position for removal of secondary, non-structural sections. As sand and wood lay on top of the pad for protection, pieces of the structure were cut and dropped to the ground. Demolition will continue into the next fiscal year until the pad is transformed into a clean pad, one without a launch tower requiring extensive maintenance. This will forever change the landscape of Kennedy and pave the way for the future. Along with the pad B demolition work, there were beginnings of dramatic changes to the landscape around the pad as well. With the installation of the aviation lights on the 600-foot-tall lightning protection towers, the lightning protection system was completed.

A couple miles west of the launch pads, the Launch Control Center also saw major changes inside Firing Room 1, known as the Young-Crippen Firing Room. The control room's numerous consoles that were needed to support a shuttle launch team were removed and replaced with fewer state-of-the-art consoles. The transformation of Firing Room 1 for long-term support to future programs began with the installation of new console enclosures in February 2010. Once the new consoles are installed, the firing room will be used to demonstrate end-to-end command and control capability. These demonstrations will provide the opportunity to verify the launch control system (LCS) architecture by



New lightning towers shine at sunset at Kennedy Space Center's Launch Pad 39B on Oct. 27, 2009.

commanding and controlling both simulated and real ground support equipment. The generic command and control LCS architecture allows Kennedy to position itself to enable emerging ground operations support requirements for future programs.

Changes were not limited to the Launch Complex 39 area of Kennedy. Down in the Industrial Area, the Launch Element Test Facility (LETF) met its operational readiness date (ORD) for completion and the LETF project completion celebration was held Aug. 17, 2010. The LETF modifications that were successfully completed included a new Vehicle Motion Simulator (VMS), an updated systems control room and new cryogenic support systems. The VMS will evaluate the interactions of ground connections to simulated flight vehicles while on the pad through liftoff.

With the release of President Barack Obama's proposed budget in February 2010, the agency has been tasked to realign priorities. This realignment includes the cancellation of the Constellation Program. Much of the work completed this year and those tasks that are still under way will be utilized by the emerging programs proposed by the president and Congress, transforming Kennedy as the launch site of choice for government and commercial launches.

Center Planning & Development

Kennedy Space Center took significant steps during Fiscal Year 2010 to grow its strategic partnerships and position the spaceport to become a multi-user space launch complex supporting both government and commercial space activities.

Following the rollout of the President's FY 2011 proposals regarding NASA, Kennedy intensified its efforts to encourage partnerships with the U.S. commercial space transportation industry.

These efforts included a major two-day industry workshop conducted at the center in March 2010, with attendance by 14 companies representing both the traditional industry providers of space transportation systems and services, as well as some of the leading entrepreneurial firms developing new commercial space services. Focused discussions during the workshop included enhancements to the center's existing processes and infrastructure, as well as new capabilities and technologies. Kennedy also presented a set of newly emerging opportunities for facilities that are available to industry, including the

launch and recovery capabilities of Launch Complex 39 and the Shuttle Landing Facility for commercial spaceflight providers, as well as opportunities for industry access to technical capabilities and technology partnerships. Space Florida described opportunities to access financing, economic incentives, and work force training and transition funds, and Brevard Workforce provided information on the highly skilled technical work force available in Brevard County.

Kennedy subsequently published an industry-wide Request for Information (RFI) seeking ideas about how to best transition the center into a multi-user space launch complex, and how Kennedy facilities, capabilities and processes might be optimized to meet both government and industry needs.

The Center Planning and Development Office (CPDO) was formally reorganized in June 2010 to report directly to Kennedy's Center Director Bob Cabana. This signaled an increased emphasis by the center on its relationship with the commercial space sector, and its interest in developing partnerships



with the companies seeking to provide commercial space services, such as cargo and crew delivery to the International Space Station. To assist in this effort, CPDO manages an external website at <http://kscpartnerships.ksc.nasa.gov>.

On June 25, 2010, officials from Kennedy and the state of Florida formally broke ground on Exploration Park, a long-planned, mixed-use technology and commerce park in development by Space Florida in collaboration with NASA under a long-term land use agreement. The park's initial infrastructure, which includes a new connector road that will enable commercial access to the existing Space Life Sciences Laboratory, was designed, and construction is expected to occur in FY 2011.

In August 2010, the Federal Aviation Administration (FAA) established a new university-led Center of Excellence (COE) for Commercial Space Transportation to perform research and development to help build a safe and strong U.S. commercial space industry. Kennedy is supporting the new COE, which includes several core university members in Florida. Center Planning and Development also worked with the FAA's Office of Commercial Space Transportation regarding plans to establish an FAA Technical Center

at Kennedy.

Kennedy entered into an agreement with Avera Motors in August 2010 for the purpose of facilitating the development support and testing of Avera's aluminum and composite space frame designed for its vehicle. This partnership has the potential for significant job creation for which the shuttle work force is ideally suited. Avera could bring its research and development work to Exploration Park.

Throughout the remainder of 2010, CPDO's expanded staff of partnership developers and spaceport planners engaged in direct discussions with a number of potential industry partners regarding their company-specific needs and requirements that might be met by utilizing the center's unique facilities and capabilities. By year-end, Kennedy was engaged in actively exploring more than 50 potential partnerships.

Throughout 2010, Kennedy Space Center worked with the growing U.S. commercial space industry to support its development and operations. Among the companies Kennedy is actively working with is SpaceX, which launched its first Commercial Orbital Transportation Services (COTS) demonstration flight from Cape Canaveral Air Force Station's Launch Complex-40 in December 2010.

An artist's rendition of how Exploration Park's first phase is expected to appear when fully developed as a mixed-use campus supporting research, technology development and space-related commercial activities at Kennedy Space Center.



Engineering & Technology

Kennedy Space Center's Engineering and Technology Directorate streamlines innovation and aligns with NASA's new direction. The Center's emerging technologies can grow from studies to concepts to reality, while pioneering research paves the way for what promises to be a dynamic future in exploration.

Kennedy's engineering and technology team has an active role in developing technology roadmaps for the space agency's future, leading the Ground and Launch Processing Technology roadmap team and participating in seven additional teams.

Exemplifying the center's expertise in the areas of processing, ground operations and launch, the directorate supported several space shuttle launches as well as liftoff of the Solar Dynamics Observatory (SDO) and the GOES-P weather and environmental monitoring satellite. The team also contributed to prelaunch preparation of the Alpha Magnetic Spectrometer-2 (AMS), set to be permanently installed on the International Space Station during the STS-134 mission in 2011.

Among Kennedy's unique resources is the Launch Equipment Test Facility (LETF), where personnel can create launch equipment prototypes, calibrate existing equipment, test entire systems or individual components, and simulate launch conditions. State-of-the-art data acquisition systems and synchronized video capability allow for accurate real-time and post-test analysis.

The facility's Vehicle Motion Simulator, developed and upgraded this year, simulates all the movements a launch vehicle experiences, from rollout through the first half-second of liftoff. The new Tilt-Up Umbilical Arm prototype also was tested in the facility's high bay. Based on the Ares-I upper stage and service module umbilical design developed by the directorate and contractor ASRC Aerospace, the prototype was partially built in the NASA Prototype Development Laboratory with the remaining fabrication, integration

and setup managed by ASRC Aerospace in the facility's machine shop.

The Engineering and Technology Directorate continues to play a key role in the research and development of new systems and processes that are critical to expanding humanity's reach in space. One such enterprise, the In-Situ Resource Utilization (ISRU) project, is led by the Kennedy team under the agency's Exploration Technology Development Program. The project seeks to identify, compare and develop technologies for future explorers to make full use of the resources available to them at destinations like the moon or other objects beyond low Earth orbit.

ISRU leads new designs through increasingly rigorous verification -- from the laboratory to the field, with the ultimate goal of testing in flight. At the International Lunar Surface Operations and ISRU Analog Test site in the volcanic ash near the summit of Mauna Kea, Hawaii, a collaborative effort involving six NASA centers and multiple U.S. and international agencies and academia, many such technologies were put to the test.

The Regolith and Environment Science and Oxygen and Lunar Volatile Extraction (RESOLVE) project was installed on a Canadian Space Agency mobility platform for the Mauna Kea demonstration. RESOLVE is a chemical processing system that would drill into the moon's dusty surface, measure the chemical content of the soil and extract the oxygen.

ISRU is investing in hydrogen reduction, carbothermal reduction and molten regolith electrolysis as potential oxygen-producing technologies.

The NASA-led Desert Research and Technology Studies, better known as Desert RATS, provides engineers, astronauts and scientists nationwide an opportunity to conduct analog testing in the Arizona desert. The Habitat Demonstration Unit included Kennedy technologies, such as Electrodynamic Dust Shield, VEGGIE Plant Growth Unit and a light-



Engineers check the mobility of the new Tilt-Up Umbilical Arm (TUUA) at Kennedy Space Center's Launch Equipment Test Facility on Oct. 21, 2010.

emitting diode system. Other Kennedy-developed technologies included the Space Exploration Vehicle Work Package Interface Quick Attach mechanism, Portable Communications Terminal and Avionics Line Replaceable Unit.

The space center continues to earn recognition for its engineering expertise. It received 227 NASA Exported Awards for \$128,625 and 165 Non-NASA Exported Awards for \$100,125, respectively ranking third and fourth in the agency in dollar amount. Patents were issued for a corrosion detection/reduction invention and a foam-aerogel technology developed in partnership with NASA's Langley Research Center in Hampton, Va. Members of the Engineering and Technology Directorate also earned one Patent Application Award, one Software Release Award, three Board Action Awards and four Tech Brief Awards.

An example of prestigious recognition given to a Kennedy team member is the "Create the Future" design contest. The employee's invention, called Rowwheel Wheelchair Propulsion System, could increase mobility and reduce repetitive stress injuries

for millions of people confined to wheelchairs. The system relies on a rowing motion instead of traditional pushing.

The Simulated Rapid Propellant Loading (SRPL) System at Kennedy's CryoTestLab (CTL) was selected to receive the National Engineer's Council "Distinguished Engineering Project Achievement Award." The SRPL System is used to develop and demonstrate new methods and equipment for loading a launch vehicle with cryogenic propellant and incorporates dozens of technologies and innovations developed by the team at the CTL.

Joining forces with contractors and Florida universities, the directorate also tested up-and-coming innovations in a simulated space environment aboard parabolic flights. Known as the Facilitated Access to the Space Environment for Technology (FAST) Development and Training Program, the flights originate from Ellington Field near NASA's Johnson Space Center in Houston.

A dual containment platform tested slosh dynamics, while another demonstration showed how propellant moving inside a fuel supply depot might





Space shuttle Discovery begins its nighttime trek from the Vehicle Assembly Building to Launch Pad 39A at Kennedy Space Center in Florida, in the early evening of Sept. 20, 2010, for the STS-133 mission.



Kennedy Space Center Engineer Mike Miller demonstrates one of the backpacks Kennedy designed and built for the Desert Research and Technology Studies project's upcoming field test in Arizona. The backpacks are equipped with GPS antennas, communications components and cameras.

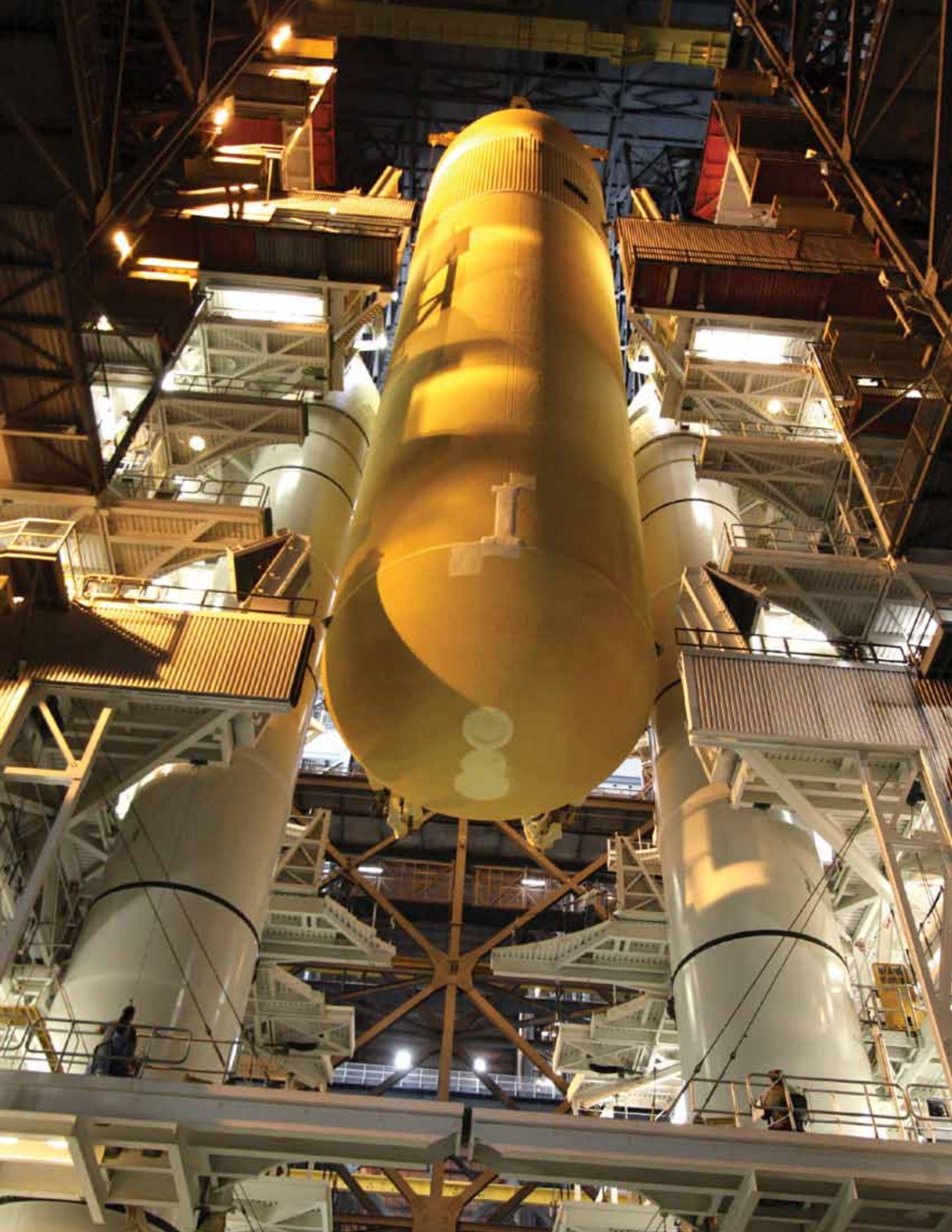
Two ISRU technologies were tested on FAST flights. One demonstrated pneumatic transfer of lunar soil, designed by the directorate's Granular Mechanics and Regolith Operations Lab with Johnson and ASRC Aerospace. Another evaluated the use of tribocharged electrostatic beneficiation, a method of using a charge to separate minerals, to enrich mineral ilmenite. Kennedy's Applied Chemistry Lab partnered with ASRC Aerospace on the project.

The directorate continues to work with NASA's Launch Services Program and United Launch Alliance on the Cryogenic Orbital Testbed (CRYOTE). The goal is to develop a way to store and transfer super-cold propellants in orbit, a capability critical to long-duration spaceflight. The directorate designed a multilayer insulation that

affect the stability of a docked spacecraft. For these studies, Kennedy partnered with the Florida Institute of Technology, Embry-Riddle Aeronautical University and United Launch Alliance. Another project, involving the University of Florida and CFO Research Corp., tested a simulation tool to investigate the physics of granular materials and design debris-impact protection.

was applied to the CRYOTE ground test article, and added nearly 30 temperature sensors to help evaluate its composite structure and thermodynamic vent system.

At right: In the Vehicle Assembly Building at Kennedy Space Center in Florida, the external fuel tank, ET-134, for space shuttle Endeavour's STS-130 mission, is lowered beside the twin solid rocket boosters already stacked on a mobile launcher platform on Nov. 23, 2009.



Research & Technology Achievements

Kennedy Space Center's research and technology work focused on eight capabilities during Fiscal Year 2010 in order to support NASA's future space exploration programs.

Storage, Distribution and Conservation of Fluids (cryogenics, liquids, gases)

Hydrogen is considered an important commodity in the aerospace industry and as a future alternative energy system. As an inherently dangerous gas due to its combustibility and invisible flame, it's important to detect a hydrogen leak in a timely manner. Hydrogen tape technology, which originally began at the Florida Solar Energy Center operated by the University of Central Florida, is providing a visual indication system

that can pinpoint the location of a leak, even in pipe flanges and connections that traditional area sensors and flame cameras may miss. At Kennedy, work is under way to further develop HyperTape, which can visually detect the presence of hypergols, another chemical used in aerospace work.

Researchers at Kennedy also developed aerogel composite materials to improve thermal insulation properties, which minimizes the heat transfer of a composite while reducing the weight and density of the base material. They achieved a 25 to 50 percent reduction in thermal heat transfer without greatly affecting the mechanical properties or processing conditions when compared to the base material. This approach can reduce the weight of lunar habitat systems, cryogenic storage tanks and piping where weight and thermal conductivity is critical to mission success.

Materials for Life Cycle Optimization

Kennedy, in collaboration with PPG Industries and the University of Texas Health Science developed a microcapsule technology that will detect and control and self-heal corrosion in electrical wires. An integrated prognostic/diagnostic Smart Wire System incorporates "self healing" materials, minimizing the need to manually repair a wire if it is within the size tolerance for self-healing capability.

Another technology, called "smart coatings," detects and controls corrosion in carbon steel, which will be used to



Inside Kennedy Space Center's Corrosion Technology Laboratory, NASA researchers Dr. Wendy Li, at left, and Dr. Luz Marina Calle examine the microcapsules that form the core of the innovative smart coatings technology.

develop new launch pad structures and support equipment. Like pills that release their contents when exposed to stomach acid, microcapsules for smart coatings are designed to release their contents in response to certain pH levels caused by corrosion.

Life Sciences and Habitation Systems

New light-emitting diode (LED) arrays for collapsible plant growth chambers were the focus of research into a system to produce fresh vegetables for crews on long-duration spaceflight missions. The new LED technology is expected to reduce overall volume and mass while doubling light output. Researchers at Kennedy and Orbital Technologies Corp. also tested capillary rooting amount concepts and conducted vibration and acoustic hardware tests. Future tests are planned to assess chamber performance and yields using lettuce and radish plants.

Remediation and Ecosystem Sciences

To address limitations with traditional abatement methods for polychlorinated biphenyls (PCBs) in paints, researchers at Kennedy and the University of Central Florida developed the Activated Metal Treatment System (AMTS). This innovative technology consists of a solvent solution made of ethanol and d-limonene that contains an activated zero-valent metal.

AMTS is first applied to the painted surface either using spray-on or wipe-on techniques. The solution then extracts the PCBs from the paint. The extracted PCBs react with the microscale-activated metal and are degraded into benign by-products. This technology can be applied without removing the paint or dismantling the painted structure.

In-Situ Resource Utilization and Surface Systems

The Dust Tolerant Intelligent Electrical Connection System project investigated techniques to mitigate lunar dust intrusion and accumulation on reusable electrical connectors. Kennedy researchers explored non-intrusive methods to detect circuit faults and automatically re-route signals while a vehicle or lunar surface equipment is in operation. The system would benefit future NASA missions, as well as the military and mining, and fuel exploration operations.



A technician at Kennedy Space Center applies the Activated Metal Treatment System to a piece of painted metal beam. The technology that breaks down PCBs in paints was developed by researchers at Kennedy and the University of Central Florida.

Life Cycle Optimization of Products, Projects and Programs

The Center for Life Cycle Design established at Kennedy leads integration of modeling and simulation for space and other complex system design, development and operations. The center pulls from the best of NASA, industry and academia to create tools and methods that will accelerate and advance the design process while reducing cost and risk.

A prime example, the Exploration Visualization Environment, accepts data from Kennedy's Design Visualization team, NASA's Lunar Analog teams, NASA's Human Exploration Framework Team, Human Architecture Team, and NASA's flight and surface simulators.

Kennedy's Design Visualization Team also worked with other groups, such as the Mars Science Laboratory team, to optimize its designs and concepts. The Supply and Manufacturing Chain

teams partnered with the Department of Defense and Florida organizations to better understand the supply and manufacturing capabilities critical to building future space systems.

Space Launch and Suborbital Technologies

Demonstrating cryogenic fluid management (CFM) technologies is critical for long-duration spaceflight missions. Kennedy researchers partnered with a host of industry partners to advance the development of a Cryogenic Orbital Testbed (CRYOTE) to demonstrate an array of critical CFM technologies in the space and ground environment. Results will aid in the development of high-efficiency ground operations, lunar surface systems, upper stages, propellant depots, solar and nuclear thermal propulsions and cryogenic science applications. Partners include United Launch Alliance (ULA), Sierra Lobo Inc., Innovative Engineering Solutions and Yetinspace Inc.

Tracking, Timing, Communication and Navigation Technologies

Improving the safety and lowering the risks of launch and landing operations and protecting human life in space and on the ground involves continually improving the tracking, communications, telemetry, navigation and range safety systems associated with spaceflight.

Kennedy led the research, development, deployment and testing of a first-generation Portable Communications Terminal (PCT), which could be used as a means for astronauts to communicate with each other in space. It was tested at the 2010 Desert RATS mission and a second-generation PCT currently is under development. A Communications Service Assembly (CSA) for future spacecraft avionics elements is in the same stage as the PCT at Kennedy.

Aeronautical communications was also an area of emphasis for the center and a system was developed for experimental use on uncrewed aircraft under the direction of the Federal Aviation Administration (FAA). The FAA will use models to study and define communication requirements for uncrewed aircraft flying in national air space.

Under NASA's Small Business Innovation Research (SBIR) Program, Kennedy developed a unique anti-jamming technology for GPS receivers, which is a critical capability for safe and secure launch vehicle navigation systems of the future.

The center also developed a WiMAX-based, high-rate, in-space proximity communications technology under a Phase II SBIR. Researchers continue to advance the development of space-based range technologies under the Space-based Telemetry, Tracking and Command Subsystem (STTACS) project in collaboration with Goddard Space Flight Center's Wallops Flight Facility in Virginia.

A Radio Frequency and Telemetry Station was completed that develops technologies which provide for pre-mission spacecraft test and checkout, and communications and tracking functions during launches.



New light-emitting diode (LED) arrays for collapsible plant growth chambers were the focus of research at Kennedy Space Center's Space Life Sciences Laboratory.



Space shuttle Atlantis races to orbit over Launch Pad 39A at Kennedy Space Center in Florida. Liftoff on its STS-129 mission came at 2:28 p.m. EST Nov. 16, 2009.

Environmental Leadership

Fiscal Year 2010 brought recognition to Kennedy Space Center for its participation in significant environment-friendly projects and its continued achievements in ongoing “green” initiatives.

NASA’s first large-scale solar power generation plant was installed at Kennedy during the last fiscal year. This year, the two locations provided a total of 11-megawatts of solar power accomplished through an enhanced-use lease with Florida Power & Light (FPL). A 1-megawatt station produces energy dedicated solely for use at Kennedy, while a 10-megawatt station, located on Kennedy property nearby, supplies power to FPL customers in the community. The completed system features a fixed-tilt, ground-mounted solar panel system designed and built by SunPower Corp. The 1-megawatt station produced more than 1.6 million kilowatt-hours



A worker with Geosyntec Consultants Inc. checks the orientation of a solar panel with an inclinometer at Kennedy Space Center. The solar panel powers a recirculation system that is removing contamination from the groundwater at this site.

of electricity in its first year of production, saving Kennedy an estimated \$156,000.

Construction of the new 10,730-square-foot Propellants North Administrative and Maintenance Facility in the Launch Complex 39 area was completed in January 2011. The new building qualifies for the U.S. Green Building Council’s Leadership in Energy and Environmental Design (LEED) Platinum designation -- a first for the center and one of only two Platinum facilities throughout the agency.

Propellants North includes deconstructed Launch Control Center firing-room glazing structures and reclaimed waste concrete in the facility’s foundation. The roof is constructed of recycled metal covered with a rainwater harvesting system that supplies restroom fixtures. The roof also is equipped with more than 80 kilowatts of integrated solar panels, rendering the facility “off the grid.” Xeriscape landscaping uses native species and recycled crushed crawlerway rock for mulch. The facility features a high-efficiency roof and walls, air conditioning with energy recovery technology, and intelligent lighting controls with step dimming and occupancy sensors.

During the fiscal year, Kennedy and its environmental contractor, Innovative Health Applications, took on two major efforts to rescue, rehabilitate and release endangered sea turtles.

The first rescue took place in early January 2010 when back-to-back cold snaps left about 2,000 turtles “stunned” and in need of help along the Space Coast. Many of the turtles were rescued from the Mosquito Lagoon, with others coming from the Indian River Lagoon and Cocoa Beach. Biologists, environmentalists, wildlife experts and other volunteers joined forces at the Merritt Island National Wildlife Refuge (MINWR) within Kennedy’s boundaries



NASA's first large-scale power generation facility opens at Kennedy Space Center in November 2009. The one-megawatt facility features a fixed-tilt, ground-mounted solar power system that will provide energy to the center.

to identify and examine the turtles. Then, the animals were transported to rehabilitation facilities throughout Florida and South Georgia, where they stayed until local waters warmed up to safe temperatures.

The second rescue began in the summer of 2010, following the BP Deepwater Horizon oil spill in the Gulf of Mexico. About 275 loggerhead, leatherback, green and Kemp's ridley sea turtle nests were carefully transported from the Florida Panhandle and Alabama to the MINWR. The nests were housed in a dark and quiet climate-controlled building called a hatchery. There, they were monitored daily for temperature and signs of hatching. More than 14,500 hatchlings were released into the Atlantic Ocean at Playalinda Beach, which is adjacent to Kennedy. The relocation and release work was a joint effort by NASA, the U.S. Fish and Wildlife Service, the Florida Fish and Wildlife Conservation Commission, the National Park Service, NOAA, FedEx and conservationists to help minimize the oil contamination risk to sea turtle hatchlings.

Kennedy had many accomplishments in environmental permitting and compliance in Fiscal Year 2010. NASA Headquarters completed a triennial review of 13 technical protocol areas and rated Kennedy "green" for each, the best review received in several years. The Schwartz Road Landfill operating

permit was renewed for another five years. Water conservation progress continues with 17 percent reduction from the FY 2007 water usage baseline.

Recycling and environmental-protection concerns were addressed among all organizations across the center, with many considered to be outside the realm of day-to-day operations. FY 2010 saw 76 booster separation motors, 66 linear-shaped charges, and an inertial upper stage motor dispositioned during excess ordnance disposal, as well as the underground storage tank at the Kennedy Service Station replaced.

Kennedy's comprehensive waste diversion and recycling program made continued progress in 2010 with the expansion to 57 collection stations centerwide. The center's top commodities recycled or diverted from disposal in 2010 included 13,157 tons of concrete from construction projects, 1,156 tons of metal, and 363 tons of paper and cardboard. About 178 tons of electronics parts, batteries, fuels, chemicals and toner cartridges also were recycled. About 52 percent of the total waste stream at Kennedy was diverted for reuse and recycling. The proceeds from recycled commodities are used to fund additional recycling, pollution prevention and sustainability initiatives.

To further support recycling markets, Kennedy



Newly hatched Loggerhead turtles emerge from their eggs in a climate-controlled facility at Kennedy Space Center in Florida on July 27, 2010. The eggs were brought to Kennedy from beaches along the northern U.S. Gulf Coast after the BP Deepwater Horizon oil spill in the Gulf of Mexico.

procures recycled-content and environmentally preferable materials where possible. Examples of recycled-content purchases in 2010 included sanitary tissue, paper, toner cartridges, carpet and floor tiles, and office, janitorial and cafeteria supplies, representing more than \$1.7 million in “green” acquisitions.

The Florida State Historic Preservation Office and the Advisory Council on Historic Preservation entered into a programmatic agreement with Kennedy for the management of historic facilities. The agreement clears the way for the center to perform normal maintenance and minor modifications to existing and future historic, ground-based facilities and structures listed on the National Register of Historic Places. It also allows for reuse of the facilities to support new programs.

The U.S. Fish and Wildlife Service (FWS) received funding from the St. Johns River Water Management District for wetland restoration along the Banana Creek on Kennedy. About 500 acres of impoundments are being restored and 12 miles of dike road removed.

NASA continues to partner with the FWS and the U.S. Geological Service to develop and implement sustainable mitigation strategies to restore eroded

dunes and protect Kennedy’s shoreline. These efforts include wildlife habitats critical to sustaining populations of threatened and endangered species, such as scrub jays and sea turtles.

Turtle-friendly light fixtures also were designed for NASA’s new mobile launcher constructed at Kennedy to support future human spaceflight programs. The aluminum fixtures are fully enclosed to reduce the scattering of light, directing it straight down to the work areas.

In 2010, Kennedy employees received three NASA Blue Marble Awards for excellence in NASA environmental and energy management. Kennedy was recognized for environmental quality in historic preservation, waste diversion through composting, and reuse of materials in the NASA Causeway Seawall Revetment Project.

Kennedy closed out Fiscal Year 2010 in the forefront in environmental leadership across the agency.



An Anhinga perches in a shrub in the Merritt Island National Wildlife Refuge, which borders Kennedy Space Center in Florida. Anhingas inhabit freshwater ponds and swamps with thick vegetation.

Education

With an increased emphasis on educational activities from President Barack Obama and NASA Administrator Charlie Bolden, Kennedy Space Center's Education Office intensified its efforts to host diverse programs and activities for students and educators.

Through workshops and programs conducted by the Educator Resource Center, Aerospace Education Services Project, the Digital Learning Network and the Exploration Station, Kennedy education specialists reached about 54,477 students and 11,805 teachers during Fiscal Year 2010.

Spurred on by the president's challenge to "make science cool," NASA launched the Summer of Innovation initiative using its out-of-this world missions and technology programs to boost summer learning. Kennedy contributed to the initiative by reaching 2,378 student participants and 50 educators from around the country.

Supported by research, employee feedback and management, the Kennedy Educate to Innovate (KETI) project was created. The project utilizes the Kennedy work force to inspire students to pursue careers in science, technology, engineering and mathematics (STEM). KETI reached more than 43,000 students, far exceeding the target goal of 35,000 students. During the year, educational kits were created; 358 Kennedy employees were trained in just three months; three NASA Family Education Nights were coordinated, reaching 737 students; and all activities were aligned to national educational standards. The Brevard Public School System superintendent, local school officials and three local educator interns also were involved in the development of KETI.

Another Kennedy education program is NASA Days at Your School, which exposed students in Florida, Georgia, Puerto Rico and the Virgin Islands to NASA STEM-based presentations and hands-on rocketry and space propulsion activities.

In May 2010, Kennedy hosted the sixth Pre-Service Teacher Institute (PSTI), which is a two-week residential workshop for 20 education majors and is designed to increase their skills and confidence in teaching mathematics and science while incorporating technology and NASA content in their



Students gather round to ask Isaac T. Gillam IV questions after the Legends and Trailblazers presentation at the Minority Student Education Forum in July 2010. Gillam was the first African-American NASA center director, from 1978 to 1981 at Dryden Flight Research Center in Edwards, Calif.



An education specialist provides direction during a hands-on activity at the Minority Student Education Forum, held at the Radisson Resort at the Port, in Cape Canaveral, Fla., in July 2010.

curriculum. Participants planned and presented a portion of a lesson to a group of fourth-graders at Gardendale Elementary School in Merritt Island, Fla., and received three hours of college credit through Hampton University, upon successful completion of the program.

Each year, Kennedy competitively selects students from across the nation to participate in agencywide and center-unique internship programs. Kennedy also began to target various minority institutions and tribal communities in an effort to increase the number of underrepresented, underserved and minority participants. During the fiscal year, Kennedy hosted 97 interns; of these, 33 percent were minorities. Four interns subsequently accepted co-op positions at the center. In the summer, interns participated in the first agencywide Town Hall telecom with NASA's administrator and deputy.

Kennedy kicked off NASA Days at Minority Serving Institutions (MSIs) with a visit to Jackson State University in Mississippi. The purpose of NASA Days is to build relationships with MSIs and provide NASA managers with insight into the institutions' technologies and students' capabilities.

Kennedy also manages several agencywide education projects, one of which is called the

Minority University Research and Education Program (MUREP) Small Project Grantees. Those grantees included Navajo Technical College, New Mexico State University, Florida A&M University, North Carolina Agriculture and Technical State University, and a team of three Hispanic-serving Institutions (HSIs), Universidad del Turabo, Universidad Interamericana-Bayamon and Universidad Politecnica de Puerto Rico, which collaborated with Michigan Technological University.

This fiscal year, NASA's Achieving Competence in Computing, Engineering and Space Science (ACCESS) Program recruited a diverse group of 20 talented undergraduate and graduate college students with disabilities for placement at all 10 NASA centers and NASA Headquarters for summer research opportunities.

The Interdisciplinary National Science Project Incorporating Research and Education Experience (INSPIRE) is a multi-tiered student pipeline program designed for students in grades nine through 12. Through INSPIRE, nine rising 10th-grade students and their legal guardians were awarded the Explorer Experience, a summer visit to a NASA facility for a one-day VIP tour, briefings and workshops. Sixty rising 11th-grade students participated in the

Collegiate Experience, a two-week, on-campus residential experience during the summer at a college or university, to encourage improved study skills and the pursuit of higher education and careers in STEM areas. Fifty-two rising 12th-grade students participated in the Residential Internship, a paid eight-week summer internship at a NASA facility, gaining valuable on-the-job experience by working directly with NASA scientists and engineers, and participating in after-work educational and cultural activities. Fifty-nine rising college freshmen participated in the Pre-College Internship, a paid eight-week summer internship at a NASA facility.

Experiment Program to Stimulate Competitive Research (EPSCoR) is designed to assist identified states in establishing an academic research enterprise directed toward a long-term, self-sustaining and competitive capability that will contribute to the state's economic viability and development between NASA research assets, academic institutions and industry. Through a merit-based, peer-reviewed competitive process, EPSCoR awarded \$16.8 million to 24 institutions.

The Exploration Systems Mission Directorate (ESMD) Space Grant project, which was developed to train a highly skilled scientific, engineering and technical work force of the future, provided 61

industry internships and 48 senior design projects. A new senior design course was developed at Louisiana State University and one senior design course was pilot-tested at Utah State University. ESMD Space Grant also contracted five faculty fellows to work on specific projects for eight weeks at a NASA center and implement that project into a senior design course at their university during the 2010-11 academic year. ESMD also supported the Space Grant Systems Engineering Paper Competition, the Constellation Research Paper Competition and the first Lunabotics Mining Competition.

Twenty-one student teams participated in the Lunabotics Mining Competition held at the Astronaut Hall of Fame in Florida. There, teams were challenged to design and build a remote controlled or autonomous excavator, called a lunabot, that could collect and deposit a minimum of 10 kilograms of lunar simulant within 15 minutes. The complexities of the challenge included the abrasive characteristics of the lunar simulant, the weight and size limitations of the lunabot, and the ability to control the lunabot from a remote control center.

Through partnerships, Kennedy was able to target and reach a significant number of students. The Suwannee District Schools NASA Day reached about 2,000 students; the Volusia Space Week reached 2,000 eighth-grade students and 70 teachers; Brevard Space Week reached 5,400 sixth-grade students and 318 science teachers; and Brevard Learns About Science and Technology (BLAST) reached 2,400 seventh-grade students. Kennedy also partnered with the Pinellas Science Center and the Johnson Space Center Teaching from Space Office to host about 300 students from underserved, underprivileged schools.

Kennedy sponsored the second annual Waste Limitation Management and Recycling (WLMR) design challenge in which fifth- through eighth-grade students nationwide created and submitted their designs for water filtration systems.



NASA Associate Administrator for Education Leland Melvin works on a LEGO structure with students inside a tent set up on the NASA Causeway at Kennedy Space Center in Florida on Nov. 3, 2010, to celebrate the new partnership between the space agency and The LEGO Group.



Students act as launch control engineers during a simulated shuttle launch, Aug. 5, 2010, at Camp KSC at the Astronaut Hall of Fame in Titusville, Fla.

During a General Electric Educators Professional Development Workshop, Kennedy education specialists conducted a Rocketry Workshop for 53, K-12 educators. The participants engaged in hands-on activities involving space shuttle, space propulsion, spacecraft for solar system and planetary travel. Kennedy partnered with five local middle schools on the NASA Schools Connection Program. The goal

was to get eighth-grade students excited about STEM before entering high school.

NASA and Reach Media Tom Joyner Morning Show (TJMS) signed a five-year Space Act Agreement that will allow TJMS to provide an outreach venue for NASA to showcase its programs and products to a national audience, as well as share specific information about the agency's educational

opportunities for students, educators and parents. Kennedy participated in the 2010 TJMS Family Reunion, and the TJMS Back-To-School Campaign. The TJMS Family Reunion reached about 12,000 people who were exposed to NASA content-based educational activities, the inherent excitement of the space program and minority role models. The TJMS Back-To-School Campaign included live multicity special broadcasts and exhibits at Back-To-School Fairs.



University students tune up and tinker with their remote controlled or autonomous excavators, called lunabots, during NASA's first Lunabotics Mining Competition at the Kennedy Space Center Visitor Complex's Astronaut Hall of Fame in May 2010.

Outreach to the World

When a space shuttle launches from Kennedy Space Center or a rocket takes off from Vandenberg Air Force Base in California, people from around the world are able to follow the countdown and liftoff live, whether watching in person as a launch guest, on a TV or computer screen, or following online through a Twitter feed or on a blog. All in real time, all brought to the world through the communications team at Kennedy.

The joint efforts of Public Affairs and External Relations enable the center to provide timely and accurate information to the media, elected officials, community leaders, students, educators and the general public. Through this team effort, Kennedy aims to reach the broadest audience to inform, educate and inspire.

Thousands of media descend upon the space center each year to cover launches and breaking news of the day. Added to this, are all of the launch

guests and general visitors who come to explore this historic space center where the eyes and ears of the world were focused upon from the earliest era of space travel. Beginning with Mercury, Apollo and Gemini program launches.

Not only does the team welcome thousands to the center for an up close view of history in the making, Kennedy brings the excitement of space travel and exploration to the world using every communication means available.

Kennedy Web Presence

Kennedy's website continued to draw a worldwide audience. The center's home page, at www.nasa.gov/kennedy, attracted more than 3 million views. The Kennedy Web team also maintained the shuttle section, at www.nasa.gov/shuttle, for the agency, which receives more than 10 million views. Both sites consistently ranked in the top 10 most-popular pages within the NASA Web portal, at www.nasa.gov.

Kennedy's social media presence, under the username "NASAKennedy," became a standard for many to find out the latest news from the space center. The fan base increased to more than 57,000 friends on Facebook, and more than 120,000 followers on Twitter. YouTube climbed to more than 10,000 subscribers, with more than 400,000 video views.

The Web team created a space shuttle era collection



At Kennedy Space Center's Press Site in Florida, astronaut Scott Kelly addresses participants during a unique event on Nov. 16, 2009, a Tweetup, held to share the excitement of a space shuttle launch with a new audience. The tweeters took a tour of Kennedy, spoke with shuttle technicians, engineers, astronauts and managers, and the staff on @NASA, and viewed the launch of Atlantis on the STS-129 mission.



Kennedy Space Center Director Bob Cabana, left, shows Commerce Secretary Gary Locke and Rep. Suzanne Kosmas the plan for Exploration Park on Aug. 4, 2010.

of feature stories and videos documenting shuttle operations. This section highlights the technology and people that supported the program for the past 30 years, and can be found at www.nasa.gov/mission_pages/shuttle/flyout/index.html.

The team provided launch processing and countdown coverage for four space shuttle missions and three expendable launch vehicle missions and the test launch of the Ares I-X rocket's capabilities. An international Internet audience was kept up-to-date during countdowns and landings with frequent updates to the mission's main page, and photo and video galleries. NASA's Launch Blog provided live commentary and up-to-the-minute information straight from a control room console to the reader. Combined, this fiscal year's launch and landing blogs racked up more than 2 million page views. Kennedy's Web video products included feature videos and podcasts, as well as highlights of launches and landings.

News Media Operations

News media representatives from around the world and hundreds of tweeters were provided with timely and accurate information about space shuttle and expendable launch vehicle launches, special events and other center activities. Communicating this information is achieved via live and taped interviews, news conferences, media updates, printed fact sheets and newsletters, exhibits and social media outlets, including websites, blogs and Twitter updates. Other avenues of communication include Kennedy's high-definition NASA TV broadcasting; streaming video of Kennedy events; digital imagery on the multimedia gallery, at <http://mediaarchive.ksc.nasa.gov>, which

received 7 million page views in Fiscal Year 2010; and a full-service office catering to professional journalists. They also provided video news releases, still photographs, video footage, tapes, CDs and DVDs to media outlets.

Kennedy Space Center Visitor Complex

The Kennedy Space Center Visitor Complex (KSCVC) shared the NASA story with more than 1.5 million guests, reaching both a national and international audience through a combination of exhibits, space artifacts, IMAX films and tours of Kennedy's hallowed grounds.

The U.S. economic decline continues to impact tourism, however, the visitor complex attendance for 2010 was only 2.2 percent shy of its 2009 attendance.

In the spring of 2010, Delaware North Companies Parks and Resorts was awarded the new concession agreement to operate the KSCVC, allowing them to continue telling the NASA story. Delaware North hit the ground running with the launch of a robust 10-year master plan. The new plan will create excitement for guests as they discover the connection between NASA and their everyday lives.

The demand for launch viewing opportunities through the complex also grew as the end of the shuttle program approaches. The complex instituted a lottery system for launch ticket purchases, which became effective with the STS-133 launch attempt.

The summer season offered exciting features, including support of the first Lunabotics Mining Competition held at the Astronaut Hall of Fame, and the opening of the new Star Trek Live! show at the main complex. As part of its community outreach program, the complex was the headlining sponsor of

the Cocoa Beach Fireworks Show as a tribute to the shuttle program on Independence Day. The induction of the ninth group of shuttle astronauts into the U.S. Astronaut Hall of Fame also was hosted during the summer. Guy Bluford, Ken Bowersox, Frank Culbertson and Kathy Thornton joined an elite group of American space heroes during a weekend of events.

Other activities included the grand opening of the new “Exploration Space” exhibit where visitors are immersed into an environment of discovery and exploration beyond our home planet. Live theater, interactive experiences and large-scale multimedia presentations display what the future of space travel may look like, and emphasized that space exploration is not just about the hardware, but also about the people behind the technology. The IMAX theaters also opened a new film, called “Hubble 3D,” in the spring and continued running it beyond the fiscal year.

The visitor complex continued to successfully operate two retail stores in the Orlando International Airport, and offered a variety of robust educational programs geared toward inspiring the next generation of explorers. More than 85,000 students participated in programs, including Camp KSC, Overnight Adventures, the Astronaut Training Experience,

student field trips, Brevard Space Week and “salute to” boy scout and girl scout programs.

For more than 43 years, the complex has operated as a self-supporting entity funded solely through revenues earned through admission, retail and food sales.

Government Relations

During Fiscal Year 2010, a number of federal, state and local elected officials and community leaders traveled to Kennedy to tour its grounds and facilities, and to learn more about the wide range of activities happening at the center. Kennedy also hosted a variety of dignitaries for shuttle launches.

The center’s senior management team participated in various workshops and meetings throughout Florida concerning the future of the space industry. In November, Center Director Bob Cabana appeared before the Brevard State Legislative Delegation in order to discuss Kennedy’s priorities, and Deputy Director Janet Petro provided an update to the Biotechnology Caucus in Tallahassee regarding Kennedy’s involvement in biotechnology matters. In March, senior management and industry representatives joined to visit with legislators during Space Industry Day in the state’s capital, and Cabana

testified on the long-term benefits of science, technology, engineering and mathematics, or STEM, education before the Senate Pre-K through 12 Education Committee.

April saw the arrival of U.S. President Barack Obama at Kennedy, the location he chose to outline his vision for the future of space exploration. During his visit, the president announced a \$40 million initiative to develop a plan for regional economic growth and job creation in Central Florida.

Elected officials and other community stakeholders



At the Kennedy Space Center Visitor Complex in Florida, 110 people from 36 countries wave their American flags after taking the Oath of Allegiance to become American citizens, July 1, 2010. This was the first naturalization ceremony hosted by a NASA facility.



Children visit Kennedy Space Center's spinoff technology display at the Visiting Nurse Association Air Show in Stuart, Fla., Nov. 14, 2009.

gathered with Kennedy senior leadership and Space Florida to celebrate the groundbreaking of Exploration Park in late June. In July, Cabana met with members of the Florida Congressional Delegation in Washington, D.C., in support of NASA's Office of Legislative and Intergovernmental Affairs' annual "Day on the Hill" event.

Exhibits

Kennedy's Display Management Team traveled to a variety of public events throughout Florida and the southeast region of the United States. Notably, the display team appeared at various sporting events, including the NASCAR Pepsi 400 in Daytona, Fla., a National Hockey League Florida Panthers game in Sunrise, Fla., and the Brevard Manatees All Star baseball game in Viera, Fla. These appearances were made with the purpose to inspire a new audience and highlight some of the technological contributions that NASA has made in the sports industry.

Kennedy exhibits also were found at home shows and various educational events. Three displays were loaned to the Challenger Learning Center in Tallahassee, Fla., where about 50,000 students were able to view them. Overall, the Display Management Team reached more than 600,000 people as it communicated the NASA message through the use of displays, videos, handout information and one-on-one interaction with the public. Materials focused on the benefits of space exploration, NASA spinoffs and NASA's mission to explore the universe.

Guest Operations

Kennedy's Guest Operations staff enabled more than 21,000 guests of NASA and its center partners to safely participate in behind-the-scenes Kennedy tours, including educational briefings provided by center engineers and operational experts. The center also hosted thousands of the agency's invited guests to participate in launch briefings and viewing opportunities for four space shuttle and two expendable launch vehicle liftoffs. Guests included members of Congress, business and agency leaders, astronaut families, medical and legal professionals, veterans, teachers and students.

Speakers Bureau

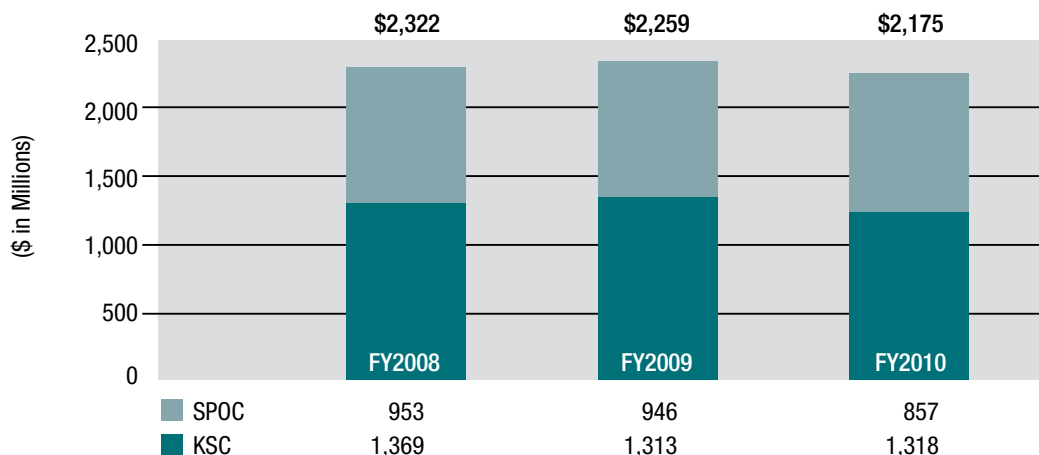
Kennedy Space Center's Speakers Bureau is composed of engineers, scientists and other professionals, who represent the agency as speakers at civic, professional, educational and other public venues in Florida, Georgia, Puerto Rico, and the Virgin Islands. The Speakers Bureau is a free service of Kennedy's public communication and outreach programs. Audiences include preschool to college students, libraries and museums, girl and boy scouts, professional and technical organizations, and community groups. This year Kennedy employees participated in the Great American Teach-In, a program that brings working professional scientists into local classrooms to share their experiences at NASA. In 2010, speakers from Kennedy reached more than 54,000 people during 271 events.

Kennedy Business Report

The Kennedy Space Center FY 2010 budget totaled nearly \$1.3 billion and more than \$2.2 billion when the Johnson Space Center-managed Space Program Operations Contract (SPOC) and related work performed at Kennedy is included. The center also performed \$85 million in reimbursable work with other government and commercial entities.

- The Space Shuttle Program (including total SPOC impacts) executed a \$1.1 billion budget by accomplishing four successful shuttle missions, all of which carried major components or logistics to the International Space Station. The STS-130 mission delivered the final components of U.S. segments to the station and the STS-132 mission delivered the Russian Mini-Research Module and critical spare parts. The FY 2010 activity also included preparations for two shuttle missions (STS-133 and 134) that slipped into FY 2011, as well as requirements associated with retirement of the program following manifest completion.
- The International Space Station's \$96 million budget allowed for fulfillment of commitments to international partners in completing station assembly, including several major component and supply deliveries -- the Tranquility module, Leonardo multi-purpose logistics module, integrated cargo carrier, and the Russian Mini-Research Module. Funding also helped the ongoing processing and flow of remaining space station components at Kennedy.
- The Launch Services Program (LSP) executed a \$399 million budget -- direct and reimbursable. LSP supported the launch of two successful missions -- the Solar Dynamics Observatory (SDO) from Cape Canaveral Air Force Station in Florida, and the Wide-field Infrared Survey Explorer (WISE) from Vandenberg Air Force Base in California. LSP also supported the Geostationary Operational Environmental Satellite-P (GOES-P) launch from Cape Canaveral Air Force Station in an advisory capacity. The

NASA/KSC Budget Authority Summary FY 2008 through FY 2010 (\$ in Millions)

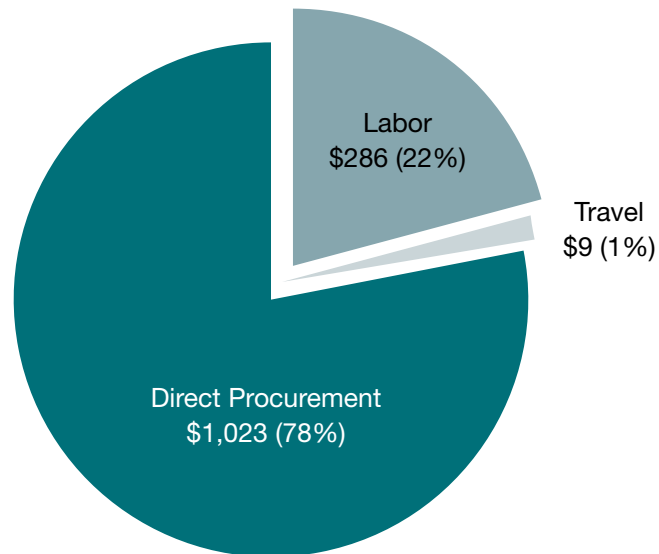


Kennedy Space Center FY 2010 Budget Authority (\$ in Millions)

Space Shuttle	\$222
Space Station	\$96
Launch Services/Science	\$360
Constellation	\$175
Center Management & Operations	\$350
Other	\$115
Total KSC*	\$1,318

** Excludes Space Program Operations Contract (SPOC)*

FY 2010 KSC Budget by Elements (\$ in Millions)



Seventy-eight percent of the Kennedy budget is spent through the purchase of goods and services from commercial providers. The SPOC, or space shuttle contract, managed by Johnson Space Center in Houston is excluded here. Its inclusion would increase the percentage of procured services to 87 percent.

program also procured launch vehicle services and other support services for several manifested missions scheduled to launch in FY 2011 and beyond.

- The Constellation Program budget of \$175 million supported ground systems design and development and ground operations infrastructure, including activities applicable to future programs. The FY 2010 activity also included the successful test launch of Ares I-X.
- Kennedy's Center Management and Operations' budget provided \$350 million to maintain the center's critical mission essential facility systems and life safety systems, as well as core technical capabilities and supporting infrastructure. It also sustained the center's safety and engineering

technical authorities, implemented NASA's Chief Information Officer initiatives and provided business systems support with improved internal controls.

Business Development

With the anticipated retirement of the Space Shuttle Program in 2011, Kennedy increased its efforts during the year to expand and strengthen partnerships with external private and public organizations to help meet the challenges of the pending transition. The center had 87 active reimbursable agreements, which generated more than \$700 million in budget-offsetting revenues. Details on Kennedy's efforts are included in the Center Planning and Development section of this report.

Economic Impact

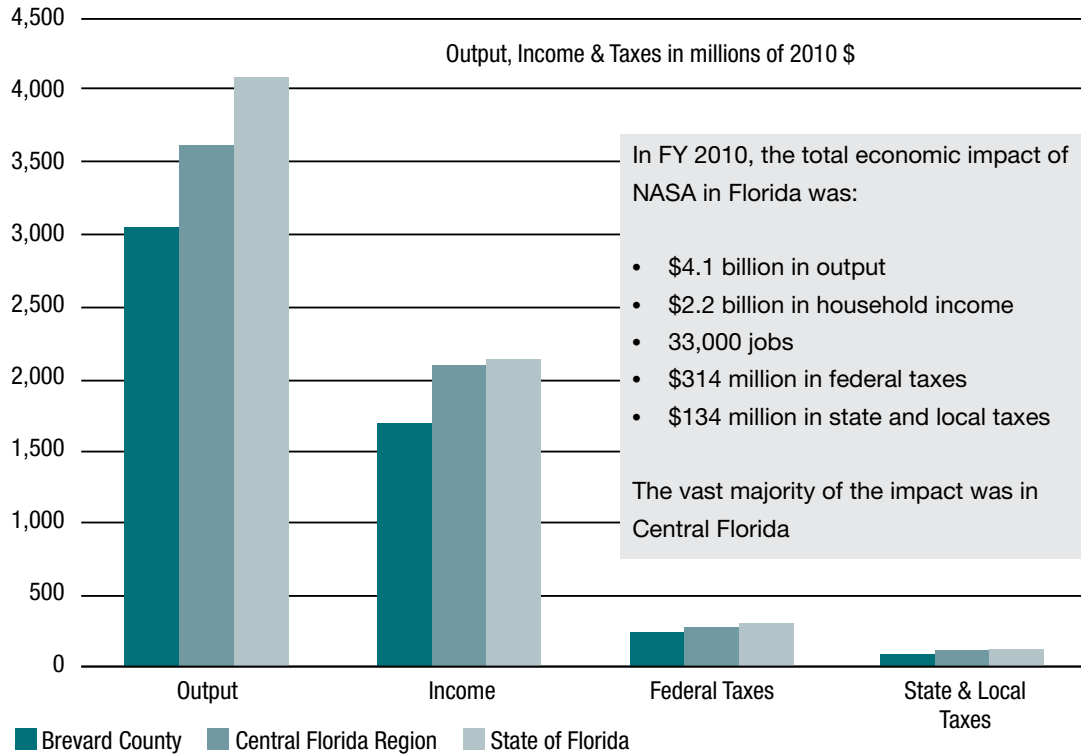
To fulfill its mission, NASA and its contractors require goods and services, both technical and non-technical, ranging from expendable launch vehicles, propellants and computer systems, to motor vehicles, facilities and office supplies. In meeting NASA's demand, local contractors employ workers, produce 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. Supermarkets, gas stations, restaurants, department stores, automobile dealers, dry cleaners, real estate offices and other businesses support the community of workers, and in turn, hire employees, pay salaries and generate further community business needs.

Also, further economic activity is generated through visitors to the Kennedy Space Center Visitor Complex, its launch events and business travel to the region. Each round of spending

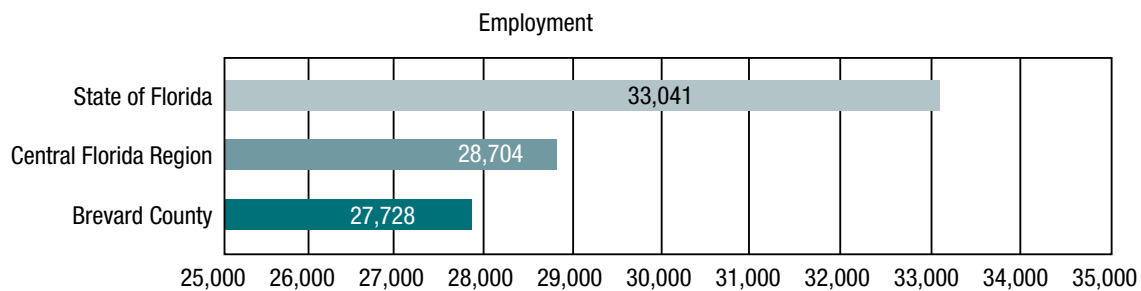
recirculates NASA's initial demand among Florida's businesses and households, multiplying the direct impact on the economy.

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 2010, of the \$18.7 billion NASA budget, Kennedy and other NASA centers spent \$1.8 billion in wages and commodity purchases within the state of Florida. This monetary injection into the local, regional and state economy induced a total economic impact within the state of \$4.1 billion in total output, \$2.2 billion in household income, and generated 33,000 jobs. The report concludes that every space-related dollar spent in Florida produces more than double the economic output; and every space-related job creates an additional 1.26 jobs within the Florida economy. Kennedy remains by far the major economic driver in Brevard County and a major contributor to the economic health of the state of Florida.

FY 2010 Total Economic Impact of All NASA Activities in Florida by Geographic Area



Area of Economic Impact	Millions of 2010 \$			
	Output	Income	Federal Taxes	State & Local Taxes
Brevard County	3,048	1,715	228	88
Central Florida Region	3,574	2,130	289	113
State of Florida	4,093	2,167	314	134



For every job at Kennedy, an additional 1.26 jobs are created elsewhere within the state of Florida, each dollar of wages was multiplied into \$2.09 in total income and each dollar of total direct spending for commodity purchases and wage payments was multiplied into \$2.16 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 future explorations. To accomplish the various missions expected of Kennedy, 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 contractor employees chartered to work for Kennedy. Other organizations, such as the European Space Agency and Patrick Air Force Base, have roles here but are not reflected in these numbers.

As of Sept. 30, 2010, the total Kennedy population was 13,631. This includes 2,126 NASA civil servants, 88 NASA students, 9,845 on-site and near-site contractor employees, 283 construction employees and 1,289 tenants on the center. There was an 11.6 percent decrease in the contractor work force in 2010 due to downsizing as NASA's Space Shuttle Program comes to an end. The civil servant skill mix includes scientific and engineering, administrative, technical and clerical workers.

Kennedy's Human Resources Office provided employees with many transition opportunities and employee assistance programs as NASA's Space Shuttle Program comes to an end. The office helped workers locate and apply for federal and private jobs, build their resumes, and hosted veteran assistance classes.

In May 2010, the center extended a Space Act Agreement with Brevard Workforce that allows the organization to provide job training

and other services to the work force through May 27, 2012. Between July 2009 and June 2010, the organization provided training to 687 workers and held 124 workshops for 2,968 participants. During that same period, more than 1,000 visits were recorded at the organization's two onsite locations for information on job search skills, training opportunities and employment referrals. More than 900 workers sought information on program services and registration, job search, resume writing and interview skills at the onsite Brevard Workforce Express mobile unit offered through the Aerospace Workforce Transition Program.

Human Resources, in conjunction with Brevard Workforce, also held two onsite job fairs and two others at offsite locations to help workers who will be displaced by the shuttle's retirement and transition.

Kennedy Space Center Work Force Profile (through 9/30/10)

Civil Servants	2,126
Co-ops and Students	88
Total Civil Servants	2,214
Civil Servant Skill Mix	
Scientific & Engineering	62%
Administration	28%
Technical	2%
Clerical	4%
On-site Contractor Employees	9,796
Off/Near-site Contractor Employees	49
Total Contractor Employees	9,845
Total Construction Employees	283
Total Tenants	1,289
TOTAL KSC POPULATION	13,631



Procurement Report

The companies listed below were some of Kennedy Space Center's top support contractors or launch services contractors in terms of dollars obligated in FY 2010. Following is a brief description of their work for the agency:

Boeing Space Operations

Boeing Space Operations was the prime contractor for the Checkout, Assembly and Payload Processing Services, or CAPPs, contract. Boeing's primary purpose was to support all aspects of payload processing for the International Space Station, space shuttle and expendable launch vehicles, or ELVs.

URS Federal Technical Services, Inc.

URS Federal Technical Services provided base operations support for Kennedy. URS Federal Technical Services was responsible for operations, maintenance and engineering for specific Kennedy facilities, systems, equipment and utilities. URS Federal Technical Services also was responsible for calibration and propellants handling at the center.

Abacus Technology Corporation

Abacus provided communication and information technology services under the Information Management and Communications Support, or IMCS, contract. Abacus supported the majority of these requirements at Kennedy, which included support to agency programs, such as space shuttle, Constellation, payloads, launch services and the International Space Station. Services provided include hardware and software integration development, computer administration and maintenance, voice and data transmission, library, graphics, publications, printing and reproduction, and IT security.

Analex Corporation

Analex was the prime contractor on the


Expendable Launch Vehicle Integrated Services, or ELVIS, contract. Analex was responsible for performing and integrating the overall programmatic ELV business and administrative functions, including program and project planning, risk management, evaluation and information technology. Services provided include the management, operation, maintenance and sustaining engineering of NASA's ELV communications and telemetry stations located at Cape Canaveral Air Force Station, or CCAFS, in Florida and Vandenberg Air Force Base in California. Analex also provided engineering services and studies, and technical services for various ground and flight ELV systems, missions and payloads.

Arctic Slope Research Corporation

Arctic Slope Research, or ASRC Aerospace, provided research and engineering services and technical support to Kennedy's Spaceport Engineering and Technology Division and other center operational customers. Support ranged in scope from engineering development and management of complex research, to engineering and technical support of various Kennedy laboratories and test beds. ASRC Aerospace utilized a consortium of affiliated universities in performing applied research and technology development efforts. ASRC Aerospace also provided technology outreach to foster awareness and utilization of Kennedy's unique capabilities.

Innovative Health Applications

Innovative Health Applications, or IHA, under the Medical and Environmental Support Contract, or MESC, provided a broad range of medical and environmental services to NASA. IHA operated the on-site Kennedy medical clinic, which conducts health exams, certifications and emergency medical treatment. IHA also performed occupational health services, aerospace medicine, industrial



hygiene, environmental permitting, compliance and stewardship, ecological monitoring, and hazardous waste disposal. IHA operated Kennedy's Fitness Centers and provided education outreach to the center's employees.

United Launch Services LLC

United Launch Services, or ULS, a subsidiary of United Launch Alliance, brought The Boeing Co., Delta Launch Services Inc. and Lockheed Martin Commercial Launch Services together. ULS provided launch services to NASA using the Delta II and Atlas vehicles under two of three existing multiple-award, indefinite delivery, indefinite quantity task order contracts. Principal location for the Delta II vehicle assembly is Decatur, Ala. Principal location for the Atlas vehicle assembly is Denver, Colo. Both vehicles launch from CCAFS and Vandenberg.

OAO Corporation

OAO led the Outsourcing Desktop Initiative, or ODIN, for NASA after acquiring the OAO Corp. The ODIN contract is an agencywide, long-term outsourcing arrangement that transfers the responsibility and risk for providing and managing the vast majority of NASA's desktop, server and intracenter communications assets and services. Such assets include desktops, servers, mobile BlackBerry devices, WebEx Web conferencing, Kennedy Unified Dialup Access, or KUDA, and e-mail.

Orbital Sciences Corp.

Orbital Sciences Corporation (OSC) of Dulles, Va., provided the agency's Launch Services Program (LSP) with small and medium class expendable launch services at CCAFS, Vandenberg, Wallops Flight Facility in Virginia, and equatorial launch ranges. OSC provides launch services on both of the NASA Launch Services (NLS) I and II multiple-award indefinite delivery, indefinite quantity task order contracts.

United Space Alliance LLC

Under a Johnson Space Center contract, United Space Alliance, or USA, was the prime contractor for the Space Flight Operations Contract. USA's primary purpose was 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 shuttle at Kennedy.

Your Procurement Dollars at Work Geographical Distribution by State (Fiscal Year 2010 Obligations)

STATE	TOTAL DOLLARS	STATE	TOTAL DOLLARS
ALABAMA	2,045,890.73	MISSOURI	1,027,071.04
ALASKA	21,332.15	MONTANA	56,501.63
ARIZONA	227,891.44	NEVADA	96,813.00
CALIFORNIA	18,756,939.41	NEW HAMPSHIRE	492,515.88
COLORADO	269,171,251.71	NEW JERSEY	1,440,198.33
CONNECTICUT	10,050,379.79	NEW MEXICO	1,340,212.00
DELAWARE	30,238.50	NEW YORK	926,274.39
DISTRICT OF COLUMBIA	615,983.00	NORTH CAROLINA	774,209.16
FLORIDA	237,735,098.60	OHIO	1,014,546.71
GEORGIA	513,964.00	OKLAHOMA	9,913.66
HAWAII	130,194.91	OREGON	100,651.00
ILLINOIS	856,101.33	PENNSYLVANIA	8,823,910.08
INDIANA	11,272.42	RHODE ISLAND	51,801.25
IOWA	109,093.42	TENNESSEE	4,621,263.48
KANSAS	13,290.91	TEXAS	18,000,866.67
LOUISIANA	6,275,437.23	UTAH	178,814.49
MARYLAND	321,071,712.53	VIRGINIA	97,255,098.07
MASSACHUSETTS	845,465.88	WASHINGTON	99,759.40
MICHIGAN	2,181,011.13	WISCONSIN	1,817,667.00
MINNESOTA	101,948.00	WYOMING	15,562.00
		TOTAL	\$1,035,932,601.33

Top 25 KSC Business Contractors for FY 2010

Contractor	Dollars
UNITED LAUNCH SERVICES, LLC	295,960,546.08
URS FEDERAL TECHNICAL SERVICES, INC.	116,998,841.76
ABACUS TECHNOLOGY CORPORATION	102,500,507.36
BOEING SPACE OPERATIONS COMPANY	88,929,179.08
ASRC AEROSPACE CORPORATION	71,935,008.09
ORBITAL SCIENCES CORPORATION	41,060,676.00
SPACE GATEWAY SUPPORT, LLC	38,972,618.71
INNOVATIVE HEALTH APPLICATIONS, LLC	23,897,873.60
ANALEX CORPORATION	23,280,388.29
OAD CORPORATION	18,585,186.38
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION	13,915,051.00
AIR LIQUIDE LARGE INDUSTRIES U.S. LP	13,442,013.15
CANAVERAL CONSTRUCTION COMPANY INCORPORATED	13,212,691.04
MILLENNIUM ENGINEERING AND INTEGRATION CO	12,866,281.01
SAUER INCORPORATED	12,860,232.26
PRAXAIR INCORPORATED	7,826,787.94
DYNAMAC CORPORATION	7,583,624.00
REDE-CRITIQUE	6,220,709.23
MILITARY CONSTRUCTION CORPORATION	6,117,085.00
ORBITAL SCIENCES CORPORATION	5,900,179.23
BREVARD ACHIEVEMENT CENTER, INC.	5,774,650.88
ASTROTECH SPACE OPERATIONS, INC.	4,691,068.14
AIR PRODUCTS AND CHEMICALS INCORPORATED	4,326,652.63
MISENER MARINE CONSTRUCTION, INC.	4,179,349.00
JONES EDMUNDS AND ASSOCIATES	3,767,900.00
TOTAL	\$1,035,932,601.33

*Soaring above Kennedy
Space Center's Launch Pad
39A towers, space shuttle
Discovery heads skyward on
its STS-131 mission, April 5,
2010, at 6:21 a.m. EDT.*



National Aeronautics and Space Administration
John F. Kennedy Space Center
Kennedy Space Center, FL 32899

www.nasa.gov