

# Kennedy Space Center

# ANNUAL REPORT FY 1997



Preserving the Past



Leading the Present



Building the Future

# Kennedy Space Center

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*ON FRONT COVER: (Background photo) The Space Shuttle Discovery soars into space. (From left) Kennedy Space Center visitors gaze at the powerful engines of the restored Saturn V rocket in the Apollo/Saturn V Center; KSC employees prepare the Node 1 for launch on the first Space Shuttle mission to build the International Space Station; the Checkout and Launch Control System is under development at KSC.*

*ON BACK COVER: A Delta II expendable launch vehicle lifts off with NASA's Advanced Composition Explorer (ACE) spacecraft from Cape Canaveral Air Station.*

# Introduction and Overview



*The John F. Kennedy Space Center (KSC) has a nearly 40-year tradition of excellence in processing and launching space vehicles and their payloads. The Center's outstanding record of achievements in America's space program has earned it an honored place in history and an essential role in the present; KSC also intends to play a vital part in the future of space exploration.*

The Center's unique capabilities and expertise have been recognized by the National Aeronautics and Space Administration (NASA), which has designated KSC as the **Center of Excellence for Launch and Payload Processing Systems**.

In further recognition of its core capabilities and strengths, Kennedy Space Center was assigned the following lead center responsibilities in Fiscal Year 1997 (FY 97):

- Lead Center for Acquisition and Management of Expendable Launch Vehicle Services (assigned in FY 97, still in transition)
- Lead Center for Payload Carriers and Support
- Lead Center for Occupational Health
- Lead Center for NASA's Benchmarking activities in Continual Improvement

- Lead Center for the National Electronic Key Management System and the NASA Central Office of Record for Communications Security, and Federal Arrest Authority Training
- Lead Center for managing the Outsourcing Desktop Initiative for the Office of Space Flight Centers, including KSC, Johnson Space Center, Marshall Space Flight Center and Stennis Space Center
- Lead Center for NASA Consolidated Helium Acquisition

Kennedy Space Center was the first NASA field center to be honored in the President's Quality Award Program. In 1995, the Center won the Quality Improvement Prototype Award and a year later was a Presidential Award for Quality finalist, receiving a Special Achievement Award for its accomplishments in the application of quality management principles and practices.

## New Leadership

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During FY 97, the mantle of leadership at Kennedy Space Center transferred from Jay F. Honeycutt, center director since January 1995, to Roy D. Bridges Jr., who came on board March 2, 1997.

After his appointment by NASA Administrator Daniel S. Goldin, Bridges quickly put together a top management team to oversee all aspects of Center operations: Loren J. Shriver as deputy director for Launch and Payload Processing; James L. Jennings as deputy director for Business Operations; and JoAnn H. Morgan as associate director for Advanced Development and Shuttle Upgrades.



*NASA Administrator Daniel S. Goldin (center) welcomes new Kennedy Space Center Director Roy D. Bridges Jr. (left) and thanks retiring KSC Director Jay F. Honeycutt for his many years of service to the space program.*

## Implementation Plan and Road Map

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*Roy D. Bridges Jr.*



*Loren J. Shriver*



*James L. Jennings*



*JoAnn H. Morgan*

With the participation of the work force, and after extensive consultations with customers and suppliers, the KSC leadership team developed an Implementation Plan for NASA's Strategic Plan and a Road Map for KSC's future through 2025. The process of developing the Implementation Plan and Road Map produced a Core Business (mission) statement, a set of four Guiding Principles and four Strategic Goals which all members of the KSC team now share as a guide for future decisions.

**Core Business:** The KSC Core Business is to provide space systems processes, test, and launch techniques and develop associated technologies.

**Guiding Principles:**

- Safety and Health First
- Build Reliance and Teamwork Everywhere
- Satisfy Our Customers' Needs Anytime, Anywhere
- Environmental Leadership

**Strategic Goals:** The Center's goals help implement the NASA Strategic Plan and its four strategic enterprises: Human Exploration and Development of Space; Aeronautics and Space Transportation Technology; Space Science; and Earth Science.

The Center's Strategic Goals are:

- 1) Assure safe, sound, and efficient practices and processes are in place for private/commercialized launch site processing;
- 2) Increase the use of KSC's operational expertise to contribute to the design and development of new payloads and launch vehicles;
- 3) Utilize KSC operational expertise in partnership with other entities (NASA Centers, industry, academia) to develop new technologies for future space initiatives;
- 4) Continually enhance core capabilities (people, facilities, equipment and systems) to meet NASA objectives and customer needs for faster, better, cheaper development and operations of space systems.

**Road Map:** The Road Map identifies specific objectives and strategies to accomplish the Center's goals and meet the objectives of the Agency and its strategic enterprises. The plan identifies an initial set of performance indicators in areas such as cost, safety and reliability. Kennedy Space Center will monitor the performance indicators to ensure that it continues to bring the most value to its customers.

The KSC Road Map envisions a carefully executed transition from a predominantly operations role to a development role for the civil service work force. The Road Map will continue to be refined and updated to meet current and projected needs.



## Restructuring and Refocusing Resources

Along with the formation of the new top management team, there was a major refocus of Center resources as well as a renewed push to improve processes.

In line with NASA's work force restructuring plans, the KSC civil service work force was further reduced, from 2,099 to 1,886, through buyout incentives and an aggressive outplacement plan.

1997 was the first full year under the Space Flight Operations Contract (SFOC) awarded to United Space Alliance (USA) for consolidation of ground processing and operations. SFOC assigns greater responsibility to the contractor, reducing the government's role in overseeing day-to-day Shuttle operations. During FY 97, NASA made considerable strides in the transition from an oversight role to an insight role in space flight operations.

As part of the structured approach to transition to SFOC, the Center's Safety Assurance Program was significantly improved by consolidating 20 safety-related documents into a single policy which details safety requirements without mandating how compliance is to be achieved.

Also in the Safety and Mission Assurance Directorate, substantial progress was made to reduce the Government Mandatory Inspection Points in accordance with the Agency's plan to turn over responsibility for day-to-day Shuttle operations to the contractor.

A significant milestone in the transition of NASA functions to USA occurred in 1997 with transfer of test management oversight of many daily Shuttle processing operations from the NASA Test Directors Office to the contractor.



*The Center's environmental stewardship allows wildlife such as this famous pair of Southern Bald Eagles to coexist with technology, as represented by the Vehicle Assembly Building (background at right).*



*KSC employees fill out paperwork for the third civil service buyout.*

The transition of all 1997 targeted NASA logistics functions to the SFOC contractor was completed, and SFOC logistics initiatives to improve efficiency and reduce costs made substantial progress.

The SFOC contract represented only one of the recent ways Kennedy Space Center signaled that it is changing the way it does business. The two other largest contracts at the Center, the Payload Ground Operations Contract and the Base Operations Contract, were renegotiated to performance-based contracts. A Structured Surveillance System was developed — and will be implemented — to automate much of the work necessary to provide assessment of contract performance.



*United Space Alliance closeout crew members assist an STS-82 astronaut into the Space Shuttle Discovery.*

For the Payload Ground Operations Contract alone, the conversion to a performance-based contract reduced the number of pages in the Statement of Work by 88 percent, decreased the data requirements by 62 percent, and reduced the overall contract cost by 37 percent over five years.

Also, Kennedy Space Center and the Air Force 45<sup>th</sup> Space Wing are making history in a unique partnership formed to award a contract for joint base operations and support in FY 98. The joint contract is expected to lower costs and increase responsiveness of services for space customers at Kennedy Space Center, Cape Canaveral Air Station and Patrick Air Force Base.

Other significant advances during FY 97 occurred in the fields of quality management and process improvement.

In response to a directive by the NASA Administrator, the Center launched a major effort to obtain certification in ISO 9001, an international set of standards for quality management systems. The Integrated Logistics Division of United Space Alliance was the first KSC organization to earn the ISO 9001 certification.

KSC's Ground Safety Review Panel was recognized as one of the best processes in NASA in the Department of Navy's *Best Manufacturing Practices Report*. The report also cited the KSC Technology Programs and Commercialization Office for its imple-

mentation of a superior system for new technology development and commercialization.

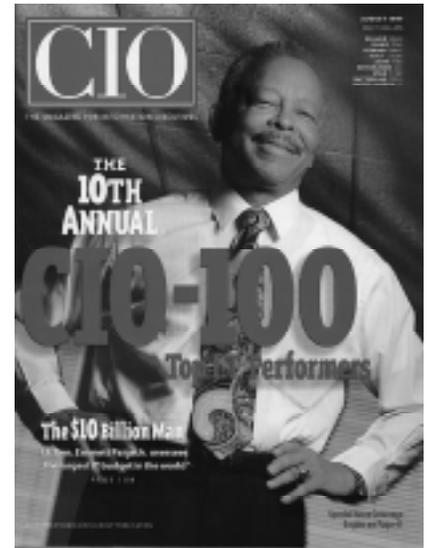
KSC's innovative use of information technology (IT) earned it a spot as one of the year's top 100 IT performers on the Chief Information Officer 100 (CIO 100) list published by *CIO* magazine.

## **KSC: A Business Doing Government Work**

The Center Director established the Business Innovation Group (BIG) to focus and integrate the centerwide efforts in strategic planning, International Organization for Standardization (ISO) 9001 certification, performance measurements, benchmarking and Continual Improvement activities. Besides helping senior management with the development of a Strategic Implementation Plan and Road Map for KSC's future, the Business Innovation Group developed a structured electronic Business Management System, and a World Wide Web-based information resource, Business World. Other innovative products are a Business System Manual and Business Objectives & Agreement documents which link the organizations with the goals, objectives and strategies of the KSC Road Map.

Kennedy Space Center has developed the knowledge, process and tools to support NASA's strategic management process at the Center level. With a firm commitment to use benchmarking as an integral part of the strategy for improvement, KSC has initiated significant benchmarking activities in areas of critical importance to the Center such as safety and quality.

In recognition of this leadership, KSC was named the lead center for NASA's benchmarking activities.



# Mission Achievements and Initiatives



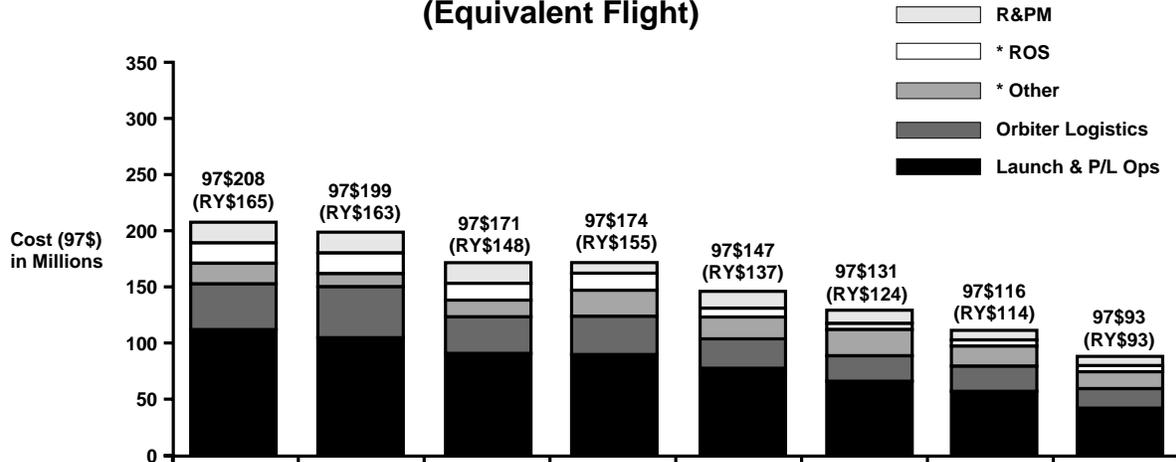
*Framed by a flock of birds in the foreground, the Space Shuttle Atlantis lifts off on Mission STS-84, one of four night launches in FY 97.*

*Kennedy Space Center is a world leader in space launch, landing and payload processing operations. The KSC team is responsible for ground turnaround and support operations, prelaunch checkout and launch of the Space Shuttle and its payloads, and the landing and recovery of the Shuttle orbiter and payloads, as well as the recovery of the reusable solid rocket boosters. The space center also provides launch support and oversight for NASA activities related to expendable launch vehicle (ELV) missions, primarily from adjacent Cape Canaveral Air Station in Florida and Vandenberg Air Force Base in California.*

# Space Shuttle

One of the most significant indicators of operational performance at Kennedy Space Center is the cost per Shuttle flight, as shown in the chart below. In 1990, the Center's cost per flight was \$165 million; by 1997, it had decreased to \$93 million, which represents a \$72 million cost savings (avoidance) per flight. The reduction in the cost-per-flight is a result of a broad spectrum of Continual Improvement initiatives, including improved equipment and work package design, better scheduling, and higher production quality. Safety remains the number one priority.

**Kennedy Space Center  
Cost Per Flight\*\*\*  
(Equivalent Flight)**



	97\$	FY90	RY\$	97\$	FY91	RY\$	97\$	FY92	RY\$	97\$	FY93	RY\$	97\$	FY94	RY\$	97\$	FY95	RY\$	97\$	FY96	RY\$	97\$	FY97	RY\$
Equivalent Flts		5.7		6.2		7.3		6.9		7.3		7.2		7.6		8.1								
Total Cost per Flt	208	165	199	163	171	148	174	155	147	137	131	124	116	114	93	93								
Launch & P/L Ops**	112	89	108	89	91	79	93	84	82	76	71	68	64	63	49	49								
Orbiter Logistics	44	35	42	34	35	30	34	30	25	23	23	22	19	18	16	16								
*OTHER	14	11	13	11	15	13	23	20	19	18	19	18	18	18	16	16								
*ROS	20	16	19	15	15	13	9	8	7	7	6	5	5	5	4	4								
R&PM	18	14	17	14	15	13	15	13	14	13	12	11	10	10	8	8								

\*Charges between OTHER & ROS due to institutional budget restructuring

\*\*Includes SFOC-KSC Processing (Data Furnished by JSC)

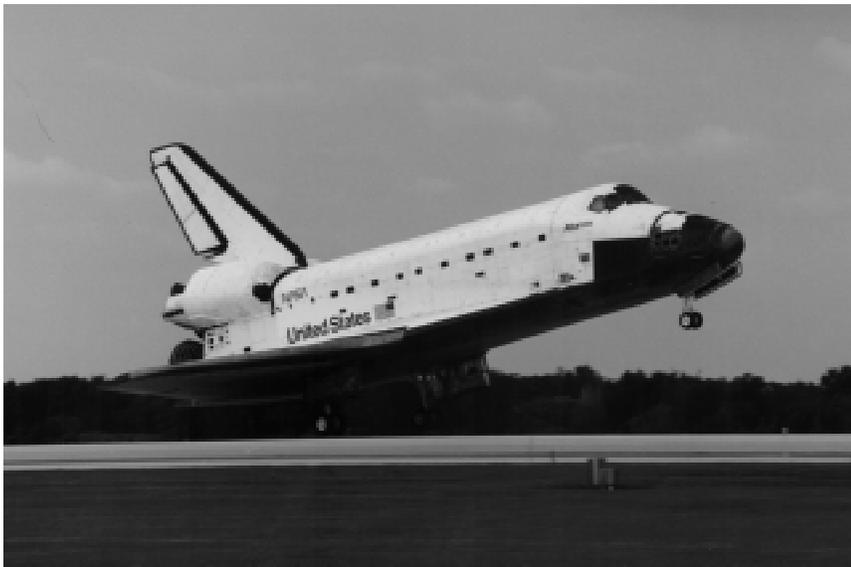
\*\*\*As of 4th QTR FY 97

## ***Flights***

During FY 97, eight Space Shuttles lifted off, carrying 45 crew members into space, logging more than 35 million miles, and taking several major payloads into orbit. The Shuttle orbiters on all eight missions returned home safely to KSC's Shuttle Landing Facility, the preferred Shuttle landing site.

Seven missions were planned, but an eighth, STS-94, was added as a reflight of the STS-83 mission with the Microgravity Science Laboratory-1 payload. STS-83 was cut short by 12 days because of concerns about a fuel cell.

The STS-94 flight three months later was the first reflight of the same payload and crew in Shuttle history. The KSC launch team processed the orbiter Columbia for reflight in 56 calendar days, a post-return-to-flight record.



*Atlantis glides in for a landing on Runway 33 at KSC's Shuttle Landing Facility.*

The total flight time of the Space Shuttle program passed the two-year mark during STS-86, the eighth and last mission of FY 97, which lifted off in September.

The orbiter Endeavour rejoined the four-vehicle fleet in March after returning from its first scheduled Orbiter Maintenance Down Period (OMDP) in California. Atlantis, veteran of 20 Space Shuttle flights and seven Mir docking missions, was readied for ferry flight to California for its second OMDP.

Also during FY 97, the two NASA ships that retrieve spent solid rocket boosters for the Space Shuttle program received an additional job – delivering the Shuttle external tanks that are manufactured in Michoud, LA, to Kennedy Space Center. The first tow operation was not scheduled until the spring of 1998, but the hardware was delivered in 1997 to NASA's Hangar AF on Cape Canaveral Air Station, home port for the two retrieval ships.

## ***Payloads***

The KSC team processed 23 payloads to fly in the Shuttle payload bay and more than 30 middeck payloads during FY 97.

The Microgravity Science Laboratory-1 (MSL-1) payload was prepared for flight twice, on STS-83 and STS-94, and the quick turnaround between those two missions was accomplished in part by the efficient reservicing of the MSL-1 payload in Columbia. It marked the first time a primary payload was reserviced in the orbiter.

Two major payloads flew on STS-80: The Orbiting Retrievable Far and Extreme Ultraviolet Spectrometer-Shuttle Pallet Satellite (ORFEUS-SPAS) made its second flight and the Wake Shield Facility flew for the third time. The primary payload on STS-85 was the Cryogenic Infrared Spectrometers and Telescopes for the Atmosphere-Shuttle Pallet Satellite (CRISTA-SPAS). The KSC team also prepared the payload for the second servicing of the Hubble Space Telescope on STS-82.

The SPACEHAB Double Module was used as a cargo container for hardware and supplies to and from the Russian Space Station Mir on three Shuttle flights.

The KSC team routinely was asked to accommodate unusual or late cargo additions to the Shuttle-Mir docking missions. A Russian oxygen generator was added to the cargo manifest of STS-84 only a few weeks before launch to replace a malfunctioning unit on the Mir. On STS-86, KSC was asked to fulfill a unique request under a tight timetable because of the collision of a Russian cargo vehicle with a Mir module. The KSC team worked with the Russians to fill three air pressurization units with highly compressed air for breathing. The task was a first for Shuttle payload workers because of the extremely high air pressurization requirements.

The KSC team also processed hardware and payloads for several future missions, beyond FY 97, preserving the processing schedule even in the case of design problems and late hardware deliveries, as occurred with the Neurolab payload targeted to fly on STS-90 in 1998.

Through a payload customer workshop and new partnerships with universities and commercial firms, changes in payload policies and processes were identified to streamline payload operations and make them more cost-effective.



*The Microgravity Science Laboratory-1 Spacelab module is lowered into Columbia's payload bay during STS-83 prelaunch preparations.*



*Payload workers perform final pre-launch processing of the Near Infrared Camera and Multi-Object Spectrometer (NICMOS) to be installed on the Hubble Space Telescope during STS-82.*



*Technicians look over a Russian-made oxygen generator that Space Shuttle Atlantis will transport to the Russian Space Station Mir on Mission STS-84.*



*The Sojourner rover undergoes a final functional check at KSC before being attached to the Mars Pathfinder lander.*



*The Saturn-bound Cassini spacecraft is lifted inside a KSC processing facility in preparation for its transport to the launch pad at adjacent Cape Canaveral Air Station.*

KSC managed several Shuttle payload packages with science experiments, including Biological Research in Canisters on STS-85, Biorack on STS-81 and STS-84, and a Shuttle/Mir Phase 1 experiment.

The Life Science Aquatic Laboratory at Kennedy Space Center opened in FY 97, offering dedicated science labs to payload customers who require launch/landing processing of aquatic specimens.

## **Expendable Launch Vehicles and Payloads**

In 1997, KSC was assigned lead center responsibility for NASA's acquisition and management of expendable launch vehicle (ELV) launch services. Transition plans got under way with scheduled completion by the end of FY 2002.

The KSC ELV team processed five major payloads for expendable vehicle launches during FY 97. In November and December 1996, it provided launch day management and processing insight for two Mars exploratory missions — Mars Global Surveyor and Mars Pathfinder — both launched on Boeing Delta II rockets from Cape Canaveral Air Station. Another Delta II rocket in August 1997 carried NASA's Advanced Composition Explorer (ACE) to study low-energy particles of solar origin and high-energy galactic particles.

From May through September, the ELV team worked with contractors Boeing and Motorola to use NASA's launch facilities at Vandenberg for commercial launches of four Iridium telecommunications satellites.

The KSC team performed similar support for two Pegasus launches during this time: the Satellite de Aplicaciones Cientificas (SAC-B) and the High Energy Transient Experiment (HETE) in November 1996 from Wallops Flight Facility; and Seastar from Vandenberg Air Force Base (VAFB), CA, in August 1997.

KSC also provided engineering assessment and launch management for the third in a series of sophisticated weather satellites called Geostationary Operational Environmental Satellites (GOES) which lifted off from the Eastern Range on an Atlas-Centaur rocket in April.

KSC provided vehicle assessment functions for the Cassini mission to Saturn in preparation for its launch on a Titan IVB/Cen-

taur vehicle in early FY 98. The Center also played a key role in contingency planning and field support to radiological operations for the processing and launch of the Cassini spacecraft.

The KSC ELV team enhanced its partnerships with NASA's Jet Propulsion Laboratory in California and Goddard Space Flight Center in Maryland, developing new approaches for payload processing to reduce cycle time and improve payload design.

## Advanced Life Support

Kennedy Space Center scientists contributed to important research in advanced life support systems for current and future missions.

In the area of plant space biology, KSC completed the development of an experiment to test an innovative nutrient delivery system in microgravity. The Center received approval from NASA Headquarters to begin development of a flight experiment to study plant photosynthesis in microgravity.

KSC scientists also wrapped up the first large-scale evaluation of rice grown in the Biomass Production Chamber, and assisted in a human test of the Advanced Life Support Program at Johnson Space Center. KSC's responsibility in the test was to recycle minerals from inedible plant biomass, and assist in the growth of a wheat crop.

Center researchers and payload engineers also completed most of their prelaunch work on the Collaborative Ukrainian Experiment (CUE), the largest and most comprehensive KSC-developed payload to date. A set of 10 plant space biology experiments, CUE was developed to fly on Space Shuttle Mission STS-87 in November 1997.

Kennedy Space Center also initiated a joint project with the Department of Energy to evaluate remote sensing instruments to determine their capability to detect plant stress at an early stage of growth. The project is on display at Walt Disney World's Epcot®.



*An Atlas-Centaur expendable launch vehicle carrying the Geostationary Operational Environmental Satellite (GOES-K) lifts off from Cape Canaveral Air Station.*



*Plant researchers examine a harvest of lettuce grown in the KSC Biomass Production Chamber.*

# Institutional Achievements and Initiatives



*The Great White Heron is one of more than 300 species of birds which make their home in and around operational areas of Kennedy Space Center.*

*With its 140,000 acres containing over 20 major facilities, Kennedy Space Center has more than the average size – and many of the same resources – of a small city. It has been called “a community within a community.” The environmentally unique federal property coexists with the Merritt Island National Wildlife Refuge and is home to more than 500 species of wildlife, including 21 on threatened or endangered lists. Stewardship of the refuge and the many one-of-a-kind operational facilities is an essential aspect of the Center’s mission.*

## Facilities

Kennedy Space Center made major progress in preserving the legacy of the Apollo era, and planning for the future through upgrades and construction of facilities during FY 97. A major new attraction, the Apollo/Saturn V Center, opened as part of the Kennedy Space Center Visitor Complex in January. The 100,000-square-foot facility houses a restored 363-foot-long Saturn V rocket just like those that took Americans to the moon in the late 1960s and early 70s.

Construction also began on two other new tour sites for public visitors – a 60-foot-high observation gantry in the heart of Launch Complex 39 and an International Space Station exhibit facility, both of which officially opened in January 1998. These improvements are made with non-appropriated funds generated by sales to the nearly three million visitors annually at the KSC Visitor Complex.

Construction of new and upgrade or renovation of existing operational facilities continued in FY 97. Construction began on the 34,600-square-foot Space Shuttle Main Engine Processing Facility which is an addition to Orbiter Processing Facility Bay 3. Space Shuttle main engine operations now housed in the nearby Vehicle Assembly Building will be moved into the new facility in 1998 to increase the capacity and efficiency of engine operations.

Construction was completed on the Component Refurbishment and Chemical Analysis Facility, which is scheduled to be fully operational in September 1998.

Extensive modifications were made to Launch Pad 39B, and to facilities serving both Space Shuttle pads. Two elevators dating back to the 1960s and instrumentation cables were replaced, the Firex fire suppression system got a facelift, the pumping station that services both pads was modernized, and new pipelines to each pad were installed.

The largest electrical project at Kennedy Space Center since the 1960s was completed with a major upgrade and restoration of the C5 Substation, the primary interface between the Florida Power & Light Co. and critical facilities in the Launch Complex 39 area.

New runway centerline lights were installed at KSC's Shuttle Landing Facility, an additional 7,500 tons of cooling capacity was



*Launch Pad 39B gets an extensive overhaul during FY 97.*



*The Space Shuttle Main Engine Processing Facility takes shape in the Launch Complex 39 area.*

added to the Industrial Area Chiller Plant, and major upgrades were completed of the 32-mile gaseous nitrogen pipeline which supplies KSC and Cape Canaveral Air Station and of the fire alarm and detection system at the Operations and Checkout Building. The Schwartz Road landfill was closed, and a new Class III landfill opened.

The conversion of the KSC Print Shop into a Duplicating Facility was completed, upgrading equipment and refurbishing those work areas for the first time in 20 years.



*Space Shuttle commanders have new runway centerline lights to help them guide orbiters home to KSC's Shuttle Landing Facility.*

## Environmental Initiatives

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The Center continued to make significant strides in protecting and enhancing its natural resources. KSC developed an innovative Memorandum of Agreement with the U.S. Fish and Wildlife Service on restoration activities for wetlands and scrub habitat at the Center.

The Center also advanced in its efforts to remediate contamination sites by developing and implementing new technologies to assess and clean up past contamination. Two hazardous waste streams at the Center were reduced and the KSC hazardous waste reduction goal was exceeded during FY 97. A small solar distillation system for minimizing hazardous waste was designed, fabricated and tested.

While the Center already recycled its paper and cardboard, in FY 97 it also implemented a program to recycle aluminum cans.

KSC efforts in developing advanced environmental decision support systems led to enhanced mapping of manatee use areas in the Banana River, and scrub jay habitat on Kennedy Space Center and adjacent Cape Canaveral Air Station.

Kennedy Space Center also began a joint venture with the U.S. Air Force to develop and test a system to recover and convert unused rocket propellant oxidizer, a hazardous waste, into liquid fertilizer. The effort is expected to save \$83,000 annually, while reducing waste byproducts, lowering operational costs, and eliminating the second largest hazardous waste stream at KSC and the Air Force-operated Cape Canaveral Air Station.



*Center officials kick off a new KSC environmental initiative to recycle aluminum cans.*

## Energy Conservation Initiatives

During FY 1997, Kennedy Space Center earned \$201,000 in utility rebates from Florida Power & Light Co., bringing the total amount to nearly \$886,000 since KSC's first rebate in FY 94. The rebates are used as incentives for implementing energy-efficient projects. Included in the 1997 rebates was \$195,000, KSC's largest single-project rebate, awarded for installing energy-efficient equipment during the Industrial Area Chiller Plant expansion.

KSC also became the first NASA installation to participate in the Department of Energy (DOE) Super Energy Savings Performance Contracting program which enables federal organizations to use DOE-contracted energy service companies to perform energy efficient projects from energy bill savings. Award of the KSC project is expected during FY 98.

The space center already has exceeded the requirement set by Executive Order 12902 to reduce energy consumption by 20 percent by the year 2000, based on a FY 85 baseline.



*Kennedy Space Center Director Roy D. Bridges Jr. (right) receives a \$195,000 rebate check for energy conservation from Florida Power & Light Co.*

## Health Initiatives

KSC was named the Agency's lead center for occupational health in 1997. Kennedy Space Center already has completed assessments of occupational health programs for all the NASA centers, identifying strengths and weaknesses that can be addressed to enhance the health and well-being of the Agency's work force. Also, a new system linking environmental health professionals on the Internet allows centers to share problems and expertise.

At Kennedy Space Center, new health services were provided to employees. RehabWorks was established to provide physical rehabilitative therapy for employees while reducing medical expenses and the use of sick leave.

Significant progress was made in evaluation of new methods of preventing heat stress in workers who must wear personal protective equipment.



*A KSC employee undergoes ultrasound treatment to an injured knee as part of the new RehabWorks program.*

## Other Efficiency, Safety and Cost-Savings Initiatives

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Kennedy Space Center has a well-established tradition of Continual Improvement initiatives to increase efficiency and reduce costs. Quality management has evolved as an integral part of KSC operations since the Center was established in 1962.



*KSC senior managers participate in the DuPont Executive Leadership and Operations Managers Safety Training program.*

The Engineering Development Directorate alone lists 17 examples of FY 97 initiatives to reduce operations time, increase safety and improve reliability. They include the development of: a prototype cable line inspection mechanism to remotely inspect, measure and videotape inaccessible cable lines; advanced cryogenic and hypergolic hazardous gas and fire detection systems; and the Automated Window Inspection Device for locating and measuring micrometeoroid damage to Shuttle orbiter windows.

The Payload Processing Technical Documentation Archive was designed, developed and activated in 1997. The system eliminates the need for microfiche in the Payload Processing Directorate and brings the information to the user via the World Wide Web. Currently a repository of about 50,000 documents, this system is growing at an average of 2,500 new documents a month.

KSC demonstrated its commitment to its foremost guiding principle, "Safety and Health First," by adopting the DuPont Executive Leadership and Operations Managers Safety Training program in FY 97.

## Technology Innovations

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FY 97 proved to be another successful year for innovations in technology at Kennedy Space Center. Under the auspices of the Center's technology transfer and commercialization programs, nine patents were filed and seven new patents were issued for KSC-developed technologies.

The Center also received \$23,000 in royalties on KSC-licensed technologies, and over 200 cash Space Act Awards were presented to employees for their support in developing and commercializing new technologies.

The technology used to develop insulation for protecting the Space Shuttle orbiter from temperatures up to 3,000 degrees Fahrenheit was transferred to BSR/TPS Products Inc., Mooresville,

N.C., for manufacture of thermal protection system materials for race cars. The BSR thermal protection kit was the first product to bear the Mission HOME official seal, which indicates that the product was developed directly from U.S. space program technology.

Other examples of recent technology innovations at KSC are:

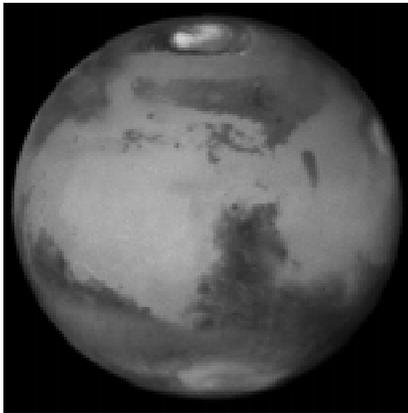
- Development of a two-phase quality/flow meter for use in cryogenic fluid systems. This technology may be commercialized by Air Products in Allentown, PA.
- Completion of development for new cryogenic thermal insulation with Small Business Innovative Research Program partner, Aerospace Design and Development.
- Development of an advanced ultrasonic leak detection and location device.
- Commercialization of a Universal Signal Conditioning Amplifier, the key component of the new KSC-developed Automated Data Acquisition System which monitors temperature, pressure and vibration measurements at the Shuttle launch pads.

KSC had a key leadership role in establishment of an international technology advancement discussion forum, The Humionics Society, which focuses on the potential benefits of advancing state-of-the-art technologies associated with wearable computers. The society includes representatives of other NASA centers, other government agencies, and academia.



*A KSC employee (above) installs a Universal Signal Conditioning Amplifier (USCA) for testing at the Launch Equipment Test Facility. The USCA is a key component of the Automated Data Acquisition System (ADAS), which includes a circuit board as shown in the photo at left. ADAS monitors temperature, pressure and vibration measurements at the Center's launch pads.*

# Preparing for the Future



*The Hubble Space Telescope (HST) captures this 1997 image of the planet Mars.*

*The diversity of work performed by the KSC work force in 1997 reflected the Center's commitment to keeping the Space Shuttle operational and the International Space Station program on track, as well as laying the groundwork for Kennedy Space Center to perform an integral role in future Moon/Mars initiatives and the development of new technologies. The civil service work force will move from an operations role to a developmental role as KSC positions itself for the future.*

# International Space Station

Preparations for the on-orbit assembly of the International Space Station (ISS) accelerated at the space center during 1997 with arrival of the elements for the first U.S. assembly flight, STS-88, scheduled for 1998. The Space Shuttle Endeavour will carry into space the Node 1, with two Pressurized Mating Adapters (PMAs) attached, to provide the interface between the U.S. and Russian-built elements of the station.

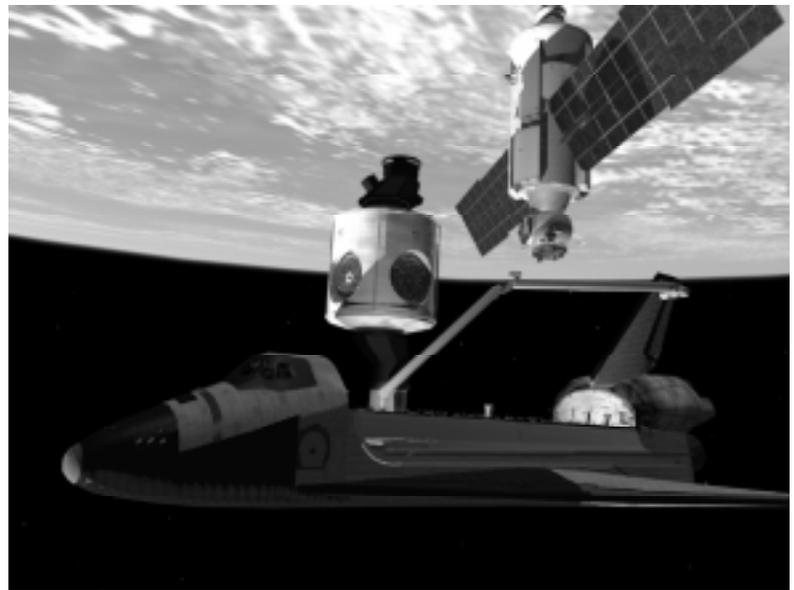
With KSC as the final checkpoint for U.S.-launched station hardware, other ISS elements are undergoing preflight processing in the Space Station Processing Facility. Approximately 45 Shuttle missions are scheduled to deliver components for the on-orbit construction of the International Space Station.

KSC's Space Station Hardware Integration Office is the program's primary agent for the management and integration of all U.S.-launched elements. KSC teams assigned by missions under Phase II and Phase III of the program worked at the primary U.S. manufacturing locations (Huntsville, AL; Huntington Beach, CA; and Canoga Park, CA) to accomplish the on-time delivery of the Node 1 and PMAs, and initiate the Phase III hardware integration operations.

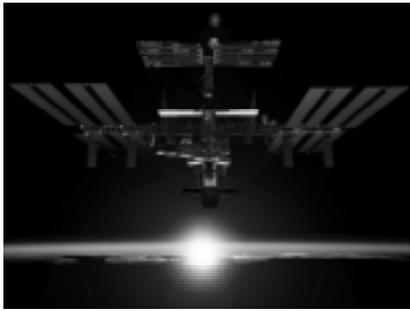
The Center's Space Station and Shuttle Payloads Directorate provided processing support for hardware in the Space Station Processing Facility, while completing preparations for processing the Mini Pressurized Logistics Modules in FY 98. Teams worked to incorporate Multi Element Integrated Testing into the ISS program, to manage the arrival and processing of trusses and other elements, to develop a vacuum chamber capability at KSC for leak testing, and to devise a Certificate of Flight Readiness Plan.



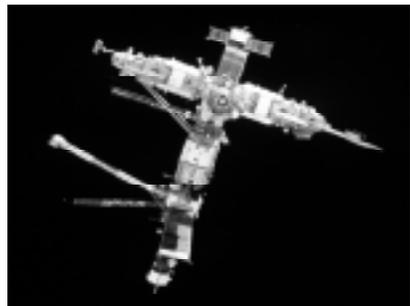
*The Node 1 and Pressurized Mating Adapter-1 undergo prelaunch processing at KSC's Space Station Processing Facility.*



*The first International Space Station assembly flight will be highlighted by the mating of the Russian-built Control Module, suspended above the orbiter Endeavour's payload bay (upper right) to the conical mating adapter at the top of the U.S.-built Node 1 (center) using the orbiter's mechanical arm.*



*The International Space Station (ISS) will be the largest and most complex international cooperative science and engineering program ever attempted.*



*STS-84 Space Shuttle astronauts capture this image of the Russian Space Station Mir on orbit around Earth.*



*The new Checkout and Launch Control System undergoing development and testing at the Center will replace the 1970s-era Launch Processing System.*

Engineering Development designed, fabricated, installed and tested ground support equipment and systems for International Space Station operations at KSC.

The Payload Carriers Program transferred three Spacelab pallets to the Space Station Processing Facility for integration on early ISS assembly flights; three more pallets have been committed to future space station missions.

During FY 97, Kennedy Space Center continued to perform a critical prelaunch processing role in the successful docking missions of the Space Shuttle with the Russian Space Station Mir under Phase I of the International Space Station. Three of the nine planned Shuttle-Mir docking missions occurred in 1997.

## Space Shuttle Upgrades

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Kennedy Space Center is providing major contributions to NASA's plan to assure safe and continuous operation of the Shuttle fleet through the year 2012 and to incorporate major improvements.

One of the primary upgrades is the Checkout and Launch Control System (CLCS), under development at KSC to replace the Launch Processing System which has been used since the 1970s. The CLCS will reduce launch processing time while lowering system operating costs by 50 percent. It will feature several major improvements over the Launch Processing System, including the capability to monitor more

than one orbiter from the same firing room. The first major milestone in the design and development of the CLCS was reached in March 1997 with the opening of an experimental control room in KSC's Launch Control Center. The CLCS is slated to be fully operational by September 2001.

Another important Shuttle upgrade project in which KSC plays a key role is the Integrated Vehicle Health Monitoring System, designed to reduce planned ground processing work, streamline unplanned work, enhance visibility into orbiter systems operation and improve vehicle safety.

During FY 97, a significant Shuttle upgrade was implemented as a result of efforts of the Integrated Vehicle Health Management Team and the CLCS Team. After a fuel cell anomaly cut short the STS-83 mission, a team from Kennedy Space Center, Johnson Space Center and contractor Boeing North American quickly developed a new Fuel Cell Monitoring System for the orbiter fleet. This team compressed a standard development cycle from two-and-a-half years to five months, readying the new system for installation in Columbia for the STS-87 mission in November 1997. The team since has installed this upgrade on three of the orbiters.

Other KSC teams are working on proposed Shuttle upgrades varying from liquid flyback boosters and less-toxic waterproofing for Thermal Protection System tiles, to a new payload carrier.

KSC's Shuttle Payload Upgrades Team initiated a fiber-optic flight experiment which is scheduled to fly on STS-95 in 1998. This pathfinder experiment is designed to validate fiber-optic performance in the Shuttle environment, with the long-term goal of reducing launch processing cycle time.

Reducing turnaround time in ground processing will be particularly important as the Shuttle fleet prepares for up to 15 flights a year in the next century.

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*“KSC’s future depends on bringing the most value to where the Agency and our customers are going . . . Making the move to a more developmental role is a tough balancing act. We must perform the critical role we have today with the Shuttle and expendable launch vehicles, while creating the new roles which will allow us to build the International Space Station and go on to Mars and beyond.”*

**Roy D. Bridges Jr., Center Director**

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*This is one conceptual view of liquid fly-back boosters, flanking the external tank (center), for the Space Shuttle program.*

## Next-Generation Launch Vehicles

KSC entered into a partnership with other NASA centers and industry in the development of next-generation crewed launch vehicles. A team of KSC employees is working with the X-34 program to support the flight design and any KSC operations involving the X-34 demonstrator vehicle. Kennedy Space Center will provide landing support for some of the test flights.



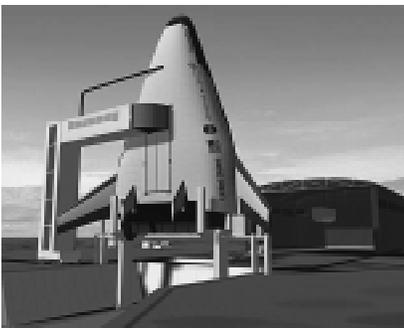
*This recent artist's concept shows the design of the X-34 vehicle.*

NASA and the Spaceport Florida Authority signed a Memorandum of Understanding agreeing to partner in the construction of a launch and landing support facility at Kennedy Space Center to be used for the X-34 program.

The KSC environmental staff also played a major role in writing the environmental impact statement for the X-33, a subscale technology prototype which Lockheed Martin Skunk Works hopes to develop in the next century as a full-scale, commercial single-stage-to-orbit reusable launch vehicle called VentureStar™.

Among the KSC initiatives in future vehicle development undertaken by KSC's Engineering Development Directorate were:

- A study of hydrogen entrapment, acoustics and cryogenic/pneumatic systems for Evolved Expendable Launch Vehicles;
- Design of X-33 ground support equipment;
- Development of an umbilical system for future launch vehicle ground support;
- Consultation and technical expertise to the Bantam booster and Sea Launch projects.



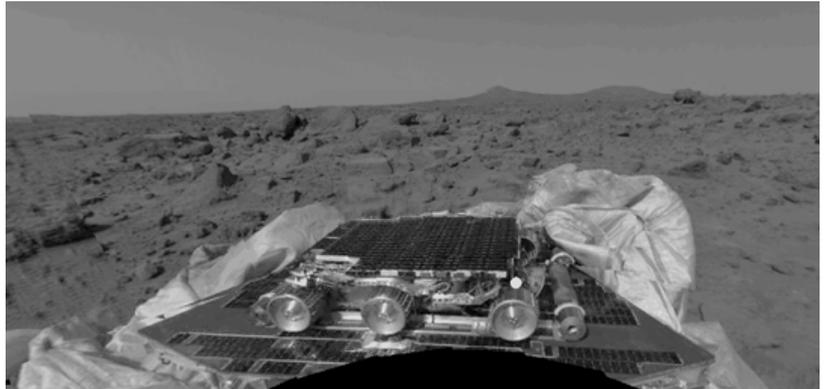
*Like the Space Shuttle, the X-33 subscale technology prototype vehicle will launch vertically and land horizontally.*

## Lunar/Mars Missions

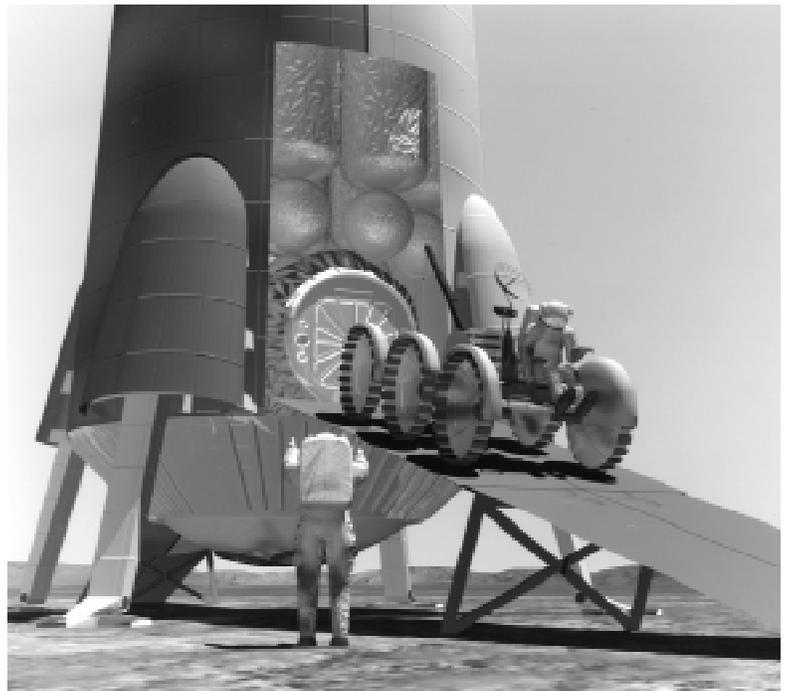
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During FY 97, Kennedy Space Center formed an Exploration Think Tank to integrate planning for future robotic and human missions to Mars. The Think Tank identified strong KSC core capabilities in cryogenics, autonomous processing, bioregenerative plant growth, advanced instrumentation, electrostatic discharge analysis and testing, and integrated vehicle health management.

Kennedy Space Center is leading the effort in the NASA Logistics Benchmarking Study of Antarctic Long Duration Expeditions. The purpose of the study is to research and assess the logistics processes and innovations used today to explore Antarctica with its isolation, frigid temperatures and high winds, in an effort to better understand the complex logistical requirements for a long-duration manned mission to the planet Mars.



*The Mars Pathfinder arrives on Mars on July 4, 1997.*



*The first humans to land on Mars will need this Cargo Lander-1 which would include an automated fuel manufacturing plant, an inflatable habitation module and a rover for transporting the module to the vehicle that carried the crew to the Red Planet.*

# Reaching Out . . .



*Local elementary students use surplus computer equipment donated by Kennedy Space Center.*

*Outreach is at the heart of NASA's and Kennedy Space Center's mission, and FY 97 was particularly noteworthy in the Center's long tradition of reaching out to a world audience, to the community at large, to educators and students, and to businesses and other organizations which can benefit from KSC's unique knowledge and expertise.*

## To the World

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Kennedy Space Center reaches out to a world audience through its popular World Wide Web pages. During FY 97, the Home Page Redesign Team undertook a major redesign effort to establish for the first time a consistent look and feel for the Center's top Web pages. Implementation began in October 1997.

The Kennedy Space Center Visitor Complex celebrated its 30<sup>th</sup> anniversary as a NASA visitor center, welcoming an estimated 2.7 million visitors from around the world to Florida's fifth most popular tourist attraction, and the best-attended of all NASA's visitor centers. A major undertaking to expand services and open new attractions at the Visitor Complex was well under way in 1997, with the opening of the new Apollo/Saturn V Center and construction of two new tour destinations. Also, the Space Shuttle mockup was completed in 1997 with the addition of the final major element, a full-scale external tank. One of three original test articles, the tank had been on display at Stennis Space Center in Mississippi.

A global audience also emerged from the worldwide coverage of KSC activities by more than 2,500 accredited press members representing 33 countries.

The space center continued to be a moviemaking mecca as it hosted the filming of two major motion pictures, *Contact* and *Armageddon*, and two television series, *The Cape* and HBO's *From the Earth to the Moon*, as well as a number of smaller productions. For *Contact* alone, more than 2,300 cast, crew, extras and KSC staff were involved with filming on a single day. KSC was reimbursed for use of its facilities.

The British rock group, Genesis, launched its new album with a space theme, *Calling All Stations*, in a concert broadcast on the radio and over the Internet from KSC's Apollo/Saturn V Center.

## To the Community at Large

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Months of planning and coordination across the Center culminated on Oct. 19, 1996, when an estimated 32,000 people drove through the gates to attend KSC's first Community Appreciation

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*"We will communicate widely the content, relevancy, and excitement of NASA's missions and discoveries to inspire and to increase understanding and the broad application of science and technology."*

### **NASA Strategic Plan Goal**

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A 60-foot-high observation tower is one of two new tour destinations under construction in FY 97.



Filming for the Home Box Office (HBO) series, *From the Earth to the Moon*, includes a scene shot in the Operations and Checkout Building and featuring the Apollo 18 Lunar Module.

Day. Many area residents got a close-up look for the first time at sights normally off-limits to the general public. Distribution of the booklets/placards and sign-up sheets was accomplished through a cooperative effort with the Brevard County Library System.

Fifty-two area non-profit service organizations set up booths at two Center locations for KSC's second annual Community Expo held in 1997. The Expo introduced KSC employees to services available in the area; it also served as a source of new volunteers for the organizations.



*Area residents attending KSC's first Community Appreciation Day got close-up views of many sights usually off-limits to the public such as the three main engines (in background at left) of orbiter Discovery.*

KSC civil service employees set a new record in donations to the Combined Federal Campaign, which provides funds to national and local charitable organizations.

Center employees also participated in several blood drives and were honored for their record-setting response to a bone marrow registration drive held at KSC. More than 900 potential donors were added to the National Bone Marrow Registry as a result of the 1997 KSC drive – a new record for the most people registered in a single day in a three-state region.

The Space Coast's Federally Employed Women chapter participated in the sixth annual Make a Difference Day, a national day of helping others, by working to improve the lives and living conditions of children at a state home in the area. The NASA Kennedy Space Center Management Association (NKMA) was recognized by Keep Brevard Beautiful Inc. for its participation in the Adopt-A-Shore program.

KSC representatives under the auspices of the popular Speakers Bureau made nearly 300 presentations reaching a total audience of more than 70,000 people during 1997. One presentation sparked the KSC-assisted redecoration of two rooms at the Pediatric Unit of Florida Hospital Waterman in Eustis with space-related murals.

KSC also participated in area trade shows and other events, among them the weeklong Lakeland (FL) Fun 'n Sun Air Show with an exhibit on NASA-developed technologies that have contributed to aviation.



*A Kennedy Space Center security dog is a hit with children at Community Appreciation Day.*

## To Students and Teachers

Kennedy Space Center directly reached more than 125,000 students and teachers through its diverse educational outreach efforts in 1997. Many of KSC's education programs for the first time were measured and tracked on the NASA Education Computer Aided Tracking System (EDCATS) to meet the requirements of the Government Performance and Results Act of 1993, the National Performance Review and the NASA Metrics Program.

Kennedy Space Center employees and resources were involved in a wide array of education programs: from teacher workshops to Spacemobile visits; from Exploration Station programs to reactivation of the engineering co-operative program: from participation in Engineers/Scientists Education Outreach to forming new partnerships with universities, K-12 schools and the state.

Among the KSC highlights, the Center or its employees:

- Worked with 19 community colleges around the country to develop a new first-and second-year math curriculum based on real-world space vehicle processing activities at the Center.
- Initiated several Internet-related programs, including the Virtual Science Mentor Program and Space Team On-line, to provide additional resources to faculty and students and to stimulate interest in math and science,
- Donated surplus computer equipment and established a surplus software loan program for schools. Since the surplus equipment program began in 1994 under the Stevenson-Wydler Act, the space center has donated to schools more than 14,000 items valued in excess of \$38 million.
- Completed a pilot program, the KSC Technical Resources for Education Program, which places newly retired NASA employees in public schools as technical consultants.
- Established the NASA Minority Partnership Awards program which is designed to provide students and faculty with exposure to high-technology small businesses.
- Led a student team which participated in the For Inspiration and Recognition of Science and Technology (FIRST) national engineering contest. The FIRST teams competed in conceiving, designing and constructing robotic devices. The KSC-led team placed 14<sup>th</sup> nationally and was the top NASA team.



*Robot 4608 demonstrates its abilities at the national finals of an engineering contest sponsored by For Inspiration and Recognition of Science and Technology (FIRST). KSC engineers joined with local high school students to participate in the robotic competition.*



*Space Coast FIRST team high school students assemble the robot for the competition.*



*Area students participate in the KidSat educational project by tracking the orbiter's position during the STS-81 mission.*



*A University of Central Florida student participates in the NASA Scholars Program at KSC.*



*KSC engineers and technicians designed and outfitted NASA's Scott Carpenter Space Analog Station, a human-tended simulator for underwater use.*

- Helped to coordinate an effort by local schools to participate in KidSat, a pilot project which enables students to make Earth observations by remotely commanding KidSat cameras onboard Shuttle orbiters, and downlinking the images for use in classroom studies. KidSat flew twice in FY 97, on STS-81 and STS-86.
- Participated in the Center for High-Tech Training for Individuals with Disabilities program which trains the disabled in computer-related skills. For its participation, KSC was named corporate sponsor of the year.
- Met with all Brevard County school principals in a major push to expand the Southeastern Consortium for Minorities in Engineering (SECME) program. SECME is designed to increase the number of minority and female students who are qualified for entering and completing studies in engineering, science and math by enriching their academic preparation.
- Sponsored several summer educational programs to give students real-world work experience, including the NASA Scholars Program, the Summer Aid program, the Summer High School Apprenticeship Research Program, and the Space Life Sciences Training Program.
- Completed and tested NASA's Scott Carpenter Space Analog Station, a functional, human-tended simulator designed for use underwater to demonstrate concepts of life support systems to students from kindergarten through grade 12. The station operated for 31 days on the sea floor near Key Largo, FL, exposing several million tomato seeds to a pressure of 1.7 atmospheres, while an identical cargo was exposed to the vacuum of space aboard Atlantis on the nearly 11-day STS-86 mission. The seeds from the joint experiment will be distributed to schools for testing as an educational outreach project. The underwater station was designed by KSC engineers and outfitted with instrumentation by KSC technicians. It was commissioned in November 1997.

## **To Businesses and Other Organizations**

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KSC sponsors programs to help companies do business with NASA, as well as programs which promote the transfer of NASA-developed technology to the private sector for commercialization.

Kennedy Space Center's seventh annual Business Opportunities Expo in December 1996 attracted more than 200 vendors from around the country. Considered to be one of the premier business opportunity events in the Southeast, the Expo brought together representatives from industry, NASA and contractors to share information about needs and services.

KSC's Central Industry Assistance Center, located just outside the Center's gate, gives companies a central location for describing their products and services while at the same time learning about the Center's needs.

The Center's efforts in enhancing competition for federal contracts by easing the bidding process for all businesses once again was recognized nationally during FY 97 with the prestigious Competition Advocacy Award from NASA Headquarters. KSC has won the award in three of the last four years.

The Florida/NASA Business Incubator Center celebrated the graduation of its first tenant in June 1997. The center is managed through a joint partnership of Kennedy Space Center, Brevard Community College and the Technological Research and Development Authority. It was created in 1996 to increase the number of successful technology-based small businesses in the area by providing necessary resources such as office space and computer access.

The KSC Technology Programs and Commercialization Office evaluated the commercial potential of 22 Small Business Innovation Research projects which resulted in \$5.7 million in contracts to small businesses supporting KSC mission needs.

During FY 97, 14 new partnership agreements were signed with commercial organizations for joint NASA/commercial development of mission-required technologies. Other KSC-developed technologies were transferred to private industry for commercial applications.



*The KSC Technology Transfer booth is a highlight of the Center's seventh annual Business Opportunities Expo at Port Canaveral.*



*The first tenant to graduate from the Florida/NASA Business Incubator Center demonstrates the software package he developed.*

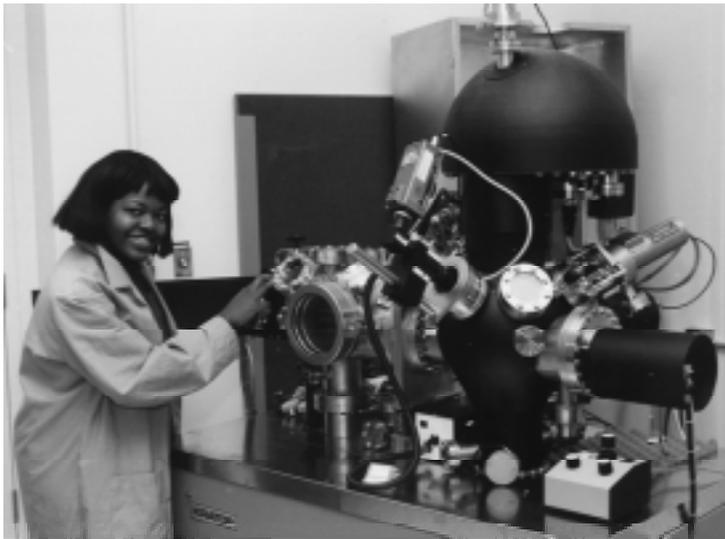


*A KSC technician connects a liquid air mixing device to dewars of liquid nitrogen and liquid oxygen. The mobile liquid air mixing unit will enable commercialization of a liquid air pack for firefighting and other rescue uses.*

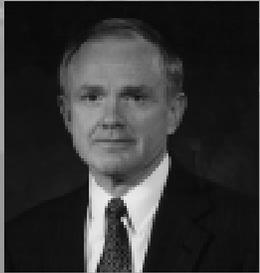
For example, firefighters and other rescue workers around the world may soon use the KSC-developed liquid air pack which can provide twice as much breathing air per pound than conventional units. More than a decade ago, KSC employees designed the compact air packs for hazardous operations around the Center and for Space Shuttle astronaut rescue crews who must enter the narrow orbiter passages in case of an emergency at the launch pad. Commercial development had been hampered by the lack of a means to produce small amounts of liquid air at the sites of fires and other emergencies. But a new KSC-developed mobile liquid air mixing unit will enable commercialization of the advanced air pack technology.

Kennedy Space Center also continued to help other agencies and organizations find solutions to problems. During FY 97, the NASA Materials Science Laboratory analyzed debris samples from two airplane accidents, including the TWA Flight 800 disaster in which a Paris-bound plane crashed shortly after takeoff from New York in July 1996, killing all 230 people on board.

The laboratory also provided assistance to the Brooksville (FL) Regional Medical Center when water from a broken sprinkler nozzle soaked hundreds of patient records. The records were then frozen and delivered to KSC. Armed with heat and a large vacuum chamber, KSC laboratory personnel dried 37 boxes of records over a three-and-a-half-week period using the sublimation process to prevent ink smearing by removing the water before it turned liquid. The recovered records were then digitally scanned and no data was lost. NASA expenses for this project were reimbursed through a Space Act agreement.

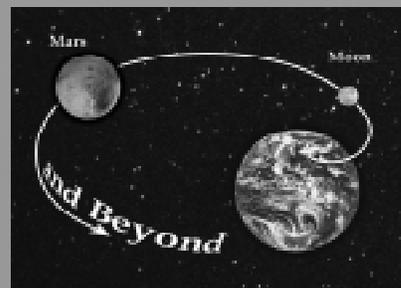


*A Spelman College student and Women in Science and Engineering Scholar at KSC demonstrates use of the X-ray Photo Electron Spectrometer in the Materials Science Laboratory.*



*“Kennedy Space Center is in a unique position to carry the U.S. space program into the next century. Our work force has no equal in the launch and payload processing business, and our ability to look to the future and prepare for the natural evolution of missions and technology will ensure that we are strategically positioned to respond to those needs. While we look forward to preparing for the on-orbit assembly and operation of the International Space Station, we also eagerly embrace the challenge of what lies beyond, whether it be a return human mission to the moon or the first crewed expedition to Mars. We’ll be ready.”*

**Roy D. Bridges Jr., Center Director**





**STATEMENT OF THE CHIEF FINANCIAL OFFICER**

The Fiscal Year (FY) 1997 financial statements (unaudited) have been prepared to report the financial position and results of NASA's operations, pursuant to the requirements of the Chief Financial Officers (CFOs) Act of 1990 and the Government Management Reform Act of 1994. These statements include the Statement of Financial Position and the Statement of Operations and Changes in Net Position. These statements include all Kennedy Space Center's activities and 100 percent of the Center's budget authority.

While the statements have been prepared from the books and records of NASA, in accordance with formats prescribed by the Office of Management and Budget (OMB) Bulletin 94-01, the statements are different from financial reports used to monitor and control budgetary resources which are prepared from the same books and records.

The statements should be read with the realization that they are for an agency of the U.S. Government, a sovereign entity. Liabilities not covered by budgetary resources cannot be liquidated without the enactment of an appropriation, and payment of all liabilities, other than for contracts, can be abrogated by the sovereign entity.

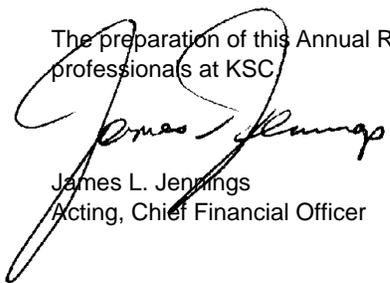
These financial statements were prepared in accordance with Federal accounting standards. These standards are evolving through the efforts of the Federal Accounting Standards Advisory Board (FASAB). This board includes members from the Office of Management and Budget (OMB), the General Accounting Office (GAO), and the Department of Treasury (Treasury). Numerous standards have been developed and promulgated. Some will not become effective until 1998. Currently, NASA observes the following hierarchy of accounting standards as required by OMB:

- individual FASAB standards published by OMB, GAO, and Treasury;
- OMB guidance on the form and content of financial statements;
- Agency accounting guidance, which represents prevalent practice; and
- accounting principles published by other authoritative sources.

NASA Headquarters, which receives its funding through annual Congressional appropriations, authorizes and funds KSC operations. KSC's total operational expenses for FY 1997 were:

<u>Appropriation</u>	<u>Amount (in thousands)</u>
Human Space Flight	\$ 341,608
Mission Support	254,115
Science, Aeronautics, and Technology	43,941
Construction of Facilities	3,738
Space Flight Control and Data Communications	(144)
Research and Development	(27)
Research and Program Management	(16)
Total Expenses	<u>\$ 643,215</u>

The preparation of this Annual Report was made possible through the teamwork and diligence of the professionals at KSC



James L. Jennings  
 Acting, Chief Financial Officer

National Aeronautics and Space Administration  
**John F. Kennedy Space Center**  
**Statement of Financial Position**  
As of September 30 (In Thousands)

	<b>1997</b>	<b>1996</b>
<b>Assets:</b>		
Intragovernmental Assets:		
Fund Balance With Treasury (Note 2)	\$ 257,903	\$ 438,177
Accounts Receivable, Net (Note 3)	6,238	6,580
Governmental Assets:		
Accounts Receivable, Net (Note 3)	703	1,304
Advances and Prepayments	0	41
Property, Plant and Equipment (Note 4)	2,314,963	8,032,066
Other Assets (Note 5)	166,959	350,303
<b>Total Assets</b>	<b>\$ 2,746,766</b>	<b>\$ 8,828,471</b>
<b>Liabilities:</b>		
Liabilities Covered by Budgetary Resources:		
Intragovernmental Liabilities:		
Accounts Payable	\$ 19,918	\$ 32,132
Other Liabilities (Note 6)	364	1,057
Governmental Liabilities:		
Accounts Payable	95,448	162,618
Other Liabilities (Note 6)	7,149	7,769
<b>Total</b>	<b>\$ 122,879</b>	<b>\$ 203,576</b>
Liabilities not Covered by Budgetary Resources:		
Intragovernmental Liabilities:		
Other Liabilities (Note 6)	\$ 57	\$ 52
Governmental Liabilities:		
Other Liabilities (Note 6)	16,468	17,808
<b>Total</b>	<b>\$ 16,525</b>	<b>\$ 17,860</b>
<b>Total Liabilities</b>	<b>\$ 139,404</b>	<b>\$ 221,436</b>
<b>Net Position (Note 8):</b>		
Unexpended Appropriations	\$ 141,965	\$ 242,022
Invested Capital	2,481,923	8,382,369
Cumulative Results of Operations	0	0
Future Funding Requirements	(16,526)	(17,356)
<b>Total Net Position</b>	<b>\$ 2,607,362</b>	<b>\$ 8,607,035</b>
<b>Total Liabilities and Net Position</b>	<b>\$ 2,746,766</b>	<b>\$ 8,828,471</b>

The accompanying notes are an integral part of these statements.

National Aeronautics and Space Administration  
**John F. Kennedy Space Center**  
**Statement of Operations and Changes in Net Position**  
For the Year Ended September 30 (In Thousands)

	1997	1996
<b>Revenues and Financing Sources:</b>		
Appropriated Capital Used	\$ 622,162	\$ 1,511,279
Revenues from Sales of Goods and Services:		
To the Public	4,414	1,830
Intragovernmental	16,639	15,779
Other Revenues and Financing Sources (Note 9)	302	1,434
Less: Receipts Transferred to Treasury	(302)	(1,434)
Total Revenues and Financing Sources	\$ 643,215	\$ 1,528,888
<b>Expenses:</b>		
Program or Operating Expenses by Appropriation:		
Human Space Flight	\$ 326,109	\$ 1,221,788
Mission Support	250,838	235,208
Science, Aeronautics and Technology	41,632	36,598
Construction of Facilities	3,718	807
Space Flight Control and Data Communications	(92)	1,446
Research and Development	(27)	13,374
Research and Program Management	(16)	2,057
Reimbursable Expenses	21,053	17,609
Total Expenses	\$ 643,215	\$ 1,528,888
<b>Total Expenses in Excess of Revenues and Financing Sources</b>	<b>0</b>	<b>0</b>
<b>Nonoperating Changes:</b>		
Unexpended Appropriations (Note 8)	\$ (100,056)	\$ 6,036
Invested Capital (Note 8)	(5,900,447)	(414,727)
Future Funding Requirements (Note 8)	830	(2,238)
Total Nonoperating Changes	\$ (5,999,673)	\$ (410,929)
Change in Net Position	\$ (5,999,673)	\$ (410,929)
<b>Net Position, Beginning Balance</b>	<b>8,607,035</b>	<b>9,017,964</b>
<b>Net Position, Ending Balance</b>	<b>\$ 2,607,362</b>	<b>\$ 8,607,035</b>

The accompanying notes are an integral part of these statements.

National Aeronautics and Space Administration  
**Kennedy Space Center**  
**Notes to the Financial Statements**  
For the Year Ended September 30, 1997

## 1. Summary of Accounting Policies and Operations

### Basis of Presentation

These financial statements were prepared to report the financial position and results of operations of Kennedy Space Center, pursuant to the requirements of the Chief Financial Officers Act of 1990. The statements were prepared from the books and records of KSC, in accordance with the comprehensive basis of accounting specified in OMB Bulletin 94-01.

### Reporting Entity

KSC is one of nine NASA field centers established to aid NASA in its mission to provide for aeronautical and space activities. Financial management of its operations is the responsibility of Center officials at all organizational levels. KSC's accounting system is one of ten distinct operations located at nine NASA Centers and Headquarters. Although KSC, like the other Centers, is independent and has its own deputy chief financial officer for finance, it operates under Agencywide financial management regulations. KSC provides payroll accounting for approximately 1,886 civilian employees and processes approximately 7,158 non-payroll related accounting transactions monthly. This data provides the basic information necessary to meet internal and external financial reporting requirements and provides both funds control and accountability.

Seven appropriations require individual treatment in the KSC accounting and control system.

- (1) The Human Space Flight (HSF) appropriation supports human space flight research and development activities for space flight, spacecraft control, and communications actions. This includes research, development, operations, services, maintenance, and construction of facilities, which encompasses the repair, rehabilitation, and modification of real and personal property.
- (2) The Science Aeronautics and Technology (SAT) appropriation provides for the conduct and support of science, aeronautics, and technology. This includes research, development, operations, services, maintenance, and construction of facilities, which encompasses the repair, rehabilitation, and modification of real and personal property.
- (3) The Mission Support (MS) appropriation provides for safety, reliability, and quality assurance activities supporting Agency programs, space communication services for NASA programs, salaries and related expenses in support of research in NASA Field Centers, and construction of facilities, which encompasses the repair, rehabilitation, and modification of real and personal property.

- (4) The Research and Development (R&D) appropriation, which was restructured and replaced in the 1995 budget, includes research and development of aeronautics and space, space vehicles, space systems effort, related institutional activities, minor construction repair, maintenance, rehabilitation, and modifications.
- (5) The Space Flight, Control, and Data Communications (SFDCD) appropriation, which was restructured and replaced in the 1995 budget, includes production, operations and support activities for the Space Transportation System which includes the Space Shuttle and expendable launch vehicles and for tracking, telemetry, command and data acquisition support of all flight projects.
- (6) The Construction of Facilities (CofF) appropriation, which was restructured and replaced in the 1995 budget, includes the construction of new facilities and the repair, rehabilitation, and modification of facilities.
- (7) The Research and Program Management (R&PM) appropriation which was restructured and replaced in the 1995 budget, includes salaries, travel, and related expenses for the civil servants in support of NASA programs.

In addition to the basic operating programs described above, KSC expenditures in FY 1997 included \$20 million of reimbursable activity.

### **Basis of Accounting**

KSC accounts are maintained on an accrual basis (i.e., expense and revenue are recorded in the accounts in the period in which they are incurred or earned). Expenses are classified in the accounts according to the appropriation that financed the activity. These expenses are coded in accordance with the Agencywide coding structure, which sets forth a uniform classification of financial activity that is used for planning, budgeting, accounting, and reporting. The expenses are further categorized in the General Ledger as operating expenses or capitalized expenses.

### **Funds with the U.S. Treasury and Cash**

KSC's cash receipts and disbursements are processed by the U.S. Treasury. The funds with the U.S. Treasury include appropriated funds and deposit funds for advances received for reimbursable services. Balances are not held outside the U.S. Treasury.

### **Advances**

KSC funds its University Contracts and Grants program through the use of predetermined payment schedules where letters of credit are not used; recipients are required to schedule drawdowns to coincide with actual, immediate cash requirements, in accordance with OMB Circular A-125 and Department of Treasury regulations. Quarterly financial reporting of cash transactions is provided on Federal Cash Transactions Reports (SF 272's). De-

tailed monitoring and accountability records are maintained; monitoring includes audits by the Defense Contract Audit Agency and NASA's Office of Inspector General.

### **Accounts Receivable**

The largest portion of accounts receivable is due from other Federal agencies and includes research and development of satellites as well as launch services. Nongovernment customers are required to provide advance payments which are placed on deposit with the U.S. Treasury until services are performed. In unusual cases, exceptions and waivers to this general rule have been granted under the Space Act, allowing customers to postpone advance payments.

### **Property, Plant and Equipment**

KSC-owned Property, Plant and Equipment may be held by the Center or its contractors. Under the provisions of the Federal Acquisition Regulation (FAR), contractors are responsible for control over and accountability for such property in their possession.

Property, Plant and Equipment is not depreciated. NASA does, however, calculate a "use" charge for application to commercial reimbursable customers, which includes factor for depreciation of facilities and equipment.

Automated data processing software is costed when acquired rather than capitalized.

Equipment with a unit cost of \$5,000 or more and a useful life of 2 years or more, that will not be consumed in an experiment, is capitalized. Capitalized cost includes unit cost, transportation, installation, and handling and storage costs.

Real property such as land, buildings, and other structures and facilities, is capitalized when the asset value is \$1,000 or more. The capitalized value represents the total cost to NASA, including both acquisition and preparation costs. Land values are recorded at original acquisition cost and do not reflect current value or include the cost of improvements. Buildings are also valued at acquisition cost, including the cost of capital improvements and fixed equipment required for functional use of the facility. Other structures include the acquisition cost of capital improvements.

Government-owned/Contractor-held property includes KSC materials, plant equipment, space hardware, special tooling, and special test equipment. Contractors are directed to annually report plant equipment costing \$5,000 or more and having a useful life of 2 years and which will not be consumed in an experiment. Reporting is also required for special test equipment, special tooling, materials, and space hardware which, for the most part, includes items that are in excess of \$5,000; however, reporting on all such items is required and their total value is included in the Statement of Financial Position. Contractors report, as of September 30, on a NASA Form

1018, Report of Government-owned/Contractor-held property, which is certified by the contractor's representative and reviewed by a Government property administrator.

Contractor-held space hardware includes flight pallets, mission peculiar experiment support structure, Spacelab, transfer tunnel, igloo assembly and similar components unique to NASA space programs and held by NASA prime contractors or their first-tier subcontractors who are responsible for building, refurbishing and launching the hardware. Contractor reporting is required for cost-type contracts exceeding \$500,000 where space hardware costs exceed \$75,000. These items are priced in accordance with guidance set forth in a NASA supplement to the FAR. The valuation policy allows for use of actual or estimated costs, which may be abstracts of data from contractors' records, computations based upon engineering estimates, estimates from NASA contractor financial management reports, formula procedures, latest acquisition/pricing estimates or other approved methods. Based on a long-standing NASA practice, these items generally do not include profit or fees in the valuation basis because certain assets are not yet completed. NASA is reevaluating this valuation practice in conjunction with a broader property valuation analysis pursuant to emerging Federal property accounting standards.

### **Other Assets**

Other assets include Government-owned/Contractor-held materials and property held by disposal officers.

### **Liabilities**

Accounts payable includes amounts recorded for receipt of goods or services furnished to the Center, based on receiving reports and billings rendered. Additionally, KSC accrues cost and recognizes liability based on information that is provided monthly by contractors on cost and performance reports (NASA Form 533, Contractor Financial Management Report). KSC relies on independent audits by the DCAA to ensure the reliability of reported costs and estimates. To provide further assurance, financial managers are required to test the accuracy of cost accruals generated from the NF 533's, and NASA Headquarters independently analyzes the validity of KSC's data.

### **Revenues and Other Financing Sources**

KSC receives the majority of its funding through multi-year appropriations. These include 3-year appropriations for construction activities, 2-year appropriations for operational and space flight activities, and a single year appropriation for civil service payroll and travel. In addition to appropriated funds, the Center performs services for other Federal agencies and the public and receives reimbursable funding authority.

## 2. Fund Balance with Treasury: (In Thousands)

Fund Balances:	Obligated	Unobligated Available	Unobligated Restricted	Fund Balance
Appropriated Funds	\$ 229,316	\$ 25,497	\$ 3,012	\$ 257,824
Deposit Funds				0
Suspense/Clearing Accounts				79
<b>Total Fund Balance with Treasury</b>				<b>\$ 257,903</b>

## 3. Accounts Receivable, Net: (In Thousands)

	Entity Accounts Receivable	Non-Entity Accounts Receivable	Allowance for Uncollectible Receivables	Net Amount Due
Intragovernmental	\$ 6,238	\$ 0	\$ 0	\$ 6,238
Governmental	283	1,080	(660)	703
<b>Total</b>	<b>\$ 6,521</b>	<b>\$ 1,080</b>	<b>\$ (660)</b>	<b>\$ 6,941</b>

Non-entity accounts receivable represent amounts that will be deposited to miscellaneous receipts when collected.

## 4. Property, Plant and Equipment: (In Thousands)

	1997	1996	Change
<b>Government-owned/Government-held:</b>			
Land	\$ 73,672	\$ 73,672	\$ 0
Structures, Facilities and Leasehold Improvements	1,363,460	1,366,536	(3,076)
Equipment	101,603	99,014	2,589
Work in Process	81,785	119,553	(37,768)
<b>Total</b>	<b>1,620,520</b>	<b>1,658,775</b>	<b>(38,255)</b>
<b>Government-owned/Contractor-held:</b>			
Equipment	134,669	733,990	(599,321)
Special Tooling	21,958	40,735	(18,777)
Special Test Equipment	76,613	109,943	(33,330)
Space Hardware	459,920	5,473,790	(5,013,871)
Work in Process	1,283	14,833	(13,550)
<b>Total</b>	<b>694,443</b>	<b>6,373,291</b>	<b>(5,678,848)</b>
<b>Total Property, Plant and Equipment</b>	<b>\$ 2,314,963</b>	<b>\$ 8,032,066</b>	<b>\$ (5,717,103)</b>

See Note 1 for further discussion on property, plant and equipment.

**5. Other Assets:** (In Thousands)

	1997	1996	Change
Contractor-held Materials	\$ 166,959	\$ 345,513	\$ (178,554)
Personal Property Held by the Disposal Officer	0	4,790	(4,790)
<b>Total</b>	<b>\$ 166,959</b>	<b>\$ 350,303</b>	<b>\$ (183,344)</b>

Personal Property Held by the Disposal Officer was transferred to Invested Capital.

NASA changed, during Fiscal Year 1997, its accounting policies related to Personal Property Held by the Disposal Officer. This asset category represented excess property and the amounts were reduced to zero with a corresponding decrease to invested capital. Had this policy not been changed in FY 1997, the balance in this account would have been \$47 million, as of September 30, 1997.

**6. Other Liabilities:** (In Thousands)

Liabilities Covered by Budgetary Resources:

	Current	Non-Current	Total
<b>Intragovernmental Liabilities:</b>			
Liability for Deposit and Suspense Funds	\$ 364	\$ 0	\$ 364
<b>Total</b>	<b>\$ 364</b>	<b>\$ 0</b>	<b>\$ 364</b>
<b>Governmental Liabilities:</b>			
Liability for Deposit and Suspense Funds	\$ 237	\$ 0	\$ 237
Accrued Funded Payroll and Benefits	6,912	0	6,912
<b>Total</b>	<b>\$ 7,149</b>	<b>\$ 0</b>	<b>\$ 7,149</b>

The liability for deposit and suspense funds includes cash advances received from other Government agencies and public reimbursable customers. Also included are funds on deposit with the U. S. Treasury for employees' savings bonds and state tax withholdings.

Liabilities Not Covered by Budgetary Resources:

	Current	Non-Current	Total
<b>Intragovernmental Liabilities:</b>			
Accounts Payable for Closed Appropriations	\$ 57	\$ 0	\$ 57
<b>Total</b>	<b>\$ 57</b>	<b>\$ 0</b>	<b>\$ 57</b>
<b>Governmental Liabilities:</b>			
Accounts Payable for Closed Appropriations	\$ 2,609	\$ 0	\$ 2,609
Contingent Liabilities	390	0	390
Unfunded Annual Leave	0	13,469	13,469
<b>Total</b>	<b>\$ 2,999</b>	<b>\$ 13,469</b>	<b>\$ 16,468</b>

See Note 1 for further discussion of liabilities not covered by budgetary resources.

**7. Leases:** (In Thousands)

Entity as Lessor:

Operating Leases:

NASA leases and allows the use of its land, facilities, and equipment by the public and other Government agencies for a fee.

Future Projected Receipts:

	Land, Facilities & Equipment
Year 1	\$ 25
Year 2	25
Year 3	21
Year 4	1
Year 5	1
After 5 years	1
<b>Total</b>	<b>\$ 74</b>

**8. Net Position:** (In Thousands)

	Appropriated Funds	Total
Unexpended Appropriations:		
Undelivered	\$ 113,456	\$ 113,456
Unobligated:		
Available	25,497	25,497
Unavailable	3,012	3,012
Invested Capital	2,481,923	2,481,923
Cumulative Results	0	0
Future Funding Requirements:		
Annual leave	(13,469)	(13,469)
Closed appropriations	(2,667)	(2,667)
Other	(390)	(390)
<b>Total</b>	<b>\$ 2,607,362</b>	<b>\$ 2,607,362</b>

**9. Other Revenues and Financing Resources:** (In Thousands)

	1997	1996
General Fund Proprietary Receipts	\$ 302	\$ 1,434
<b>Total</b>	<b>\$ 302</b>	<b>\$ 1,434</b>

General Fund Proprietary Receipts represent user fees, gifts, fines or interest penalties.