



Shuttle missions update



STS-96

Discovery
2nd ISS Shuttle flight
Spacehab Double Module
Launch: May 20, 9:32 a.m.
Launch window: 5-10 min.
Landing: May 30, 5:12 a.m.



STS-93

Columbia
Chandra X-ray Observatory
Launch: July 9, 1:19 a.m.
Launch window: 46 min.
Landing: July 14, 12:26 a.m.

STS-99

Endeavour
Shuttle Radar Topography
Launch: Sept. 16, 8:47 a.m.
Launch window: 2 hr., 30 min.
Landing: Sept. 27, 12:55 p.m.

STS-101

Atlantis
3rd ISS Shuttle flight
Spacehab Double Module
Launch: Oct. 14, 9:30 p.m.
Launch window: 5-10 min.
Landing: Oct. 25, 4:30 p.m.

STS-92

Discovery
4th ISS Shuttle flight
Z-1 truss, PMA-3
Launch: Dec. 2
Launch window: 10 min.
Landing: Dec. 13

Spaceport News

America's gateway to the universe. Leading the world in preparing and launching missions to Earth and beyond.

John F. Kennedy Space Center

A deep freeze hits Kennedy Space Center

The lowest temperatures of the year are expected to hit KSC by November. These subfreezing temperatures should occur in the spaceport's new cryogenics testbed, scheduled to be operational by the end of the year.

"Our cryogenics laboratory will soon expand to a larger testbed facility in order to offer research and development capabilities that

will benefit KSC, academia and private industry," said Maria Littlefield, NASA's cryogenics testbed manager at Kennedy Space Center.

Cryogenics is the science that deals with the production of very low temperatures and how materials behave when they get there.

KSC has long used cryogenic liquids as launch vehicle propel-

lants. Each time a Shuttle is fueled for launch, it requires more than a half-million gallons of super cold propellants. The liquid hydrogen and liquid oxygen propellants, for example, are at -427 degrees F and -297 degrees F, respectively.

Cryogenic hydrogen and oxygen also react to provide electrical power for the orbiter while it is in space. With the rigors of very low temperatures combined with high vacuum conditions in space, cryogenic systems need to have seals and fittings specially designed in order to prevent leaks.

In space applications, cryogenic coolers also extend mission lifetimes and the range of temperatures at which sensitive instruments can operate effectively.

KSC's cryogenic infrastructure and expertise have the Space Coast well equipped to support the next generation of reusable launch vehicles (RLV) currently in development.

Center Director Roy Bridges noted that "KSC's new cryogenics testbed is just one example of how we are able to utilize KSC operational expertise in partnering with members of industry and academia to develop new technologies for both space and down-to-Earth initiatives. This is a part of KSC's roadmap and a step toward our vision of the Spaceport Technology Center."

(See Cryogenics, Page 3)



Cryogenics such as liquid hydrogen and liquid oxygen power the Space Shuttle three main engines, seen here clearly near the center of the photo. Oxidizer from the external tank enters the orbiter at the orbiter/external tank umbilical disconnect and then the orbiter's main propulsion system liquid oxygen feed line. There it branches out into three parallel paths, one to each engine.

KSC gave \$966 million boost to Florida

Space-related employment and contracts at NASA's Kennedy Space Center yielded a \$966 million boost to Florida's economy during the 1998 fiscal year that ended Sept. 30, 1998.

This figure represents \$848 million in contract dollars and purchases along with \$118 million in civil service personnel

compensations.

About 83 percent of the Florida impact dollars, approximately \$799 million, was expended within Brevard County. Of the total expenditures, \$762 million went to contractors operating on-site at the space center.

An additional \$37 million went to off-site businesses in Brevard

County, while \$49 million was awarded to Florida businesses outside the county.

Out-of-state purchases totaled about \$154 million.

More than \$66 million was awarded in contracts to small, small disadvantaged, and woman-owned

(See Economic, Page 5)

Don't just 'get a life' — give one!

On Jan. 22, Ed Markowski had the opportunity of a lifetime. Two lifetimes, actually — his own as well as the life of the person who received Markowski's bone marrow that evening.

Markowski, a NASA training coordinator in Shuttle Processing at KSC, underwent a marrow 'harvest' procedure that morning at St. Luke's Hospital in Jacksonville, Fla. Mayo Clinic doctors removed 1,200 cc of his marrow during a two-hour procedure.

"It was a simple procedure, really," recalls Markowski, "and everyone treated me so well. It was painless, since I was under general anesthesia. I was a little sore afterward, but that quickly passed."

Markowski's donated marrow also quickly passed into the hands of Jennifer Murray, a NASA employee at KSC who organized two previous marrow donor recruitment drives at KSC. She was selected to be a courier for the potentially life-saving marrow, delivering it to a hospital elsewhere in the country for a patient who received the marrow 12 hours later in a separate procedure.

For Markowski, the opportunity to help began more than a year before the actual date of the procedure.

"Just before the Red Cross came to KSC in November 1997 to conduct a marrow donor recruitment drive, we were given a video to watch that described the process," Markowski said. "Then my supervisor, Steve Chance, encouraged all of us to participate in the drive, which consisted of donating a blood sample. I went and gave the sample, and I'm so glad I did. Given the opportunity to possibly save someone's life, it was the right thing to do."

In donating, Markowski joined 3.3 million people who are a part of the National Marrow Donor Program Registry.

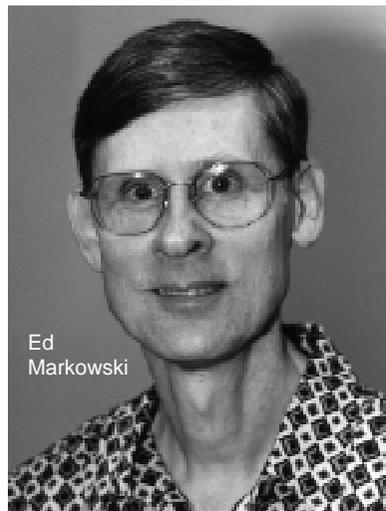
Eight months later, Markowski received a letter from the American Red Cross Southeast Regional Office in Savannah, Ga., advising him that he was a potential match for a 41-year-old man with chronic myelogenous leukemia. They asked

Markowski if he wished to continue in the process and go on with confirmatory testing. He did.

The Red Cross sent a representative from the Daytona Beach office to KSC that summer to take more blood samples. After further testing, Markowski was identified as an exact match for this man with leukemia.

Red Cross policies prohibit disclosure of the recipient's name and location for one year. After that, if both parties consent, personal information can be exchanged and a meeting arranged.

Incredibly, with 3.3 million individuals registered as potential donors and after a year and a half



Ed Markowski

of searching, this particular patient couldn't match marrow types with anyone — until Markowski donated in November 1997.

"I am honored to be used by God in this way," said Markowski, "to literally pour my life into another human being. If you are presented with the opportunity to register as a potential marrow donor, I urge you to do so. There is no cost to you and the physical discomfort is minor. The process has been one of the greatest experiences of my entire life."

Matchmaker, matchmaker

Although marrow transplants save thousands of lives each year, 70 percent of patients needing a transplant are unable to have the procedure because a suitable marrow donor cannot be found.

Why is a good match so hard to find? Human leukocyte antigens

(HLA) are proteins present on nearly every cell in the body, and these particular antigens are the major factor in determining whether or not a potential donor and recipient might be a match.

Since there are many HLA antigens, it is considered highly unlikely that any two unrelated individuals will have the same HLA makeup.

Even people within the same family may not provide a good match. In fact, the chance that a given sibling will have the same HLA antigens as those of a brother or sister is only 25 percent.

Marrow transplants require one of the highest levels of HLA antigen matching.

Interestingly, in Markowski's case, his antigens were a perfect match with the patient's.

There's something about marrow

Marrow transplantation is a relatively new medical procedure used to treat diseases once thought incurable.

Since its first successful use in 1968, marrow transplants have been used to treat patients diagnosed with leukemia; aplastic anemia; lymphomas, such as Hodgkin's disease; multiple myeloma; immune deficiency disorders and some solid tumors such as breast and ovarian cancer.

In a marrow transplant, the recipient's diseased marrow is destroyed and healthy marrow is infused into the bloodstream. In a successful transplant, the new marrow migrates to the cavities of the large bones, engrafts and begins producing normal blood cells.

The marrow 'harvest' takes place in a hospital operating room.

While the patient is under anesthesia, a needle is inserted into the cavity of the rear hip bone, and less than five percent of the donor's marrow is extracted, which the body will replace in a month's time. There are no surgical incisions or stitches involved.

The amount of marrow harvested depends on the size of the recipient and the concentration of marrow cells in the donor's blood.



Usually one to two quarts of marrow are harvested.

When the anesthesia wears off, the donor may experience discomfort at the harvest site.

The discomfort varies from individual to individual, but most compare it to a hard fall on ice.

Donors are usually kept overnight in the hospital for observation and then released.

How can you help?

The National Marrow Donor Program (NMDP) Registry is a computerized list of the HLA types of more than three million people who gave a simple blood sample and have volunteered to donate some of their marrow to a person who needs it to live. For more than a decade, the NMDP has dedicated itself to facilitating marrow transplants between unrelated donors and patients with life-threatening blood diseases.

In 1998, President Clinton signed into law the National Bone Marrow Registry Reauthorization Act, providing \$18 million in funding for the NMDP and authorizing Congressional spending for the NMDP through 2003.

Patients who are unable to find a matched donor within their family search the NMDP Registry for an unrelated donor.

At any given time, there is an average of 3,000 potential recipients searching the NMDP Registry, and on average, they have an 80 percent chance of finding a potential match on the NMDP Registry.

Today, more than 100 patients each month receive marrow transplants through the NMDP.

American Red Cross Blood Services administers the National Marrow Donor Program locally.

For more information, call Tammy Anguiano, (407) 723-7141.

Cryogenics ...

(Continued from Page 1)

With its already considerable resources backed by solid cryogenics experience, KSC offers world-class capabilities for current and potential customers.

In the case of the cryogenics testbed, NASA and Dynacs Engineering Co., Inc. (KSC's engineering development contractor) formed a unique partnership under a Reimbursable Space Act Agreement. It allows Dynacs to manage projects with industry customers while NASA at KSC manages projects with other centers and other federal customers. This is the first such arrangement for KSC.

Dynacs then pursued funding support from Florida's Technological Research and Development Authority (TRDA) to create the cryogenics testbed. TRDA accepted the proposal and has committed \$750,000 to assist in the startup of this expansion effort.

TRDA was created by Florida legislature in 1987 to promote economic development and education.

Other partners teaming with Dynacs include Air Products and Chemicals, Inc., in Tampa, and the University of Florida, in Gainesville.

Air Products' involvement focuses on private industry applications, while the university focuses on analyzing results.

Dynacs Cryogenics Testbed Manager Steve Sojourner added

that "the cryogenics testbed is intended to become a resource that extends beyond the confines of KSC.

"It is a network of people and laboratories working in the area of cryogenic engineering," Sojourner said. "The testbed is a collaboration of aerospace, industry, and scientific partners aimed at promoting technology development throughout the cryogenic industry."

But how does KSC's testing of cryogenic systems help industry? Who outside of Shuttle operations could possibly benefit from superinsulation testing and cryogenic valve qualification?

Biology and medicine use liquid nitrogen for preservation and storage of human and animal cells and tissues as well as for destruction of cancer tissue (cryosurgery).

Hospitals use superconductive magnets cooled with liquid helium for magnetic resonance imaging (MRI), and the food industry uses liquid nitrogen for freezing and long-term storage.

To be efficient, cryogenic systems require thermal isolation from the surrounding environment.

"It takes a lot of heat to make a little cool, so to speak," said James Fesmire, the NASA engineer leading KSC's cryogenics work. "We've developed new thermal insulation materials and methods for better overall performance of cryogenic containers and piping systems."

KSC's laboratory includes



A spent Space Shuttle external tank drifts toward the Atlantic Ocean minutes after the launch of STS-41 on Oct. 6, 1990. The only major Shuttle element not reused, the external tank contains liquid hydrogen and liquid oxygen, supplying them to the Shuttle's three main engines in the orbiter during liftoff and ascent. When the main engines are shut down, the external tank is then jettisoned, enters and breaks up in the Earth's atmosphere, and impacts in a remote ocean area.

cryostat test apparatus and high-vacuum equipment necessary for precise thermal measurements at liquid nitrogen temperature (-321 degrees F). The cryostat measures the heat flow through different insulation systems at various vacuum levels. A dewar test apparatus determines the actual performance on an insulation system under operating conditions.

Located just outside of the lab and new testbed is a liquid nitrogen flow test area (used to test and evaluate cryogenic valves), flowmeters and other handling equipment in field conditions. A 6,000-gallon tank supplies liquid to low-flow and high-flow test sections.

Dynacs also has enlisted the help of a leading expert in the cryogenics area. Dr. Stan Augustynowicz joined Fesmire in the cryogenics laboratory in 1998. "Our target is to achieve international excellence in cryogenic testing, training and education," said Augustynowicz.

Also available to industry and academia are conceptual design and prototype construction. KSC engineers and scientists can model and perform analyses on concepts, as well as build a prototype and test it in the field using KSC's unique equipment.

The center of KSC's cryogenics testbed will be located directly south of the Launch Equipment Test Facility (LETF), a testing

site for launch-critical ground support systems and equipment such as the orbiter access arm, the external tank gaseous vent arm, the external tank vent line, tail service masts and umbilical systems.

Lockheed Martin's RLV prototype, the X-33, required umbilicals to be designed and built at KSC, and testing of that hardware is ongoing in the LETF.

The facility was designed to simulate launch vehicle events, such as movement from wind, vehicle ignition and liftoff, effects of solar heating and cryogenic shrinkage.

The expansion of KSC's cryogenics expertise started in the early 1990s at the LETF. Based on KSC operational needs, a limited cryogenics test capability was established, that in turn met a range of NASA needs. In November 1997, the associate administrator of the Office for Space Flight designated KSC as an Operational Development and Engineering Testbed and focal point.

Other NASA centers were encouraged to utilize KSC's capabilities and unique facilities. The centers were also encouraged to have KSC assist them with technology and commercial partnerships.

KSC's testbed areas provide joint development partnerships and testing services unavailable elsewhere.



Kennedy Space Center Director Roy Bridges (center) met Feb. 10 with industry and government leaders associated with KSC's Cryogenics Testbed. From left to right are EDC Program Manager Dick Lyon, Dynacs; NASA Chief Project Manager for Advanced Development and Shuttle Upgrades Hector DelGado; TRDA Executive Director Frank Kinney; Florida Department of Community Affairs Secretary Steven Seibert; Bridges; Dynacs President and CEO Ramen Singh; Air Products Director of Aerospace and Defense Larry Belnoski; University of Florida Chairman of Aerospace Engineering Dr. Wei Shyy; and NASA Director of Engineering Development Sterling Walker.

KSC to host FIRST southeast regional event

Let the games begin!

That is a challenge soon to be heard at the Kennedy Space Center Visitor Complex as 30 high school teams from the southeast converge to test their engineering skills in the 1999 FIRST robotics regional competition, Mar. 4 to 6.

"This year's game promises to be very exciting," says FIRST Senior Engineer Eric Rasmussen. "It will test creativity, teamwork and communication skills. This isn't just about robots; this is about life."

While Kennedy Space Center has held two previous local competitions, this year is the first regional event held in the southeast United States.

The playing field will be under a tent erected on the lawns next to the Rocket Garden. Robots will be on display in the "pit" located inside the Center for Space Education; a deejay will provide music all day Friday and Saturday.

For competition, each team forms an alliance with another team and competes against another alliance for two-minute matches. Each alliance uses two team-built robots, four robot operators, two human players and four coaches. The robots must be able to pick up "floppies" and place them on a "puck" on the playing field. A floppy is a lightweight pillow-like object with self-gripping material in the center and around the perimeter. A puck is a five-inch high, carpeted octagonal rolling platform.

Scores are given based on the number of floppies on the puck and the height of the floppy above the floor, with additional scoring if a robot has climbed onto the puck and if the puck is within the opposition's end of the field. The highest possible score is 540 points.

FIRST, or For Inspiration and Recognition of Science and Technology, aims to create curiosity about science and mathematics by immersing high school students in the hard work and process of engineering. The program shows

them the joy and satisfaction of accomplishment and teamwork. Corporations and universities team with local high schools to design and build a robot that can be remotely controlled.

NASA contractors and KSC employees have spent many hours working with three local high school teams to prepare for the competition.

Representing the ComBBat Team are Astronaut High and Titusville high schools; for the Space Coast FIRST Team are Rockledge, Cocoa Beach and Merritt Island high schools; and the Scorp Squad is Satellite Beach High School.

Area corporate sponsors include AT&T, Astronauts Memorial Foundation, Bionetics, Boeing, Brevard Community College, Delaware North Parks Services, Dynacs, Florida Institute of Technology, Florida Today, GSMA-Parrish, Harris Corporation, Interface and Control Systems Inc., Lockheed Martin, NASA and United Space Alliance, among others.

KSC employees who have helped with the teams include Matt Atkinson, Tom Bonner, Eduardo Lopez del Castillo, Carol Cavanaugh, Tom Miller, David Rainer, Mike Sklar, Jim Trawick, Carmen Wolford-Natschke, Alberto Silva, Doug Willard, and Jan Zysco.

More information about the teams and sponsors can be found on their Web sites at:

- <http://www.brevard.net/~first/> (Space Coast FIRST Team);
- <http://www.ksc.nasa.gov/external/bbat/> (ComBBAT TEAM); and
- <http://scorpn.net/brevard.k12.fl.us/spages/first/first.html> (Harris/Satellite).

Information about regional competitions and all the teams in the nation participating in this year's event can be found at www.usfirst.org

Qualifying matches begin 9:20 a.m. on Friday, Mar. 5, and continue at 9:30 a.m. on Saturday, Mar. 6. Final matches are scheduled for 1 to 2:30 p.m. on Mar. 6.

On-orbit status of the ISS

The International Space Station (ISS) continues to fly with no systems problems affecting its performance as flight control teams in Houston and Moscow watch over the orbiting outpost.

Flight controllers continue to test the commanding capability of the Zarya module through the Early Communications System of the Unity connecting node. Test objectives include demonstrating the general commanding capability using NASA's communications satellites while training flight controllers in both centers for commanding sequences that could be required primarily during contingency situations when commanding capability is interrupted through Russian ground stations. Testing will continue for the next couple of weeks.

The station is in an orbit with a high point of 259 statute miles and a low point of 245 statute miles. Its orbital period (the time it takes the station to circle the Earth once) is approximately 92 minutes.

ISS viewing opportunities from the ground can be found on the internet at: <http://spaceflight.nasa.gov/realdata/sightings/>

Space Club luncheon to be held Feb. 23

The National Space Club, Florida Chapter, is hosting a special luncheon featuring keynote speaker and investment analyst Wolfgang Demisch on Tuesday, Feb. 23, at 11:30 a.m. at the Double Tree Hotel in Cocoa Beach. The luncheon and talk will last about one hour.

Demisch, an authority in aerospace, is managing director of Wasserstein Perella Securities, Inc. He has more than 20 years of experience as a senior analyst and is responsible for coverage of aerospace, defense and high technology industrial companies.

Demisch has appeared repeatedly on national financial television, including "Wall Street Week," to help people understand the economic issues and conditions of the space industry. He is a frequent speaker at industry and corporate meetings.

Some of his recent presentations were at the Aerospace Industry Association, the American Institute for Aeronautics and Astronautics, the Association for Manufacturing Technology and the Industrial College of the Armed Forces.

The cost of the luncheon is \$15.



GRAND OPENING

The Grand Opening of KSC's new and expanded Fitness Center at the Operations and Checkout (O&C) Building is about a month away. The event will include games and kick-off festivities, with the first-ever Fired Up Relay Race on Tuesday, Mar. 23 at 5 p.m. You must register to participate in the race.

The Grand Opening of the actual Fitness Center at the O&C will be on Wednesday, Mar. 24, at 10:30 a.m.

Contact the Fitness Center at 867-7829 for more information or to register for the race. More details will be included in upcoming issues of *Spaceport News* and *Countdown*.

KSC and IDEA to develop contamination monitoring technology

A Maryland-based company has joined NASA at Kennedy Space Center in a cooperative agreement to develop and commercialize a KSC-developed contamination detection system.

The new system will help KSC and private industry reduce labor costs.

The KSC Technology Programs and Commercialization Office recently announced this dual-use agreement with the Aerospace Engineering Group of IDEA, of Beltsville, Md.

The purpose of the agreement is to jointly develop an Active Particle Fallout Monitor (APFM) system based on a NASA-developed system capable of measuring particulate fallout accumulation in KSC cleanrooms.

NASA's need is to accurately detect and monitor the accumulation of potentially damaging environmental contamination, such as dust, fiber or condensation, on sensitive payload components in real time.

The one-year agreement calls for IDEA to optimize the APFM system. They will focus on ease of manufacturing, validating performance and assessing market potential.

This work will culminate in production of a prototype that will ultimately fulfill the KSC need and result in a commercial product for IDEA.

The company plans to accomplish the joint development through its newly established

cleanroom facility in Palm Bay. IDEA project manager Carl Maag said the facility would be open in February.

IDEA has worked with NASA as an engineering support services contractor at Goddard Space Flight Center, Langley Research Center, and NASA Headquarters.

NASA Engineer Paul Mogan, Engineering Development Directorate, is the KSC technical lead. He explained that "NASA developed and patented a particle fallout contamination detection instrument that directly images, sizes, and counts contamination particles.

"This instrument was field-tested," Mogan said. "NASA then selected, through a competitive process, an industry partner interested in commercializing the instrument. This is where the project originated."

Mogan expressed his enthusiasm for APFM technology and its potential for revolutionizing the way cleanroom contamination is measured.

"This project is about NASA partnering with industry to bring real products to market," he said.

"These projects allow NASA and the commercial partner to do what they are best at, and the final product is much better because of this," Mogan continued. "This benefits NASA and the commercial marketplace."

IDEA has obtained license rights to two

patented KSC-developed technologies to help them with the project.

One is an exclusive license to commercialize the 'Detector for Particle Surface Contamination,' developed by the NASA Contamination Monitoring Laboratory (CML) and the former KSC contractor I-NET, Inc. The second license is non-exclusive, for the 'Particle Fallout/Activity Sensor,' also developed by the CML and I-NET.

The first technology is a real-time monitor that can quantitatively measure (count and size) particulate fallout contamination.

This device distinguishes between particles and fibers (aspect ratio greater than 10:1) and counts them as well as measuring and reporting their dimensions.

The second technology, also called the Real-time Optical Fallout Monitor, is a portable, optoelectronic instrument that uses a light-scattering technique to measure the accumulation of particles. The monitor was developed in response to NASA's need for accurate detection of potentially damaging environmental contamination.

This improves NASA's ability to mitigate, avoid and explain mission-compromising incidents of contamination occurring during launch vehicle ground processing and, potentially, in flight.

Robert Sieck appointed member of Aerospace Safety Advisory Panel

Former KSC Director of Shuttle Processing Robert Sieck recently was appointed by NASA Administrator Daniel Goldin to serve on the Aerospace Safety Advisory Panel (ASAP).

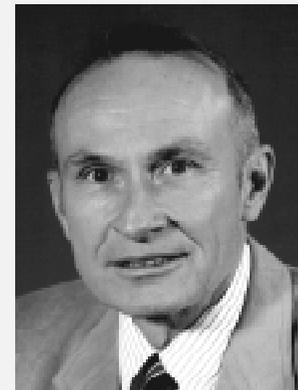
The Aerospace Safety Advisory Panel reviews and evaluates current and future NASA programs and activities and reports panel findings to the NASA Administrator. Priority is given to programs that involve the safety of human flight.

ASAP was established as an advisory committee to NASA in 1968.

ASAP has 15 members and is organized into teams that review safety issues in the Space Shuttle, International Space Station and aerospace technology programs.

"The benefit to NASA and the space program is that all panel members serve in capacities directly related to their own work experience," Sieck said. "Being a member of the panel allows me to stay connected with the people and the programs that I've enjoyed in my career with NASA."

Sieck retired from NASA in December 1998.



Robert Sieck

Economic ...

(Continued from Page 1)

businesses. This is a 5.2 percent increase over the projected 13 percent small business goal.

Federal employees at KSC totaled 1,801 on Dec. 31, 1998. While about 1,140 people were employed through construction and tenant jobs at KSC, the majority of the workers were employed by the on-site contractors and numbered about 9,043.

Approximately 11,984 workers were employed at KSC through the close of the year.

These numbers do not reflect the 1998 civil service buyouts.

Jan. 2, 1999 was the last day NASA employees could take advantage of the Agency's buyout offer. The downsizing resulted in the voluntary departure of 65 federal employees, leaving KSC with a current civil service work force of about 1,732 at this time.

Interestingly, there are still 61 NASA employees at KSC who were here for the Gemini program, 206 from the Apollo era, 481 who saw the first Space Shuttle launch, and 1,096 who witnessed return to flight.

During fiscal year '98, major contractors at KSC included United Space Alliance, the Space Flight Operations Contractor (under contract with Johnson Space Center, Houston, TX); The Boeing Company, the Payload Ground Operations Contractor; Dynacs Engineering Company, Inc., providing engineering services. EG&G Florida was the Base Operations Contractor through the end of FY '98.

Space Gateway Systems took over as the joint NASA KSC and Patrick Air Force Base Operations Contractor at the beginning of FY 99.

Chandra's arrival at KSC



The Chandra X-ray Observatory was removed Feb. 6 from an Air Force C-5 Galaxy transporter after landing at KSC's Shuttle Landing Facility two days before.

NASA's Chandra X-ray Observatory, scheduled to be launched and deployed during STS-93, will be the world's most powerful X-ray telescope. Chandra will allow scientists to monitor cosmic events that are invisible to conventional optical telescopes.

Chandra's X-ray images will yield new insight into celestial phenomena such as the temperature and extent of gas clouds that comprise clusters of galaxies and the superheating of gas and dust particles as they swirl into black holes.

Chandra, previously known as the Advanced X-ray Astrophysics Facility (AXAF), is the third in NASA's family of Great Observatories that includes the Hubble Space Telescope and the Compton Gamma Ray Observatory.

The launch of Chandra is now scheduled for July 9 at 1:19 a.m. aboard the Space Shuttle Columbia on STS-93.

A major milestone in KSC's processing of Chandra will be the test using the Cargo Integrated Test Equipment. It will verify that Chandra and the Inertial Upper Stage (IUS) will have the ability to receive and reply to commands once aboard the Space Shuttle.

Also, an end-to-end test will verify the communications systems of the payload and its ability to communicate through the Tracking and Data Relay Satellite system with Mission Control in Houston and the Chandra ground station located in Cambridge, Mass.

The Chandra/IUS combination will then be ready to go to the launch pad.



Stardust heads toward a comet

Billows of exhaust fill Launch Pad 17-A at Cape Canaveral Air Station as the Boeing Delta II rocket carrying the Stardust spacecraft launches on time on Feb. 7. After a 24-hour postponement, the rocket lifted off at 4:04 p.m. EST. Stardust is destined for a close encounter with the comet Wild 2 in January 2004. Using a silicon-based substance called aerogel, Stardust will capture comet particles flying off the nucleus of the comet. The spacecraft also will bring back samples of interstellar dust. These materials consist of ancient pre-solar interstellar grains and other remnants left over from the formation of the solar system. Scientists expect their analysis to provide important insights into the evolution of the sun and planets. The collected samples will return to Earth in a sample return capsule to be jettisoned as Stardust swings by Earth in January 2006.

STS-96 crew visit

New STS-96 crew member Valeri Tokarev (left), with the Russian Space Agency, and Commander Kent Rominger visited KSC recently for a payload Interface



Verification Test for their upcoming mission to the International Space Station. STS-96 is a logistics and resupply mission for the station and will be the first flight to dock to the International Space Station. STS-96 is scheduled for launch May 20 at 9:32 a.m. from Launch Pad 39B. Between the two crew members is Interpreter Valentina Maydell.



John F. Kennedy Space Center

Spaceport News

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