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Roundup

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Russian 'Star' takes center stage

Countdown begins for Zvezda Service Module

Russian and U.S. engineers are making final preparations for the launch of the Russian Zvezda Service Module in July, a launch which represents one of the most anticipated events for the International Space Station Program and a move that will begin a new cascade of ISS assembly flights.

Zvezda, Russian for "Star," is the cornerstone of Russia's ISS modules. At the time of this printing, a specific launch date had not yet been announced, but a General Designer's Review and a Joint Program Review were the only remaining steps to confirming the flight readiness of the module that will provide many crucial systems to the ISS.

In the meantime, the Service Module is undergoing final checkouts to prepare for its long-awaited launch. The solar arrays were installed in early June, followed by installation of handrails and thermal blankets. Complete disinfection of the module will then protect the hardware and inhabitants from microbial contamination.

Official closeout photos and a final weight and balance calculation were to be the last steps before closing the hatches and pressurizing the module June 20, not to be viewed again until the STS-106 crew arrives on *Atlantis* in September.

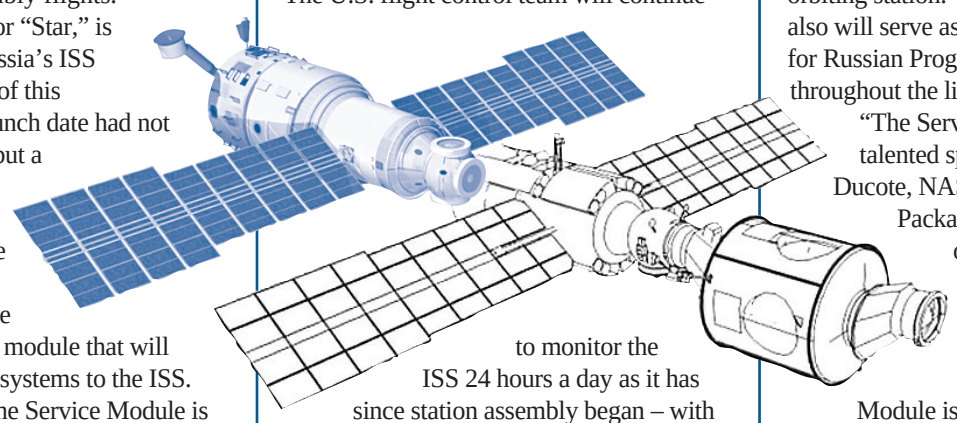
Until launched, the module will rest in its protective shroud atop the Proton rocket. Now with the improved reliability of redesigned second- and third-stage engines, the Proton will propel Zvezda 250 miles into space to fulfill its destiny.

Here in Houston, the ISS flight control team has been gearing up for the launch as well. Mark Ferring, the NASA ISS flight director assigned for the launch, and his team have been working furiously the months before launch to prepare for the event.

Starting June 22, for the first time ISS flight controllers and Russian ground control teams conducted Joint Integrated Simulations for non-shuttle-related activities. The teams focused on three primary scenarios with the Russian controllers: docking of Zvezda to ISS; combining the Unity, Zvezda, and Zarya computer systems; and simulation of the Progress docking.

"Simulating mission scenarios with the Russians is one of our best methods to ensure the Russian and U.S. controllers both understand the joint procedures and plans, and how to respond to contingency situations," said Ferring. "In particular, the simulation of the station-wide computer systems integration is a critical step and requires a complex orchestration of commands to the Unity, Zvezda, and Zarya over multiple Russian ground sites."

The U.S. flight control team will continue to monitor the ISS 24 hours a day as it has since station assembly began – with the joining of Zarya and Unity a year and a half ago. Due to the critical nature of the activation, checkout, and docking operations during the weeks following the Zvezda launch, there will be expanded controller support in Mission Control to monitor critical Russian segment operations and to provide commanding of the U.S. segment systems.



"The Zvezda module is the cornerstone to continued assembly operations and permanent crew staffing," said Ferring. "You can feel everyone's excitement level growing as we near the launch. It is time to move forward, and we are happy to be a significant part of the shift in momentum."

Similar in design to the Mir core module, the 43-foot-long Zvezda will serve as the primary living quarters for early ISS crewmembers and provide the life support system, electrical power system, data processing system, flight control system and propulsion for the orbiting station. With its four ports, Zvezda also will serve as the main docking venue for Russian Progress resupply vehicles throughout the life of the space station.

"The Service Module is a very talented spacecraft," said Gordon Ducote, NASA Service Module Launch Package manager. "In fact, it is one of the most complex spacecraft developed by either the Russians or the U.S. ever."

The Zvezda Service Module is scheduled to launch from Baikonur Cosmodrome in Kazakhstan and then will drift in free flight for almost two weeks, slowly catching up to Unity and Zarya as controllers perform various verification tests and rendezvous burns. With its delicate solar arrays deployed, measuring 97.5 feet end-to-end, the ISS will dock with Zvezda via remote control 14 days after launch at an altitude of about 245 statute miles (394 kilometers).

"The Zvezda launch has been a long time getting here but it's just the beginning for the Service Module," said Ducote. "The first crew is scheduled to go up in October and that is when the Service Module will really get tested operationally. We will have a permanent human presence aboard space station and the Service Module is the crucial key to that capability.'"

Three weeks after the Service Module launches, the first Progress M1 cargo vehicle will dock to the aft-most port on Zvezda.

Less than two months later will be two shuttle missions in quick succession to further ready the station for its first occupants. STS-106, a logistics flight scheduled for no earlier than September 8, will deliver supplies and equipment to the newly expanded station. Later that month, the crew of STS-92 will arrive and install the first small piece of the truss structure, containing four gyroscopes and a conical docking adapter. The hardware will be attached using the shuttle's robotic arm. Crew EVAs will complete the final connections and preparations for the Expedition One crew, which arrives via a Russian Soyuz spacecraft in November.

"There is a great sense of expectation about this launch," added Ducote, who himself has been involved in the Service Module project for more than six years. In that time, he's traveled to Moscow more than 25 times to assist or monitor Zvezda testing, design and ISS interface verification. "We're all very excited to now have the launch in sight."

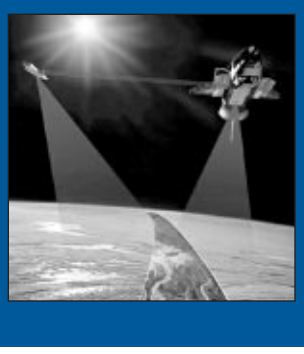
In the final weeks before the launch, Ducote will travel two more times to Russia; but, he says, it's the start of a long road with many important and critical milestones. ■

Inside Zvezda

INSIDE THE ZVEZDA, which weighs 42,000 lbs., are three pressurized compartments – Transfer Compartments at each end and a long, cylindrical main Work Compartment that make up the center of the module.

Living accommodations within Zvezda are personal sleeping compartments for the crew, a toilet and hygiene facilities, a kitchen with a refrigerator, freezer and a table for securing meals while eating. The module has 13 windows, including three 9-inch diameter windows in the forward Transfer Compartment for viewing docking activities, one large 16-inch diameter window in the Working Compartment, and individual windows in each crew compartment. Other windows are positioned for Earth and intramodule observations.

Exercise equipment includes a NASA-provided treadmill and a stationary bicycle. The crew's wastewater and condensation water will be recycled for use in oxygen-generating devices on the module, but it is not planned to be recycled for use as drinking water. Space walks using Orlan-M spacesuits can be performed from Zvezda using the Transfer Compartment as an airlock. The module also will provide data, voice and television communications with Mission Control Centers in Moscow and in Houston. ■



Officials report on successful radar mapping mission.

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Aviation history made at Ellington Field.

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Preparing for a female presence in technology.

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Officials report on successful radar mapping mission

Processing and analysis of the data from last February's Shuttle Radar Topography Mission will take about another two years, officials from NASA's Jet Propulsion Laboratory reported during a program held May 17 at the Johnson Space Center's Teague Auditorium.

SRTM Chief Scientist Dr. Michael Kobrick and SRTM Chief Engineer Ed Caro discussed the 11-day flight during the STS-99 mission aboard *Endeavour*, including the flight's highlights, results to date, lessons learned for future flights, and the overall importance of the mission.

NASA JSC Photo 2000e01556

Two radar images were bounced off the Earth's surface simultaneously during STS-99, one by the same C-band and X-band antennas used to take radar images from the shuttle's payload bay on STS-59 and STS-68 and another similar antenna at the end of a 60-meter mast.

Kobrick reported that the mission was an outstanding success. "Everything worked nearly perfectly. We have made backup copies of all 330 data tapes, and the quality of the data appears to be fabulous."

The SRTM payload consisted of three main sections: radar electronics and antennas located in the payload bay; a mast that deployed to 200 feet once in space (the largest rigid structure ever flown in space); and outboard antennas attached to the end of the mast. The SRTM acquired enough data during the 10 days of operation to compile what will be the most complete, near-global, high-resolution topographic map of the Earth ever made.

The Spaceborne Imaging Radar-C (SIR-C) and X-band Synthetic Aperture Radar (X-SAR), which flew twice on the space shuttle in 1994 during the STS-59 and STS-68 Space Radar Laboratory missions, comprised the heart of the SRTM radar. But several modifications were made, which gave the SRTM system new capabilities compared with SIR-C/X-SAR. The major change was the addition of C-band and X-band antennas at the end of the mast. These secondary, or "outboard," antennas allowed the radar to use a technique called interferometry to map the elevation of the terrain in a single pass, which was not possible with SIR-C/X-SAR.

Interferometry can be likened to a person dropping two pebbles into a puddle of water and watching the ripples, or concentric circular waves emanating outward from the splash, meet and interfere with each other. In a radar interferometer, the interference patterns were generated with microwaves, which were then measured by the radar systems on board the shuttle to acquire topographic data. The main antenna on the shuttle bounced radar pulses off the Earth, and the "backscattered," or reflected, radar echoes were recorded by both antennas simultaneously.

The design of the SRTM mission was also different from SIR-C/X-SAR. Instead of focusing on a limited number of "supersite" targets for repeated viewing, as was done with SIR-C/X-SAR, SRTM was designed to map as much of the land surface as possible. SIR-C/X-SAR covered only a few percent of the Earth's land area.

During the mission, *Endeavour*'s radar systems mapped more than 47.6 million square miles of the area between 60 degrees north latitude and 56 degrees south latitude at least once. This represents 99.96 percent of the planned mapping area. About 94.6 percent of it was covered twice and almost half was covered three or more times. Only about 80,000 square miles in scattered areas remained unimaged, most of them in North America and Asia and most already well mapped by other methods.

For various parts of the world, maps of Earth's topography are limited, inaccurate, or nonexistent. For example, many mountain chains, inhospitable deserts, and dense tropical forests have topographic coverage that is totally inaccurate, mainly because of the difficulty in getting to these locations and the near-constant cloud cover. Even where topographic maps exist they may have been created in such a way as to limit their usefulness. For example, neighboring countries may generate topographic data using entirely different methods. This lack of standardization effectively limits the scope of regional or global studies where precise topography is important.

According to Kobrick, two years will be needed to process SRTM data because there is so much of it and because extreme care will have to be taken in processing it to meet mapping accuracy standards. All of the data have to be combined into a comprehensive mosaic. "Nobody has taken data like this and made a global map," Kobrick said.

Kobrick noted that SRTM data would find applications in many fields including communications (placement of communication towers) and air traffic safety (development of enhanced ground proximity warning systems). ■

For the latest on results from the mission, visit Web site www.jpl.nasa.gov/srtm/

Mission in-flight anomalies:

- Cold gas thruster failure. The thruster operated for 18 hours and then stopped. The failure was traced to a ruptured burst disk.
- Damper failure. The failure was traced to a missed step in manufacturing – and the manufacturer did not account for possible material shrinkage over time.
- Mast stalling at end of retraction sequence. The anomaly was attributed to the fact that the cables got very cold after 10 days in space and became less flexible.

Lessons learned from the SRTM:

- Flight safety is foremost. Involve the safety panel at JSC early in the program. Safety is paramount, especially when human lives are at stake.
- Don't neglect the simple things. Complex systems get a lot of attention, which usually leads to uncovering potential problems. Simple things attract less scrutiny but can potentially bring the whole system down.
- Conservative design pays off. The structural margin in the mast allowed for increased stability.
- Margin is important. Additional propellant helped complete the mission.
- Training and mission simulations are valuable. Simulations were crucial to developing the level of proficiency needed to conduct the complex mission. Very little data were lost during the mission. None of the loss can be attributed to spacecraft problems or crew error.
- Teamwork is important.
- Do not use the formal review process to address problems for the first time.

Super Guppy Shipping Fixture has new home

The JSC Center Operations Directorate, Logistics Division, Transportation Branch, took user-possession of Bldg. 924, the Super Guppy Shipping Fixture Storage Building, on May 3. On that date, the SGSF was transported to Bldg. 924 and placed inside for the first time.

The new SGSF storage building is located behind the Sonny Carter Training Facility. This location provides for easy access to the Ellington Field flight line where the fixture is on/off-loaded on the Super Guppy aircraft. The facility was built as a design/build project in conjunction with the Neutral Buoyancy Laboratory Mockup Storage Building and laydown area.

Building 924 is a 40-foot by 125-foot metal building with two 6-ton bridge cranes having a hook height of 35 feet. The building was designed to provide a secure and controlled environment specifically to house the SGSF and to be able to remove the SGSF Environmental Control System top and end covers and store them separately in the building.

NASA JSC Photo 2000-03863

Building 924 behind the Sonny Carter Training Facility is the new home for the Super Guppy Shipping Fixture.

The SGSF is used to transport International Space Station hardware from manufacturing locations to both test and launch sites. The SGSF had previously been stored temporarily in the NBL and Light Manufacturing Facility areas of the SCTF. The protection of the SGSF is of great importance to NASA's International Space Station Program.

The other facilities built on this project consist of a 20,000-square-foot NBL mockup storage building (Building 925) and a 25,000-square-foot concrete laydown area. These areas were needed to house the expanding number of mockups used in the NBL and to free up high-bay space in the NBL and LMF for mockup outfitting and development.

Bobby Boyd of the Logistics Division, Transportation Branch, said, "We are elated to have a home for the Super Guppy Shipping Fixture. We would like to give a special thanks to Project Manager William Roeh and the entire Center Operations Directorate Project Management Office for their excellent work in getting both buildings 924 and 925 built and ready for occupancy in such a short time."

Design/build construction was chosen by the Center Operations Directorate's Project Management Office as a means to construct these facilities on a fast-track basis. The primary fast-track driver was the need for mockup storage. A contract with Barnier Building Systems was signed on August 27, 1999. Approval of the installation had to be obtained from the Federal Aviation Administration, Houston Airport System, and the City of Houston.

Excellent weather conditions during the site preparation phase allowed the mockup laydown area to be completed ahead of schedule. Occupancy of this area was taken on January 13, 2000. ■

COMMUNITY NEWS

SciAd success

NASA JSC Photo 2000-04745 by James Blair

JSC volunteers celebrate the completion of the first year for the Science Advisor Program at JSC. Center Director George Abbey personally thanked and congratulated all the volunteers at a reception at the Gilruth Center earlier this month.

Volunteers in JSC's Science Advisor Program were recently recognized at a ceremony celebrating the completion of the pilot program's first year. One hundred employees volunteered throughout the 1999/2000 school year as part of the new educational outreach program, which is already registering volunteers for the following school year.

"It is very rewarding to work with young people as you have and I think it is really going to mean a lot to our future because they represent our future," said Center Director George Abbey. "If we can get students interested in math, science and engineering, we're going to ensure that we have young people who are going to be able to carry the vision on and do what we have to do during the coming years. You have made a difference and that is important. So thank you for a job well done."

The SciAd program, which White Sands Test Facility pioneered for NASA, is designed to serve as a resource for teachers. Through SciAd, JSC volunteers can help design science experiments and lesson plans, prepare labs or even help with computer equipment.

"The SciAd program promotes an awareness of science that is very important," said Sybil Littlejohn, a third grade teacher at Ward Elementary School and science coordinator for grades three through five. "It also brings in excellent role models – real people with real jobs in these fields for the students to meet."

Littlejohn and Alice Prisk, a second grade teacher at Ward Elementary School, attended the event to personally thank the SciAds for their work. Ward's SciAds served as science fair judges, assisted with a student robotics competition team, and developed hands-on activities designed to spark students' interests in physical and life sciences topics.

"Our SciAds in particular were very good at getting the students involved," added Prisk. "They let them figure out what the experiment was about and let them make mistakes. It really kept their interest."

"We really appreciated their enthusiasm," said Littlejohn. "Any time a visitor has a lot of enthusiasm it gets carried over to the students, and even to ourselves."

Many SciAds said they were glad they had participated and felt good to be contributing to the development of future scientists and engineers.

Dena Haynes, a JSC employee and SciAd at Ross Elementary School, who is the mother of a kindergartner at the school where she volunteered, said she was appreciative of the opportunity to be involved with their education.

"I felt this was a good way to participate and I think the students thought it was neat to see someone they know in the classroom," said Haynes, who was able to use her electrical engineering expertise while helping with the first robotics competition and electronic circuitry experiments. "The students really responded and wanted to know how they could do more at home."

All Clear Creek Independent School District elementary schools and intermediate schools are part of the JSC SciAd program. Phase Two of the program invites JSC contractor companies to launch their own SciAd programs with surrounding school districts.

"This was an excellent year for the pilot program," said Susan Braymer, SciAd steering committee chair and deputy director of Human Resources. "Based on this year's experience, we look forward to enhancing the 2000/2001 program with CCISD."

Organizers are currently recruiting civil servant volunteers for the 2000 – 2001 school year. Each SciAd is allowed eight hours of duty time per month to support their school. Individuals interested may apply online by visiting the SciAd Web site at hro.jsc.nasa.gov\SCIAD. While applications will be accepted continuously, selections for the fall will be made from applications submitted by July 21. ■

Volunteer effort key to successful Open House 2000

Center preparations continue for the fifth annual Open House set for Saturday, August 26

About 400 volunteers are needed to prepare for the anticipated 120,000 Open House guests. Civil service and contractor volunteers are needed to staff information booths, act as rovers, assist visitors with directions, staff the lost child care center, help keep the cafeterias clean during peak times, oversee children's activities at the Teague Auditorium, and handle crowd control in the International Space Station trailer.

"The volunteers' effort is crucial to the success of the day," said C.C. de la Garza, volunteer coordinator for Open House 2000. "Please take the time to support this exciting event. Open House provides all employees the opportunity to personally share the excitement shown by the many visitors who spend the day at JSC."

NASA and contractor retirees are invited to volunteer in this effort. There is a special need for bilingual volunteers and individuals willing to work afternoon time slots. All volunteers will attend training sessions, which will be scheduled at a later date and will be announced in the *Roundup*.

The easiest way to sign up is by pointing your browser to http://www4.jsc.nasa.gov/openhouse/Databases/ and selecting the time and position you would like to work. For more information, contact de la Garza at x31033.

Open House, which begins at 9 a.m. and ends at 5 p.m., is free to the public. Visitors may enter the center through three gates not normally open to the public – on NASA Road 1 just east of Saturn Boulevard, on Space Center Boulevard near Bay Area Boulevard, and on Space Center Boulevard near NASA Road 1. Parking in JSC lots is available at no charge.

"We are looking forward again this year to hosting the public at the Johnson Space Center," said JSC Director George W. S. Abbey. "We hope everyone will enjoy both the opportunity to meet the dedicated women and men who work here and the chance to learn how their investment in the space program makes it possible for us to continue our advances in space exploration while at the same time providing real benefits to our lives here on Earth."

Visitors check out the shuttle mockup in Bldg. 9 during last year's Open House.

Exhibits and hardware from all of JSC's various programs will be featured in more than 19 buildings throughout the center. In addition, tours will be provided of the Sonny Carter Training Facility, where astronauts train for space walks in the largest indoor "pool" in the world, as well as Ellington Field, where NASA training jets, Shuttle Training Aircraft and the KC-135 weightless trainer are housed.

Visitors will be able to tour Mission Control to see both the space shuttle and the International Space Station flight control rooms. This facility is the nerve center for human space flight operations and served as the model for the new echocardiography lab at Texas Children's Hospital in Houston where noninvasive tests are performed using ultrasound to examine the structure and functioning of the heart for abnormalities and disease.

In Bldg. 9, at the Space Vehicle Mockup Facility, visitors can see a full-size version of the first and only reusable spacecraft ever built – the space shuttle – which in the past year conducted a variety of missions including the deployment of the Chandra X-Ray Observatory, a servicing call to the Hubble Space Telescope, a radar mapping mission that covered more than 47 million square miles of the Earth's surface, and, most recently, a return to the International Space Station to prepare it for the arrival of the next major station component, the Zvezda Service Module.

Building 9 also contains full-size mockups of the Zvezda module along with other major components of the International Space Station.

NASA astronauts will be on hand throughout the day to provide autographs in several buildings, including both JSC cafeterias and Ellington Field. Food, beverages and souvenirs will be available for purchase as well around the center.

Other facilities used for research in advanced technologies involving composite materials, plant growth, life support systems, global positioning systems and physiological studies will be open to the public.

Two new spacecraft under development at JSC – NASA's X-38 vehicle, which will be available to return crews from the International Space Station, and the inflatable TransHab module, proposed for crew habitation on the station – will also be on display.

JSC's annual Open House coincides with the annual Ballunar Liftoff Festival, a three-day event sponsored by local communities and held on the NASA grounds. The festival includes more than 100 hot air balloons, midway rides, games, skydiving exhibitions and other displays. Festival cost is $3 for adults. Children under 12 are admitted free.

For more information on this year's Open House event, visit the JSC Web site at http://openhouse.jsc.nasa.gov/ or call the information hotline at 281-244-5312. ■

A masterpiece of planning: *The move of NASA 930*

By Eileen Hawley

Aircraft Operations Heavy Aircraft Maintenance Officer and Flight Engineer Sandy Sloan had the task of figuring out how to move the retired KC-135A from its storage location on the far side of Ellington Field's runways to its new home on Aerospace Boulevard.

Under any conditions, moving a 110,000-pound aircraft is no easy feat. Moving one that has been stripped of its electrical and mechanical systems and needs to traverse an active airfield is a challenge indeed.

"Originally, we estimated the move itself would take about two days," said KC-135 Project Pilot Dave Mumme. "We significantly reduced that estimate. It took four hours." A smiling Sloan quickly responds. "It took five years!"

As early as 1997, JSC and the City of Houston were working as partners to create the permanent monument for NASA 930 at the entrance to Ellington Field, off of Highway 3. With negotiations for the transfer of ownership from NASA to the city complete, it was finally time to move the aircraft.

And, after much planning and preparation, a small group of people clustered around the KC-135 on February 28 and readied themselves and the plane for its final journey.

"This was the real masterpiece of the entire process," said Sloan.

The move involved NASA's Aircraft Operations, personnel from the power and telephone companies, members of the Civil Engineering Squadron of the Texas Air National Guard at Ellington and the Red Horse Squadron from Kelly Air Force Base at San Antonio.

The National Guard provided engineering expertise in advance of the move and muscle power the day of the move.

"We couldn't have done it without them," said Mumme.

Picture the geography of Ellington Field. The plane would have to be towed across runways, past hangars, over curbs and streets, and past telephone poles and electrical wires.

"You can't tow the plane up and down over the curbs on these streets," said Sloan. "The structural stress would simply be too much."

The solution was to create a level path for the aircraft by filling the streets to curb level with crushed gravel. That meant acquiring, pouring and leveling enough crushed gravel to fill the five streets up to curb level – about 4 inches – to give NASA 930 an even ride to its permanent home.

In advance of the plane's move, utility workers temporarily removed traffic signs, laid telephone poles on their sides and moved power lines to accommodate the aircraft's 130-foot-wide wingspan.

The exacting choreography required to move NASA 930 began at Hangar 990, NASA Flight Operations' large aircraft maintenance facility.

Before any motion could occur, volunteers from the Texas Air National Guard placed metal sheets of matting in front of the plane. The matting, which is used by the military to construct temporary airfields, provided the aircraft with a consistent travel surface.

With the tow bar attached to its nose gear, the plane was started on its way.

Over the course of the next four hours, the National Guard volunteers "leap-frogged" in front of the plane, pulling up the matting the plane had just traveled over and placing it in NASA 930's path, essentially building a very short and continually moving airfield for the large airplane to traverse.

"We only had about 25 to 30 feet of these strips," said Sloan. "It was hard work and, by the end of the day, these guys were tired."

Traveling an average of two miles per hour, the aging KC-135 was towed slowly across Ellington Field.

Once NASA 930 and its entourage of safety engineers and support personnel arrived at Aerospace Boulevard, they began the hard work of towing the 55-ton plane up a graded, crushed concrete slope and into its final stopping place. Once the aircraft was atop the slope, a jack was used to lift it up so that strut cradles could be placed under its gears. The slope was dug out from under the aircraft and a crane was used to raise the aircraft's nose up until the aft-mounted strut assembly made contact with its mounting pad and was welded into place.

And so, after hundreds of hours spent in planning, in stripping the old aircraft and reclaiming many of its spare parts, in negotiations with the city, and with the assistance of the Texas Air National Guard and the power and telephone companies, NASA 930 now stands at its new permanent location at the entry to Ellington Field, perennially poised for take-off. ■

Many teams took part in moving NASA 930 to its new home including JSC Aircraft Operations, Texas Air National Guard, the Red Horse Squadron from Kelly Air Force Base in San Antonio, and members of the Houston Airport System staff.

Highlights in the history of NASA 930

By Eileen Hawley

For more than 20 years, NASA 930 flew high over the Gulf of Mexico performing a series of arcs and dives that no doubt looked like some sort of aerial ballet. In the process, critical space hardware was validated for flight, astronauts learned to work in zero-g, and researchers gained valuable insight into the behavior of fluids, flames and mechanics in microgravity.

And now, mounted at the entrance to Ellington Field, this historic aircraft appears permanently poised for take-off. All that remains inside its now empty shell are the memories of those who were there for the more than 58,000 parabolas flown by NASA 930 during its career.

Its chairs, wall coverings, and electrical and mechanical systems have been removed. Small openings, hatches and doors are riveted shut. Its landing gear wheels are locked in place. But the aircraft leaves behind a legacy, playing a unique role in the nation's space program and occupying a place in history.

NASA 930 began its career as an Air Force tanker, rolling off the Boeing Aircraft Company production line in 1959 – the same year the Mercury 7 astronauts were selected. At some point, it was transferred to the Federal Aviation Administration where it performed extensive aircraft pattern work verifying airport information. Its final base of operation for the FAA was Honolulu, Hawaii.

When the aircraft reached its designed service lifetime of 13,000 hours of flight time, it was placed in storage at Tinker Air Force Base. Subsequent fatigue analysis studies, engineering change proposals and Boeing's Aircraft Structural Integrity Program extended the service lifetime of the aircraft, and, in September 1972, the aircraft – known by its serial number 59-1481 – was selected as the fourth KC-135 aircraft for use in the Reduced Gravity Program.

Apollo 13 **Director Ron Howard and KC-135 Flight Engineer Sandy Sloan**

The Reduced Gravity Program actually began at Wright Patterson Air Force Base in 1957. Three piston-engine C-131 aircraft were the first used for zero-g flights.

Two KC-135As and one C-135 followed. NASA 930 became the fourth of the 135-style aircraft to be used in the zero-g program and the first wholly owned and operated by the space agency.

Now out of storage, the aircraft was sent to the Boeing plant in Wichita, Kansas, for required maintenance work. With those repairs complete, the plane was flown back to Tinker Air Force Base for additional zero-g modifications and, on August 15, 1973, was flown to Ellington Field.

Its first zero-g foray took place on September 6, 1973. In the next 20 years, NASA 930 would host a variety of experiments and researchers. From Astronaut Bob Crippen who tested the mobility and performance of EVA suits being designed for use by shuttle astronauts, to researchers gathering information on neurovestibular responses to microgravity, to experiments that validated performance of the shuttle's Orbital Maneuvering System fuel tanks, NASA 930 played a key role in human space flight. The aircraft gained some public popularity in late 1994 and early 1995 as director Ron Howard and the stars of *Apollo 13* visited Ellington Field and filmed key footage for that movie.

NASA 930 flew its final parabola on July 21, 1995. The final flight of NASA 930 inaugurated a new and exciting KC-135 program at JSC, hosting the pilot program of the KC-135 Student Flight Campaign, now in its fifth year.

Retired from flight on July 21, 1995, NASA 930 remained in "flyable storage status" at Ellington Field for more than one year as discussions on its ultimate fate continued.

In 1996, KC-135 flight engineer Sandy Sloan began a "reclamation process," removing equipment and hardware from the plane. "Every time we had a spare hour from our normal duties, I was working with (aviation support contractor) DynCorp to take something off that plane," said Sloan.

Some of the removed parts were taken to the shop, serviced, and certified and now are available for use on its replacement – NASA 931.

And now, after 17,791 hours of flight and 58,236 parabolas, NASA 930 stands proudly at the gates to Ellington Field. Retired after a 20-year career and revered by those who flew it, the old KC-135 is a monument to the historic events in which it played a part and a promise of the future greeting astronauts, students, researchers and guests as they enter Ellington Field. ■

Behind the scenes with the KC-135

By Eileen Hawley

NASA 930 and its follow-on aircraft NASA 931 have been used in the Reduced Gravity Program to provide researchers, astronauts and students with a unique laboratory in which to test their skills and theories.

Periods of zero gravity are achieved by flying a specific parabolic trajectory to provide about 25 to 30 seconds of weightlessness. The plane flies at an altitude of about 24,000 feet over the Gulf of Mexico. It then pulls up to about a 45-degree "nose high" profile, and at about 32,000 feet "arcs over" and descends for about 10,000 feet at a 45-degree "nose down" profile before the engines are powered back up to 450 miles per hour for the pull-out maneuver.

Periods of reduced gravity simulating lunar or Martian conditions can also be achieved by modifying the parabolic profile.

The KC-135 provides a truly unique environment to study the effects of weightlessness on people, hardware and technologies. But before anyone ever climbs on board the plane for a day of research and study, hours of behind-the-scenes maintenance and inspection are already complete.

"We have the elite in aviation technicians," said Sandy Sloan, heavy aircraft maintenance officer and flight engineer. "The ground crew keeps the airplane safe and reliable."

Three hours before flight time, the DynCorp ground crew begins its pre-flight check of the plane. It is a thorough inspection including checks of the plane's surfaces, hydraulics, struts, tires and fueling.

Once the pre-flight inspection is complete, there is a one-hour "hands-off" period. During that one-hour waiting period, the flight engineer performs a visual safety pre-flight inspection of the aircraft. The "hold" time ensures that maintenance crews don't overlap in their duties and provides time for any discrepancies noted by the flight crew during their inspections to be corrected without delaying the scheduled take-off time.

Finally, the pilot-in-command for that day's flight performs a walk-around inspection of the plane, usually accompanied by the flight engineer. In all, a minimum of three sets of eyes verify the plane's pre-flight readiness before anyone climbs on board to take to the air.

NASA JSC Photo 2000e04100 by James Blair

Hours of maintenance and pre-flight inspections are key to the success of NASA's KC-135 program.

"Our aviation technicians are all FAA certified," said Dave Mumme, KC-135 project pilot. "NASA set the standard for government contracts by requiring this certification. The quality emphasis has been enhanced and we wanted to increase the quality of maintenance."

Other government agencies are now beginning to follow suit, requiring FAA certification for aviation technicians.

As the flight engineer and pilot conduct their pre-flight inspections of the aircraft, the test director conducts pre-flight briefings and coordinates customer activities on board for that flight. The test director is also responsible for supervising the loading of equipment on board the KC-135. Before any equipment is loaded on board, though, test director John Yaniec and his staff have already reviewed experiment proposals and conducted thorough safety and test readiness reviews.

Once all pre-flight verifications are complete, the flight crew climbs on board and begins the process of configuring switches, checking equipment, receiving updated weather reports, verifying information and preparing for flight.

The standard flight crew for the KC-135 includes the pilot-in-command, the co-pilot, and a flight engineer in the cockpit and generally two test directors in the rear of the aircraft.

"Every pilot starts the day by making a decision if it's safe to fly today," said Mumme, who has more than 14,000 parabolas to his credit. "That decision is based on a combination of things including the aircraft condition, the weather and the people. The whole thing is a process and no one snapshot of that process accurately reflects the work that goes into flying."

Inside the cockpit, the flight crew begins its interior pre-flight operations. The co-pilot is responsible for working through a prescribed checklist of responsibilities, actions and safety checks.

"It's a challenge and response procedure," Mumme explains. "The co-pilot calls out an action and the responsible person responds verbally once the action is verified complete."

This sort of attention to detail doesn't stop when the pre-flight inspections are complete. Throughout engine start, taxi, take-off and landing, the crew is constantly working together to ensure a safe flight.

But flying parabolic maneuvers is hardly the sort of flight profile most aircraft crews perform as routinely as NASA's pilots and flight engineers do. In fact, the KC-135 generally flies 35 weeks a year, Tuesday through Friday.

Does the unique nature of zero-g flight make unique demands on the flight crew?

During the zero-g maneuvers, each member of the flight crew has specific duties to perform. The pilot controls the pitch axis of the aircraft – that is, the angle of the nose of the aircraft – while the co-pilot manages performance boundaries. The co-pilot is responsible for managing power to the KC-135's four engines, keeping the power to full-up until the moment the plane "goes over the top." At that time, the power is reduced almost to idle to create the zero-g environment.

"It's a constant litany of communication," said Mumme.

In the back of the plane, the test director is in constant communication with the cockpit crew. Yaniec works with a people from a wide variety of disciplines and cultures, coordinating their requirements during the periods of microgravity and ensuring they are operating safely.

It is Yaniec who advises researchers when the zero-g cycle begins and issues his familiar "feet down, coming out" warning just before the pull-out maneuver begins with its resulting 2-g force.

"Safety is my primary responsibility on board the plane," said Yaniec. "There's a lot of work taking place in the cockpit and in the back of the plane. We're conducting an orchestra up there." ■

Legendary KC-135 welcomes visitors to historic Ellington Field

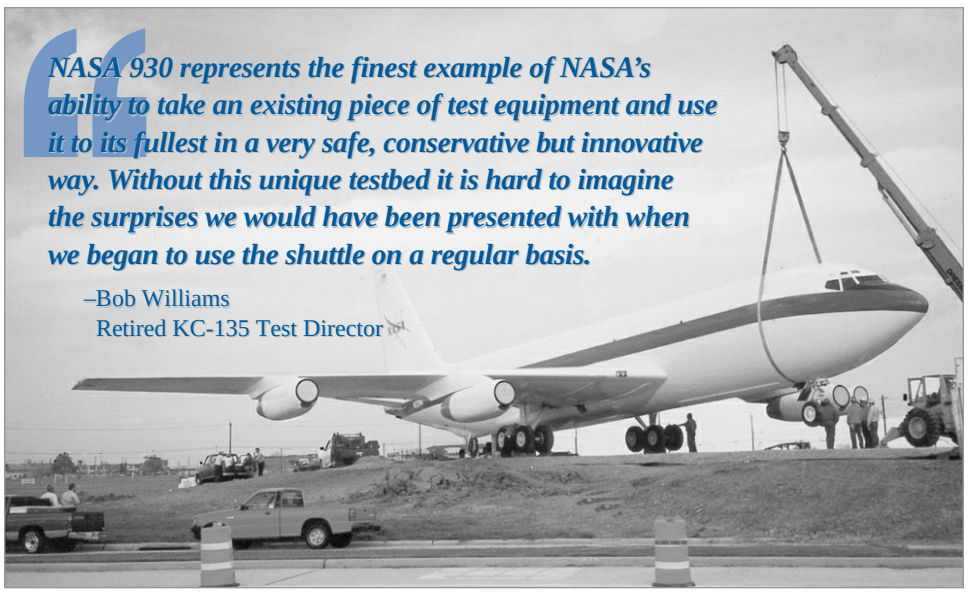
Standing as a massive, glistening monument at the gates to Ellington Field, one of NASA's most vital aircraft, the KC-135 known as NASA 930, was officially retired by NASA and bequeathed to the City of Houston in a dedication ceremony May 15.

City dignitaries including Mayor Lee Brown, aviators, and enthusiasts young and old all gathered to see the dedication of the plane, now skillfully poised over Aerospace Boulevard as a majestic tribute to its near 30 years of service to the space program.

"What we see here today is really a classic example of great cooperation between NASA Johnson Space Center, the aviation department and the City of Houston," said Mayor Brown who went on to declare May 15, 2000, as KC-135 Day in Houston. "It is clear to me that by working together we can accomplish some great things."

Many organizations that call Ellington home took a role in bringing the plane to its permanent site. The 147th Fighter Wing – Texas Air National Guard, the U.S. Army 149 helicopter Battalion, the U.S. Coast Guard, as well as Reliant Energy HL&P, and Houston Parks and Recreation Department worked with NASA's Aircraft Operations Division to coordinate the move of the historic aircraft.

"There are a lot of people who have played a big part in getting this airplane here," said JSC Center Director George W. S. Abbey. "All the pilots and commanders that have flown the space shuttle received heavy aircraft training in this airplane so it has played a major role in preparing crews for space flight. It represents a great deal of history and we're pleased that we have been a part of that program and were able provide this aircraft for the entrance to Ellington Field."



NASA-930, a KC-135 which played an extraordinary role in the space program, is hoisted to its new home at Ellington Field.

NASA 930 played a major role in heavy aircraft training for the shuttle pilots who, as typically very experienced military pilots, are accustomed to smaller, lighter and more maneuverable fighter jets.

"They generally have little or no heavy aircraft time," said A.J. Roy, a retired NASA pilot and the last pilot to fly NASA 930. "Coming into the shuttle program, they are not familiar with the crew concept or the inertia that plane has. Without exception, they find the airplane to be very challenging and very similar to the shuttle. It's been an invaluable training machine."

The modified KC-135 was also used extensively in the Reduced Gravity Program – a program initiated during the earliest phases of space flight that continues to serve as the primary zero-g testing ground for space flight hardware, in-flight procedures and crew familiarization.

"Maneuvering in zero g is a whole new ball game," said Dr. Chuck La Pinta who, as NASA's primary on-board physician for the KC-135 program since 1974, has experienced more than 20,000 parabolas. "It's an exhilarating sensation and quite frequently is accompanied by a sense of euphoria, but at the same time, it's stressful and physically demanding. It's quite a different experience for astronauts who, as fighter pilots, may have experienced zero g strapped tightly in the cockpit – to be floating and able to move like a world-class gymnast."

The reduced-gravity environment is created by raising the nose of the aircraft to a 45-degree nose high attitude, then pushing the nose over to achieve 25 seconds of zero gravity. When the nose is 45-degrees nose low, the maneuver is terminated and the aircraft is flown into another zero-gravity parabola.

"During those parabolas, a lot of good science goes on in the back of these aircraft," said Robert Naughton, chief of

Please see **LEGENDARY**, Page 7

Ripped from the ROUNDUP

Ripped straight from the pages of old Space News Roundups, here's what happened at JSC on this date:

1 9 6 5

President Johnson and his family came to Houston June 11 to bestow an honor on the crew of the Gemini IV mission and to pay his first visit to the Manned Spacecraft Center at the Clear Lake site.

The President praised Astronauts James A. McDivitt and Edward H. White II for their contribution to America's space program and announced that he had nominated them for the rank of lieutenant colonel in the Air Force. He also nominated Astronaut Virgil I. Grissom, also a major, for lieutenant colonel. Grissom was command pilot for the first manned Gemini flight.

1 9 7 0

Changes to be made in the Apollo spacecraft and procedures before the Apollo 14 mission will require postponing the launch to no earlier than January 31, 1971.

The changes and new date were announced June 30 by Dr. Thomas O. Paine, NASA Administrator, following a review of recommendations of the Apollo 13 Review Board, an evaluation of the Board's report by the NASA Aerospace Safety Advisory Panel, and recommendations by NASA's Office of Manned Space Flight.

The Review Board had reported that a short circuit ignited electrical insulation in spacecraft oxygen tank No. 2, causing failure of the tank, subsequent loss of electrical power and abort of the lunar-landing mission 200,000 miles from Earth on April 13.

1 9 8 5

Houston Mayor Kathy Whitmire co-piloted a Beechcraft Hawker 125 jet through a runway ribbon June 14, officially opening Ellington Field as a Houston civil aviation facility. Southwest Airport Services, which has been awarded a three-year interim contract to provide services at Ellington as the fixed base operator, also marked its grand opening June 14. The company which will do business at Ellington as Southwest Services, is providing fueling, tie downs, rental cars, taxis and hangar storage. The City of Houston assumed control of Ellington last year.

Competition sparks girls' interest in math, science

By Eric Raub

NASA, together with the Mayor's office, Texaco, and Women in Technology International, recently attempted to find a solution to the puzzling and dramatic drop in interest in math and science as potential fields of study and career areas for girls between the ages of 11-14. The result was the Girls in Technology 2000 (GIT2K) competition.

The competition was designed to increase interest in math, science, and technology for girls in the sixth through eighth grades in the Houston area. Alongside competitive spirit, the roughly 150 girls' interest in the event was also piqued by the chance to compete for impressive prizes.

"This competition was a good opportunity to spark girls' interest in math and science," said Jessie Hendrick of the Equal Opportunity Programs Office who served as the liaison to the competition organizers, Executive Women in Technology. "They also got a chance to see professional women at work, providing sorely needed science- and technology-oriented role models for these young women."

The girls were grouped into teams of four or five and were paired with a female mentor from the technology sector. They were then set to work on a potential problem the City of Houston will undoubtedly face in the future – an energy shortage. Each team had to select one of three problems to address: 1. In what ways can we harness alternate energy sources – wind, solar and water – to help power the City of Houston in the new millennium? 2. How can NASA use alternate energy sources in space? 3. How can energy companies use alternative energy sources? The possible solutions to these problems were many and included solar-powered cars and spacecraft, dams, windmills, and waterwheels.

NASA JSC Photo 2000-04650

Photos by James Blair

Designed to increase interest in math, science, and technology for girls in the sixth through eighth grades in the Houston area, the Girls in Technology 2000 competition attracted about 150 girls whose interest in the event was also piqued by the chance to compete for impressive prizes.
1) Leaders in Lighting the Future team work on their winning satellite.
2) Mentor Christie Sauers and her team build a windmill.
3) As judge, Cathy Kramer evaluates a team project.

NASA JSC Photo 2000-04646

NASA JSC Photo 2000-04648

The teams were instructed to write out and address the problem on paper and then to construct a three-dimensional model of their solution with LEGOS®. The competition was held on April 29 and featured speakers Dr. Clarisse Behar Molad, Astronaut Bonnie Dunbar, Rachel Muir, Melissa Sconyers, and Estella Hernandez Gillette. The awards dinner was May 23 and included Cindy Clifford from Mayor Lee Brown's office and Janice Dorr.

GIT2K was related to, and preceded, the Mayor's Women in Technology Conference 2000 (WIT2K), an opportunity for women to discuss technology, trends, and success. Dr. Helen Lane, of NASA, kept the audience enthralled with her presentation on the applications of advanced NASA technology on Earth. The WIT2K was held May 24 at the George R. Brown Convention Center.

The winning team at GIT2K was team L, the Leaders in Lighting the Future, and consisted of Alysse, Heather, Jeanine, Julie, Meghan, and Rishika. JSC mentor Barbara Zelon led the girls, who designed and built a model of a geosynchronous orbit satellite to collect energy from the sun and take pictures from space of areas with dwindling resources. Other JSC participants in the event included Dorothy Rasco, Kathy Kaminski, Elizabeth Fountain, Gladys Henderson, Christie Sauers, Sharon LaFuse, Cathy Kramer, Ellen Braden, and Stacey Menard.

The grand prize consisted of free round-trip tickets to San Diego courtesy of Continental Airlines and free admission to Legoland courtesy of the LEGO® Corporation of America. Other prizes included scientific calculators, pagers, digital organizers, and cameras. ■

TICKET WINDOW

The following discount tickets are available at the Exchange Stores

General Cinema Theaters				$5.50
Sony Loew's Theaters				$5.50
AMC Theaters				$5.00
Fiesta Texas	adult	$20.50.	child (under 48 inches)	$17.25
Astroworld	1 day	$21.00	2 day	$31.00
WaterWorld				$12.00
Moody Gardens (2 events) (does not include Aquarium Pyramid)				$10.75
Moody Gardens (Aquarium only)				$9.25
Sea World	adult	$29.00	child (3-11 years)	$19.25
Schlitterbahn	adult	$21.50	child (3-11 years)	$18.00
Space Center Houston	adult	$11.00	child (age 4-11)	$7.25
(JSC civil service employees free.)				
Space Center Houston annual pass				$18.75
Splash Town	1 day	$13.00	Season Pass	$37.50
Postage Stamps (book of 20)				$6.60

Exchange Store hours

Monday-Friday
Bldg. 3 7 a.m.-4 p.m.
Bldg. 11 9 a.m.-3 p.m.

- All tickets are nonrefundable.
- Metro tokens and value cards are available.

For additional information, please call x35350.

Please bring your driver's license to pay by personal check.

Astronaut candidates map fault in New Mexico

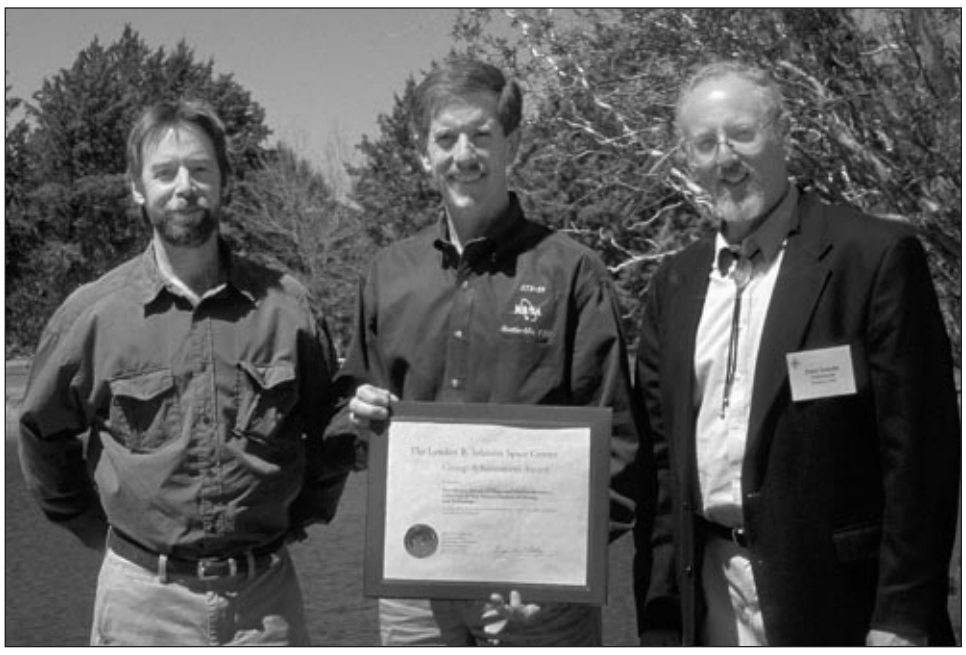
One of the many training activities provided to each new class of astronaut candidates (ASCANs) is a geology field trip to northern New Mexico. The instructor for these field trips is Dr. William Muehlberger, professor emeritus, University of Texas Department of Geological Sciences. Dr. Muehlberger has been training the astronaut corps in geology since the Apollo days.

In addition to geology training, the most recent ASCAN class, the Penguins, also participated in a geophysical exercise, which was a simulation for a Mars landing site investigation. This exercise was developed in collaboration with the New Mexico Bureau of Mines and Mineral Resources and the New Mexico Institute of Mining and Technology by Dr. Patricia Dickerson, a Lockheed Martin geoscientist at JSC; Dr. Paul Bauer, assistant director and senior geologist for the bureau; and Dr. Muehlberger.

"All the critical elements coalesced for this first field geophysical sim for planetary exploration: a need to assess the local water resources, well-defined scientific objectives, thoroughly professional project leaders from NMBMMR and NMIT, motivated and perceptive explorers, and supportive center, directorate, and contractor management. All were vital, " Dickerson stated, "but Paul and his coworkers assured our success."

The objectives of the exercise were to begin building an exploration experience base within NASA and to start training the astronaut corps in geophysical methods appropriate for exploring Mars. Astronauts John Young and Jim Reilly participated in one of the field exercises to help validate the simulations.

The ASCANs used global positioning system equipment, laser-ranging devices, and gravity meters to collect gravity data to define buried faults as part of an ongoing groundwater investigation. The data acquired by the class were processed and incorporated into a groundwater database for the Taos basin and the state of New Mexico.



Astronaut Jim Reilly, center, presents a JSC Group Achievement Award to Paul Bauer, left, assistant director for the New Mexico Bureau of Mines and Mineral Resources, and Peter Scholle, director of the Bureau.

The fact that this survey provided real data which addressed a pressing societal problem, in addition to providing valuable training, held strong appeal for the ASCAN group. The buried fault that the ASCANs helped locate and map will appear on the maps of the New Mexico Bureau of Mines and Mineral Resources as Penguino Fault. The data gathered will be published, with acknowledgment of the Penguins' contributions, as a scientific report by the bureau, as well as in their science news publication.

On April 7, astronaut Jim Reilly presented a JSC Group Achievement Award to Dr. Bauer to recognize the contributions of the geoscientists at the bureau and at New Mexico Tech for their contributions in making this exercise an outstanding success.

Peter Scholle, director of the bureau, sent a letter to JSC saying, "Thanks to all the folks at NASA for taking the time, energy, and expense to recognize this achievement." ■

Continued from Page 5

LEGENDARY

NASA JSC Aircraft Operations Division. "Many miscalculations about the effect of zero gravity have been corrected because of lessons learned in this aircraft and many procedures for crew operations for space were perfected in this aircraft. This aircraft represents a symbol of scientific discovery that we're very proud of."

Bob Williams, a well-known KC-135 test director, witnessed many of those discoveries.

"There were many, many pieces of space hardware that were developed and qualified in NASA 930 during my time spent with the program," said Williams, who recalls many high-profile, critical hardware tests that have since proven to be integral parts of our space program. For example, the new shuttle EVA suits nearly delayed the first shuttle launch until Bob Crippen tested them in the KC. Or the shuttle Orbital Maneuvering System fuel tanks, which presented a state-of-the-art system for delivering gas-free propellant to the OMS engines in orbit but were not able to be operationally demonstrated in 1 g.

The KC's value is truly apparent when testers discover the unexpected anomalies during reduced gravity-testing on board the plane.

"There were a number of pieces of equipment that were tested as just 'something to do' and found to be unacceptable because of unforeseen reactions to the zero-g environment," explained Williams. "One such piece was a 'space saw' designed to be used by an EVA crewmember to cut the 'dogs' that hold open the big cargo bay doors on the shuttle. Some folks were concerned that the aluminum saw dust generated by the saw would cause problems, so a zero g flight was flown with the saw enclosed in a dust collector box to see how the particles would behave as they were thrown off by the saw blade. The surprise came when, within two seconds of turning the saw on in zero g, the saw blade drive mechanism came completely apart. The cog belt drive was somehow damped in 1 g, yet in zero g became undamped and came completely apart – a totally unexpected event, and one that could have proved disastrous if the saw had been needed for the emergency."

"We always enjoyed the flights where new foods and food packaging were tried out in zero g," added Williams. "The foods that are used on the shuttle are really pretty good. Naturally, when the food techs became a little 'upset' with flying the parabolas, someone had to carry on with the tests of the food."

NASA 930 flew its first parabola in September 1973. Originally used by the Federal Aviation Administration in the Pacific Rim to verify navigation aids, the plane was retired from use and slated for the Davis-Monthan Air Force Base "boneyard." NASA obtained the aircraft from the FAA/USAF and completely refitted it to almost as-built condition and used it to a much fuller lifetime as the Weightless Wonder IV.

"We picked it up in the early 70s and did a complete overhaul – which it needed," said Gordon Fullerton, the first pilot to fly NASA 930. Fullerton is now a research pilot at Dryden Flight Center. "Surprisingly few systems modifications were needed so it could fly the zero-g parabolas. The hydraulic system reservoir was modified to keep it from losing fluid when the plane floats over the top, and we modified the oil cooler lines because the oil pressure varies a lot as the oil floats around the tank. We padded the interior and started to fly it in '73."

Since then, the aircraft has flown 58,236 parabolas – the last one in July 1995.

"This airplane has done an excellent job in playing a major role in our space program," said Roy. "And the way it is displayed is outstanding!"

"Many people made that happen," said Naughton. "The contributors to the zero-g program and 930's rich history start with the flight crews and the flight engineers who fly this aircraft to the edge of its envelope. Flying nearly 60,000 parabolas takes a lot of skill and a lot of effort. The program has been here at JSC for 27 years without accident or incident. That's remarkable. "

Naughton credits the maintenance professionals for the aircraft's safe record.

"Without their day-to-day vigilance and professionalism, none of these flights would be successful," said Naughton. "This aircraft display is testament to the many people who contributed to 930's rich history. The Apollo 13 movie brought a lot of fame to the KC-135 program, but this aircraft's real contribution was to the benefit of NASA's human space flight mission. 'Well done' to all who made that happen." ■

NASA JSC Photo 2000-04215 by Robert Markowitz

Area dignitaries join in a ceremony dedicating the historic NASA 930 at Ellington Field. Shown here, from left, are Mary Case, Ellington Field Airport manager; Rick Vacar, director, Houston Airport System; Houston Mayor Lee Brown; JSC Director George Abbey; Robert Naughton, JSC Aircraft Operations Division chief; and Chaplain Wayland Coe.

> ***Ellington Field itself has a great heritage in aviation history in this country, dating back to World War I when it was a training field. We are very pleased to dedicate this plane with the City of Houston for now it will be here for generations to come.***
>
> –George W.S. Abbey

DATES & DATA

July 11

Aero Club meets: The Bay Area Aero Club meets at 7 p.m. at the Houston Gulf Airport clubhouse at 2750 FM 1266 in League City. For additional information, contact Larry Hendrickson at x32050.

July 12

IAAP meets: The Clear Lake/NASA Chapter of the International Association of Administrative Professionals meets at 5:30 p.m. at Bay Oaks Country Club. Cost is $16. For more information and reservations, call Tami Barbour at (281) 488-0055, x238.

July 13

Airplane club meets: The Radio Control Airplane Club meets at 7 p.m. at the Clear Lake Park building. For more information, contact Bill Langdoc at x35970.

MAES meets: The Society of Mexican-American Engineers and Scientists meets at 11:30 a.m. in Bldg. 16, Rm. 111. For more information, contact George Salazar at x30162.

July 14

Astronomers meet: The JSC Astronomical Society meets at 7:30 p.m. at the Center for Advanced Space Studies, 3600 Bay Area Blvd. For details, contact Chuck Shaw at x35416.

July 15

Fun Run: The 22nd annual Lunar Rendezvous Run/Walk takes place at 8 a.m. July 15 at the Gilruth Recreation Center. Walkers, runners and wheelchair participants of all ages are welcome to participate in the 5K event sponsored by Honeywell. A post-race party will feature door prizes, refreshments, and music from KLDE 94.5. For details, call Abi Pineda at (281) 486-9677, E-mail spacerun2000@juno.com or register online at http://www.runnertriathletenews.com/

July 18

NPMA meets: The National Property Management Association meets at 11:30 a.m. at the Gilruth Center. For more information, contact Ray Whitaker at (281) 212-6030.

July 19

Scuba club meets: The Lunarfins meets at 7:30 p.m. For more information, contact Mike Manering at x32618.

July 20

Directors meet: The Space Family Education board of directors meets at 11:30 a.m. in Bldg. 45, Rm. 712D. For more information, contact Lynn Buquo at x34716.

Inspection2000 centerwide effort officially underway

The NASA JSC Inspection2000 campaign began recently with a kick-off meeting for all directorate representatives and a centerwide call for exhibits to be included in the annual event. Inspection2000 is scheduled for November 1, 2, and 3, and, as always, will be open to all members of the business and academic community, from the corporate decision maker to the start-up entrepreneur, the university engineering department faculty member to the undergraduate student (invited attendees should be college-age or above).

Exhibit proposals should be submitted electronically at http://www4.jsc.nasa.gov/scripts/InspectionDay/Exhibits/ExhibitIndex.cfm. The deadlines for submittal are: July 14 for the Engineering and Space and Life Sciences directorates, July 21 for other JSC organizations, and July 28 for exhibitors from outside the center.

For more information on Inspection2000 and to register, visit the JSC external Web site http://inspection.jsc.nasa.gov or call the official Inspection hotline at 281-244-1316.

To help publicize the event, employees attending business-related conferences or participating in speaking engagements with adult audience members are requested to talk about Inspection2000 and pass out information cards. To request a copy of talking points and bookmark-size handouts to publicize Inspection2000 at these opportunities, contact Robin Hart at x34754 or Linda Matthews-Schmidt at x38609 in the Public Affairs Office.

GILRUTH CENTER NEWS

Sign up policy:

All classes and athletic activities are on a first-come, first-served basis. Sign up in person at the Gilruth Center and show a yellow Gilruth or weight room badge. Classes tend to fill up two weeks in advance. Payment must be made in full, cash or by check, at the time of registration. No registration will be taken by telephone. For more information, call x33345

Gilruth badges:

Required for use of the Gilruth Center. Employees, spouses, eligible dependents, NASA retirees and spouses may apply for photo identification badges from 7:30 a.m.-9 p.m. Monday-Friday and 9 a.m.-2 p.m. Saturdays. Cost is $12. Dependents must be between 16 and 23 years old.

Open from 6:30 a.m.-10 p.m. Monday-Thursday, 6:30 a.m.-9 p.m. Friday, and 9 a.m.-2 p.m. Saturday. Contact the Gilruth Center at (281) 483-3345.
http://www4.jsc.nasa.gov/ah/exceaa/Gilruth/Gilruth.htm

Nutrition intervention program: Six-week program includes lectures, a private consultation with the dietitian and blood analysis to chart your progress. Program is open to all employees, contractors and spouses. For details call Tammie Shaw at x32980.

Defensive driving: One-day course is offered once a month at the Gilruth Center. Pre-registration required. Cost is $25. Call for next available class.

Stamp club: Meets every second and fourth Monday at 7 p.m. in Rm. 216.

Weight safety: Required course for employees wishing to use the Gilruth weight room. Pre-registration is required. Cost is $5. Annual weight room use fee is $105. The cost for additional family members is $58.

Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays. Cost is $24 for eight weeks.

Step/bench aerobics: Low-impact cardiovascular workout. Classes meet from 5:25-6:25 p.m. Tuesdays and Thursdays. Cost is $40 for eight weeks. Kristen Taraszewski, instructor.

Yoga stretching: Stretching class of low-impact exercises designed for people of all ages and abilities in a Westernized format. Meets Thursdays 5-6 p.m. Cost is $40 for eight weeks. Call Darrell Matula, instructor, at x38520 for more information.

Ballroom dancing: Classes meet Thursdays from 6:30-7:30 p.m. for beginner, 8:30-9:30 p.m. for intermediate and 7:30-8:30 p.m. for advanced. Cost is $60 per couple.

Country and western dancing: Beginner class meets 7-8:30 p.m. Monday. Advanced class (must know basic steps to all dances) meets 8:30-10 p.m. Monday. Cost is $20 per couple.

Fitness program: Health-related fitness program includes a medical screening examination and a 12-week individually prescribed exercise program. For more information call Larry Wier at x30301.

Aikido: Martial arts class for men and women meets 5 - 6 p.m. Tuesdays and Wednesdays. No special equipment or knowledge is needed to participate. Aikido teaches balance and control to defend against an opponent without using strength or force. Beginning and advanced classes start each month. Cost is $35 per month.

NASA BRIEFS

X-RAY JET POINTS TOWARD COSMIC ENERGY BOOSTER

NASA's Chandra X-ray Observatory has revealed a spectacular luminous spike of X-rays that emanates from the vicinity of a giant black hole in the center of the radio galaxy Pictor A. The spike, or jet, is due to a beam of particles streaking across hundreds of thousands of light-years of intergalactic space toward a brilliant X-ray hot spot that marks its end point.

The hot spot is at least 800 thousand light-years (eight times the diameter of our Milky Way galaxy) away from where the jet originates. It is thought to represent the advancing head of the jet, which brightens conspicuously where it plows into the tenuous gas of intergalactic space. The jet, powered by the giant black hole, originates from a region of space no bigger than the solar system.

One possible explanation for the characteristics of the X-rays is that shock waves along the side and head of the X-ray jet are accelerating electrons and possibly protons to speeds close to that of light. In the process the electrons are boosted to energies as high as 50 thousand billion times the energy of light. These electrons lose their energy rapidly as they produce X-rays, so this could be the first direct evidence of this process so far outside a galaxy.

The hot spot has been seen with optical and radio telescopes. Radio telescopes have also observed a faint jet. Jets are thought to be produced by the extreme electromagnetic forces created by magnetized gas swirling toward a black hole. Although most of the material falls into the black hole, some can be ejected at extremely high speeds. Magnetic fields spun out by these forces can extend over vast distances and may help explain the narrowness of the jet.

Images associated with this release are available on the Internet at: http://chandra.harvard.edu and http://chandra.nasa.gov

COMPTON GAMMA RAY OBSERVATORY RETURNS TO EARTH

NASA's Compton Gamma Ray Observatory re-entered the Earth's atmosphere at approximately 2:10 a.m. EDT on June 4, according to calculations made by controllers at NASA's Goddard Space Flight Center in coordination with the U.S. Space Command's Control Center.

As planned, pieces of the observatory that survived the re-entry landed in the Pacific Ocean approximately 2,400 miles (3,862 km) southeast of Hawaii.

The fourth and final burn needed to re-enter NASA's Compton Gamma Ray Observatory was initiated at 1:22 a.m. EDT on June 4. Compton's Attitude Control thrusters and Orbit Adjust thrusters were fired for 30 minutes.

After the failure of one of Compton's three gyroscopes, NASA decided to bring the satellite back via a controlled reentry. NASA determined that it was much safer to bring the satellite back now to safeguard against further system failures in the spacecraft that might hinder a controlled reentry.

Compton spent nine productive years in orbit. Engineers began planning for the Observatory's reentry in April 1999 when gyroscope #3 first began experiencing problems. By the time the gyro actually failed in December 1999, engineers had devised a number of deorbit scenarios. Engineers at Goddard, assisted by their counterparts at the Johnson Space Center, spent the past five months designing a reentry plan to safely deorbit the CGRO spacecraft.

A total of four burns were used to gradually lower the spacecraft's orbit. The first reentry burn was conducted on May 30, and a second burn occurred on May 31. At midnight on June 4, controllers fired CGRO's primary thrusters for a third time bringing the spacecraft's low point to within 92miles (148 km) of the Earth's surface.

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