



Fortieth Anniversary
Pioneering the Future

Mars Global Surveyor antenna deployed



The 'Happy Face Crater,' or Galle Crater, was recorded by Mars Global Surveyor.

A steady stream of new data from Mars, including high-resolution images, are arriving at Earth receiving stations following recent deployment of the Mars Global Surveyor's high-power communications antenna.

The antenna was deployed at about midnight EST, on March 28.

It had been stowed since launch in November 1996 to reduce its chances of being contaminated by exhaust from the spacecraft's main engine, which was fired periodically throughout the mission.

The spacecraft entered orbit around Mars in September 1997 and used a technique called aerobraking to gradually lower the spacecraft's altitude to the desired orbit for mapping.

The mapping mission began March 9; full-scale mapping began April 4.

With the antenna successfully deployed, Mars Global Surveyor will return a nearly constant stream of observations of Mars for the next two years. Information from the science instruments is recorded 24 hours a day on solid state recorders on board the spacecraft.

Once a day, during a 10-hour tracking pass over a

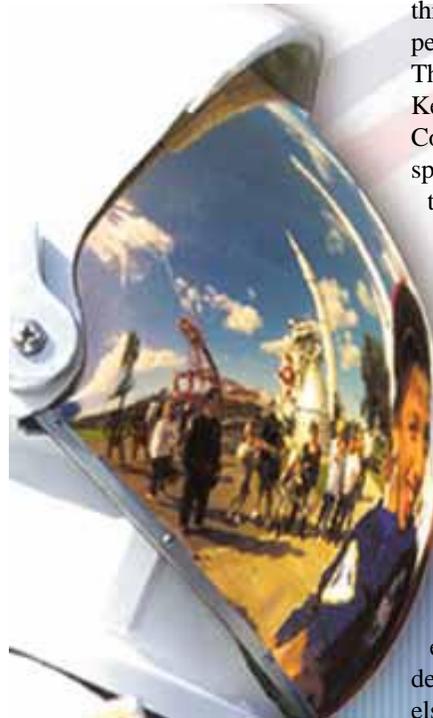
(See Mars, Page 8)

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

Looking at KSC from a new perspective: *touring KSC's Visitor Complex*



Psychologists tout that about three feet of space is what most people need to feel comfortable. That's not enough for visitors at Kennedy Space Center's Visitor Complex, who are treated to more space than tourists anywhere else in the world.

Visitors to the complex are now introduced to NASA and to the past, present and future of space exploration by a new eye-catching ticket plaza and entryway.

"The new entry and future-focused experiences set the stage for our emphasis on space exploration," said Jim Ball, NASA manager of the KSC Visitor Complex. "These exciting new presentations dealing with the search for life elsewhere in the universe and the

preparation for human exploration beyond Earth orbit are intended especially to appeal to our young people, to capture their imaginations and inspire their dreams as we move into a new century and millennium. After all, the future belongs to them and their children."

Through interactive exhibits, IMAX movies and tours, the KSC Visitor Complex tells the story of NASA's space exploration. That story and the way it is told draws more than 2.75 million visitors a year to KSC's Visitor Complex, which now has an International Space Station-themed ticket plaza. The new addition includes a structure of overhanging solar panels.

At the new entryway, Visitor Complex 'crew members' greet

(See Visitor, Page 4)

Landsat 7: Keeping up with an ever-changing world

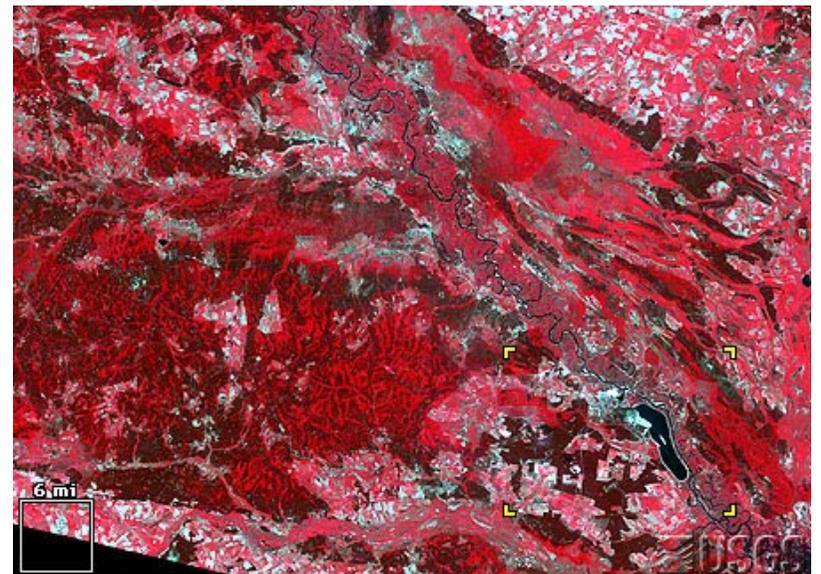
Landsat is the United States' oldest land-surface observation satellite system. Although the program has scored numerous successes in scientific and resource-management applications, Landsat has had a tumultuous history of management and funding changes over its 26-year history.

Landsat 7 marks a new direction in the program to reduce the costs of data and increase coverage for use in global change research.

At press time, Landsat 7 was scheduled for launch April 15 from NASA's Space Launch Complex 2 at Vandenberg Air Force Base in California aboard a Delta II launch vehicle.

The diversity of Landsat applications makes it unique among Earth observation satellites. Images acquired by Landsat

(See Landsat, Page 2)



A devastating nuclear accident happened at Chernobyl, Ukraine, on April 26, 1986. This Landsat 5 image shows the area around the nuclear power plant approximately one month after the accident. This type of area is near the common borders of Ukraine, Belarus and Russia. The plant lies near the Pripyat River, seen in the image. Another Landsat image, taken in 1992, is on page 2. See if you can spot differences in the images over the years. The Landsat Program is the longest running enterprise for acquisition of imagery of Earth from space.

Landsat ...

(Continued from Page 1)

satellites were used to produce the first composite multi-spectral mosaic of the 48 contiguous United States.

They have been used to monitor timber losses in the U.S. Pacific Northwest, map the extent of winter snow pack and measure forest cover at the state level.

In addition, Landsat has been used to locate mineral deposits, monitor strip mining and assess natural changes due to fires and insect infestations.

NASA launched the first satellite in the Landsat series (originally called the Earth Resources Technology Satellites) on July 23, 1972. The program was given the name Landsat in 1975.

Efforts to move the Landsat program into the commercial sector began under the Carter Administration in 1979 and resulted in legislation passed in 1984 that charged the National Oceanic and Atmospheric Administration (NOAA) to transfer the program to the private sector.

During the Landsat program's management as a commercial operation, it became increasingly expensive to gather data. As a cost-saving measure, Landsat imagery was only collected when a user requested it rather than as an ongoing process. Landsat 7's commitment to collecting and archiving all scenes in the United States including Alaska and Hawaii is a significant change in the program.

Processing, distributing, and archiving Landsat data will also be significantly improved. Previous Landsat data were often too expensive for widespread scientific use. All Landsat 7 data received at the U.S. Geological Survey (USGS) EROS Data Center receiving station will be archived and available electronically within 24 hours and will be sold at cost.

In addition to the main U.S. receiving station, several international ground stations will collect Landsat 7 data around the globe, archive them and make them available through on-line Internet browsers.

Back in 1992, with the passage of the Land Remote Sensing Policy Act, oversight of the Landsat program began to shift from the commercial sector back to the federal government.

Management was transferred from NOAA to NASA and the Department of Defense.



What salient new feature do you notice in this Landsat 5 image taken in 1992 that differs from the 1986 image on page 1? Among the new features in the image above is a curved white structure north of the Pripyat River. You can see water dammed up against it and in the channels behind it. Soon after the accident the Soviets built a series of levees, dams and other structures to prevent contaminated runoff water from entering the rivers and contaminating regional water supplies, especially for the city of Kiev downstream.

President George Bush authorized Landsat 7 in the same year.

The Department of Defense withdrew from the program in 1994, and NASA was named the lead agency working with NOAA and the USGS.

Landsat 5, launched in 1984, is still returning images. Commercially built and managed Landsat 6 was destroyed after launch in 1993 when the rocket's upper stage failed to fire.

NASA, which integrated Landsat 7 into its Earth Observing System (EOS) program in 1994, is responsible for the development and launch of the satellite and the development of the ground system.

Landsat 7 is transitioning to a dual-agency program between NASA and USGS, and future management will be governed by a joint agreement between the two agencies.

As part of NASA's EOS series of satellites, Landsat 7 will provide a unique suite of high-resolution observations of the terrestrial environment. It will gather remotely sensed images of land surface and coastal regions for global change research, regional environmental change studies, national security uses, and other

civil and commercial purposes.

The Landsat 7 project is part of NASA's long-term research effort to study the Earth as a global environmental system.

The Landsat Science Team, composed of 14 scientific investigators, is conducting a range of studies designed to exploit the characteristics of Landsat 7 for global change research.

The spacecraft will capture and store in a U.S. archive global landmass data once per season.

Following an initial 60- to 70-day checkout period, Landsat 7 will begin normal operations. Daily commands will be sent to the spacecraft defining which images to record and when to downlink data either to U.S. or international ground stations.

This dataset will, for the first time, provide a high-resolution view of both seasonal and interannual changes in the terrestrial environment.

The USGS Earth Resources Observation Systems Data Center (Sioux Falls, S. D.) will process, archive, and distribute all U.S. Landsat data. U.S. data will be acquired primarily at the EROS Data Center; supporting ground stations in Alaska and Norway will also be used.

NASA will continue to manage day-to-day operations until October 2000, when they will be turned over to USGS.

The Landsat Project, located at Goddard Space Flight Center (Greenbelt, Md.), manages Landsat development for NASA's Office of Earth Science in Washington, D.C. USGS operations will be performed at a Mission Operations Center at the Goddard Space Flight Center and at the EROS Data Center.



Space Congress launches April 19

"Countdown to the Millennium" is the theme of the 36th Space Congress, scheduled to open April 27. Although Space Congress is always forward-looking, this year's four-day conference has a special focus on the future of the space program.

Space Congress will include, as in past years, paper and panel sessions, exhibits, banquets, receptions and a golf tournament, but several enhancements have been introduced by general chairman Rick Abramson, president and chief operating officer of Delaware North Parks Services of Spaceport, Inc.

All sessions and exhibits will be held at the Radisson at the Port in Port Canaveral, and a greater emphasis will be given to student outreach.

"We believe that getting students more involved with Space Congress will pay enormous dividends," said Abramson. "Today's students will be among those who shape the space program of the new millennium."

Highlights of the conference include:

- Keynote speaker for the Space Congress Banquet Jerry Rising, president of VentureStar LLC, who led in design development of the X-33;
- Mark Saunders, head of the Space Science Support Office, who will discuss the Discovery program during the Tuesday luncheon;
- Thomas Tycz of the Federal Communications Commission, who will lead a panel discussion about advances in global personal communication;
- Jean-Michel Desobeau, director of engineering for Arianespace Inc., who will lead a paper session on global competition and cooperation; and
- the Pioneer's Banquet '99, which will be held at the Officers Club at Patrick Air Force Base.

The four-day forum on space accomplishments and future activities will also include sessions on other topics such as the push to Mars and beyond, the military's changing role in space and education's contribution to international space efforts.

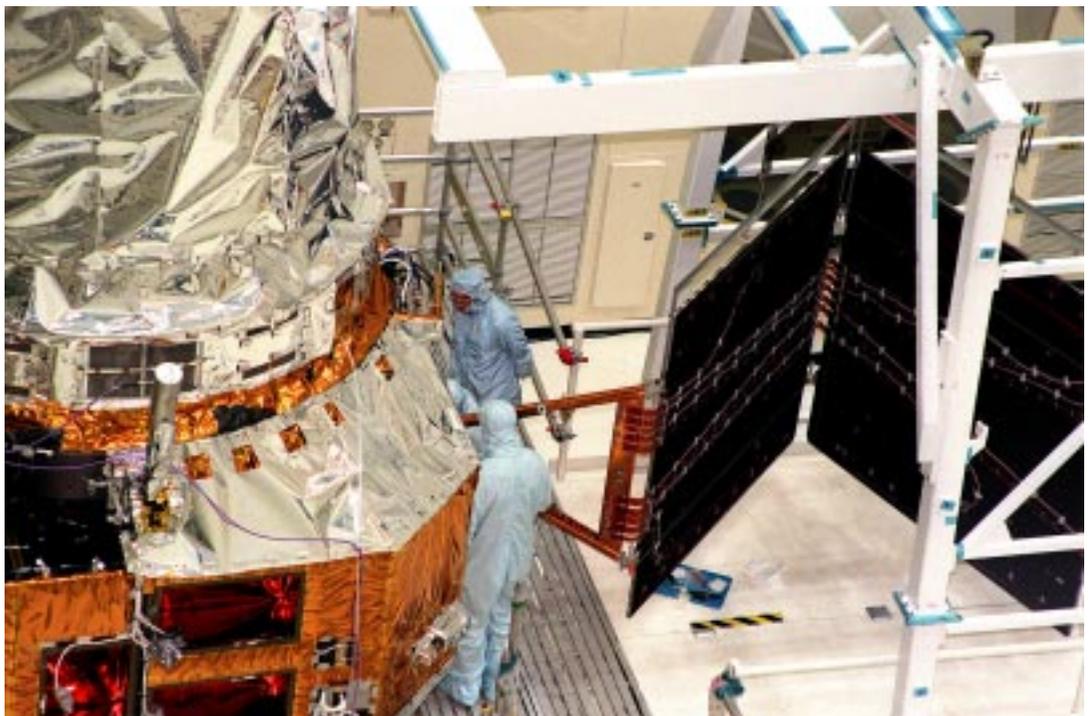
Space Congress is sponsored annually by the Canaveral Council of Technical Societies, a group represented by members of 33 professional and technical societies and advisory groups.

Chandra, a new observatory for X-ray astronomy, recently observed at KSC

Below, STS-93 Pilot Jeffrey Ashby and Commander Eileen Collins look at a hinge used on the solar panels of the Chandra X-ray Observatory in KSC's Vertical Processing Facility. Members of the STS-93 crew recently came to KSC for payload familiarization. Collins, the first woman to serve as a Shuttle mission commander, was also the first woman pilot of a Space Shuttle — STS-63, the first flight of the joint Russian-American Space Program. In addition, Collins served as pilot on STS-84. Chandra is targeted for launch this summer aboard Space Shuttle Columbia. Chandra will allow scientists from around the world to see previously invisible black holes and high-temperature gas clouds.



In the Vertical Processing Facility, a TRW technician (above) checks the attachment of the solar panel array to the Chandra X-ray Observatory. Chandra has 10 times the resolution of previous X-ray telescopes and is designed to conduct comprehensive studies of the universe. Chandra (the third of NASA's Great Observatories, following the Compton Gamma Ray Observatory and the Hubble Space Telescope) will enable scientists to study exotic phenomena such as exploding stars, quasars and black holes. Below, other TRW technicians check the point of attachment of the solar panel array to Chandra.



Visitor ...

(Continued from Page 1)

visitors to help them plan their day, answer questions and distribute information in seven languages.

The dramatic new entryway and exhibits — a \$13 million expansion — is the newest phase of the complex's planned \$100 million transformation. Additions in recent years have included the Apollo/Saturn V Center, the Launch Complex 39 Gantry and the International Space Station Center.

It has been three decades since the inception of the KSC Visitor Complex, which is now one of the top five tourist attractions in Florida.

Along with the growth in attendance came the drive for an expansion of facilities.

New presentations depicting a bold vision of our future in space are now open with these latest changes to the Visitor Complex.

They range from a glimpse into the future of human exploration beyond earth orbit to the search for



The \$13 million expansion to KSC's Visitor Complex includes a new International Space Station-themed ticket plaza, featuring a structure of overhanging solar panels and astronauts performing assembly tasks.

life elsewhere in the universe and protection of the environment at KSC.

The Robot Scouts

The newest exhibits include a narrated, walk-through Robot Scouts exhibit, which introduces visitors to NASA's trailblazers — robotic planetary probes.

Highlighted in the Robot Scouts exhibit are NASA probes that have been launched over the years, such as the Viking Mars lander, Cassini Saturn probe, Lunar Prospector and Hubble Space Telescope. These probes are given personality in this humorous and informative experience, and, through the 'eyes' of the

probes, visitors are shown breathtaking views of the Earth's moon, Mars and the cosmos.

A host robot, 'Starquester 2000,' helps describe the accomplishments of the space probes, the critical role they play in space exploration and the preparations they made for humans possibly to follow.

Perhaps the most thrilling part of the exhibit offers a view of how data from the robotic probes might be used to build a human habitat for Mars.

It includes a display for visitors

One of KSC's new exhibits is Robot Scouts.



New attractions at Kennedy Space Center's Visitor Complex include a display for visitors to witness a simulated Martian sunset.

to witness a simulated Martian sunset.

“While the presentation is light and entertaining and should have special appeal to young people, the message is serious and inspiring,” Ball said.

Quest for Life

Probes also play a significant role in the new film, *Quest for Life*, shown in a new 300-seat theater.

The film thoughtfully considers whether there is life beyond our planet. In addition to dramatic computer-generated visuals and live-action scenes, the latest scientific findings on how life might have emerged on as many as two billion other planets are presented.

‘Deep Space Nine’ star Avery Brooks narrates the film.

“This film not only describes ways in which we have and are attempting to answer the question about whether life exists elsewhere, it provides a vision of the future, with human explorers on Mars and a robotic probe beneath the icy surface of Europa,” said Ball.

Admission to two of the new experiences, Robot Scouts and *Quest for Life*, are included in the price of a tour ticket or combination tickets.

The only back-to-back twin IMAX theaters in the world are at KSC’s Visitor Complex, and several exciting motion pictures are shown daily on these screens that are 5-1/2 stories tall. The \$6 million IMAX theater opened in 1985 — paid for by the sale of food, tour tickets and merchandise, not U.S. taxpayer money.

The Wild Side

After visiting the edge of the space frontier, guests will enjoy a new glimpse into the wilds of nature — the third new exhibit, which is free to all visitors. This walk-through adventure shows how NASA and nature exist and thrive side by side at KSC.

Included are simulations of various habitats at the refuge, the continental shelf, beach, grasslands, salt marshes and lagoon.

Displays describe native species, including



‘Deep Space Nine’ star Avery Brooks (right) narrates the film *Quest for Life* at the Visitor Complex. At the April 9 grand opening of the complex’s new attractions, KSC Director Roy Bridges presented Brooks with a plaque recognizing his contribution to advancing the public’s understanding of NASA and the search for life elsewhere in the universe. Brooks also was given a NASA jacket and hat.

loggerhead turtles, alligators, manatees, black mice and indigo snakes.

All of these new attractions represent the latest phase of a comprehensive effort to make the American space program as accessible as possible to members of the general public visiting KSC.

“These new attractions, along with the Apollo/Saturn V Center, the LC39 Gantry, and the International Space Station Center, give visitors unprecedented access to the U.S. space program and KSC,” said Ball.

“Now, visitors can learn more about how NASA is able to accomplish some of the science on our missions with lower costs, how we coexist with nature here at America’s spaceport



More than 2.75 million visitors come to KSC each year, enjoying bus tours of the center and special attractions.

and why we continue to explore our fascinating universe,” he added.

The Visitor Complex is NASA’s official public gateway to KSC. Operated by Delaware North Parks Services of Spaceport, Inc., the Visitor Complex features bus tours of the space center with up-close views of Space Shuttle launch facilities and International Space Station processing.

Educational exhibits feature historic flight hardware and tell NASA’s story of human space flight.

The complex is open from 9 a.m. to dusk every day of the year except Dec. 25 and certain periods on launch days. Admission and parking are free.

A Mission Pass for a bus tour of KSC and two IMAX films is available for \$26 for an adult and \$20 for a child ages three through 11. A Crew Pass for a bus tour of Kennedy Space Center and one IMAX film is available for \$19 per adult and \$15 per child.

For more information, visit the KSC Visitor Complex web site at <http://www.KennedySpaceCenter.com> or call (407) 452-2121.



Experience the thrill of the new exhibits and future-focused experiences at KSC’s Visitor Complex.

Life's a picnic at KSC's KARS Park on April 10



Above, Max-Q entertains the crowd at the picnic, while a young cowpoke (right) sings of his own happy trails.



The KSC All-American Picnic held April 10 at KARS Park I drew an enthusiastic crowd — around 5,000! — on a spectacularly beautiful day. Although the Black Employee Strategy Team, above, won the prize for best presentation at the annual cookoff this year, none of the fish caught (below) during the fishing tournament made it into the food served. At right, Astronaut Joe Tanner signs the tee-shirt of a young admirer, while another young horserider (bottom right) takes to the trails in a different way. As the pictures tell, happy picnic guests had lots to enjoy.



Groundwater cleanup agreement signed by NASA, USAF, federal officials



Representatives of NASA, the U.S. Air Force and various federal environmental agencies sign a Memorandum of Agreement at Launch Complex 34.

A Memorandum of Agreement was signed April 6 at Launch Complex 34 on Cape Canaveral Air Station formalizing the cooperative efforts of a group of federal agencies in groundwater cleanup initiatives. NASA, the U.S. Air Force and various federal environmental agencies have formed a consortium and are participating in a comparative study of three innovative techniques to be used in cleaning a contaminated area of Launch Complex 34.

The study will be used to help improve groundwater cleanup

processes nationally.

Pictured at left signing the agreement are, left to right, Timothy Oppelt, U.S. Environmental Protection Agency; Tom Heenan, U.S. Department of Energy; Col. James Heald, U.S. Air Force; Gerald Boyd, U.S. Department of Energy; James Fiore, U.S. Department of Energy; Brig. Gen. Randall Starbuck, Commander, 45th Space Wing; Roy Bridges Jr., KSC center director; and Walter Kovalick Jr., Ph.D., U.S. Environmental Protection Agency.

Bring your daughter to KSC

For the seventh year, Kennedy Space Center will celebrate Take Our Daughters To Work Day on April 22. The event is for girls from ages 9 to 15, an age when they are forming their sense of self and building on ideas for their future.

On this day, KSC employees are invited to bring daughters, granddaughters, nieces, sisters or neighbor's children to work with them to share the work experience and encourage the girls to set goals for their future, and to build self-esteem. The theme for this year is "The Future Is Me."

Gate 1 at Cape Canaveral Air Station (CCAS) will be open to employees bringing girls to work with them. Employees working at CCAS may participate and take their children to their work areas as long as they do not work in a controlled access area.

Due to limited seating, only NASA employees may participate in a special program with former NASA employee Andrea Shea-King in the IMAX II Theater of KSC's Visitor Complex from 8 a.m. to 9:30 a.m. Shea-King now has her own company, Shea-King Communications, and writes for *Florida Today* newspaper.

There will also be a science demonstration near the Exploration Station.

Open to all contractor and NASA sponsors are the following events:

- At 9:30 a.m., a robotics demonstration by Steve Van Meter, NASA Hazardous Duty Robotics Specialist, between the Galaxy Center and the pond by the Astronauts Memorial. The KSC

Visitor Complex Spaceman will also be available at this site for a photo opportunity.

- Tours — Ticket costs are \$14 for adults and \$5 for children. Tickets must be purchased in person between 11 a.m. and 4 p.m. April 19-21 at the Group Sales Window in the Ticket Pavilion at the Visitor Complex.

- 10 to 11 a.m. — Audubon Society Birds of Prey, in the Training Auditorium.

- 1 to 3 p.m. — Big Cat Run, in the Training Auditorium.

- 8:30 a.m. to noon — SGS Security and Fire Services display and demonstrations (boats, fire truck, fingerprinting, SWAT and K-9) behind KSC Headquarters.

Special badges will be distributed for the event. Contractor employees should contact their own representatives to obtain badges. NASA employees may pick up their badges April 19-21 between 10 a.m. and 2 p.m. in Headquarters, room 2331.

Reminders:

- children must wear a badge and stay with a badged employee,
- sponsors are responsible for the children they bring, and
- children may not enter any controlled access area that requires a controlled access badge. Employees working in these areas, including the Vehicle Assembly Building, Orbiter Processing Facilities and Operations and Checkout Building, may arrange for another person to take their children to an approved area.

For more information, please call Jean Rhodes, 867-2307.

Environmental and Energy Awareness Week approaches

Kennedy Space Center has enlisted the Air Force and its contractors to co-sponsor this year's Environmental and Energy Awareness Week, April 19 through 22.

By joining forces, the groups will be able to present a greater variety of exhibits and demonstrations at more locations in recognition of Earth Day, April 22.

That means employees will be able to learn even more about what government agencies, preservation societies and environmental contractors are doing — primarily behind the scenes and with little public recognition — to help communities protect and improve the environment and conserve energy.

There will even be tips on how to save money by conserving resources.

Exhibits will be on display at the KSC Visitor Complex on April 19, at Cape Canaveral Air Station's Hangar F on April 20 and at Patrick Air Force Base Officers Club on April 21.

Selected exhibits will be on view April 22 at NASA Headquarters, KSC Training Auditorium, Space Station

Processing Facility, Operations Support Building and the CCAS Food Court. Hours are 9 a.m. to 3 p.m.

The public is invited to the Visitor Complex and Officers Club exhibits.

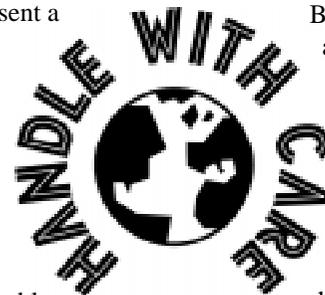
Buses will be available to transport employees from KSC Headquarters to the Visitor Complex and back every half hour on

April 19.

Because big cat and bird of prey shows have drawn large audiences in the past, they are being held in the Training Auditorium on April 22.

A variety of wildlife will also be at the Visitor Complex, Hangar F and Officers' Club on days that those venues feature exhibits, thanks to Coon's Run wildlife sanctuary, the Brevard Zoo and Animals, Animals, Animals Inc.

Director of the HUBBS-Seaworld Research Institute Dr. Duane Defrees and Agricultural Extension Agent Doug Kutz will give presentations at the Training Auditorium on April 22.



Journey through Atlantis



Now in Orbiter Processing Facility Bay 3, the orbiter Atlantis shows off its new digital cockpit to Center Director Roy Bridges (right) and Associate Director for Advanced Development and Shuttle Upgrades JoAnn Morgan. The orbiter is scheduled to fly on its next mission on Dec. 2 — STS-101, the third International Space Station flight. Atlantis returned to KSC from the Palmdale, Calif., facility in late September 1998 after having received extensive orbiter modifications and maintenance. As one of the more significant modifications, Atlantis became the first orbiter to obtain a fully digital cockpit.

April employees of the month



April employees of the month are, left to right, Mike Dick, Checkout and Launch Control System Office; James Jones, Installation Operations; Steven Horn, Office of the Chief Counsel; Wanda Petty, Equal Opportunity Program Office; Michael Paraway, Office of the Chief Financial Officer; and Amador Capellin, Engineering Development. Not shown are Thomas Dwyer, Safety and Mission Assurance; Art Maples, Biomedical Office; Loraine Schafer, Logistics Operations; Gloria Vigilante, Space Station and Shuttle Payloads; Richard Stevens, Shuttle Processing; Gennaro Caliendo, Space Station Hardware Integration Office; and Armonda Piloto, ELV and Payload Carriers Program.



Inside the Multi-Payload Processing Facility, the lid covering the Shuttle Radar Topography Mission (SRTM) is lifted. The primary payload on mission STS-99, the SRTM consists of a specially modified radar system that will fly onboard the Space Shuttle during the 11-day mission scheduled for launch Sept. 16. This radar system will gather data expected to result in the most accurate and complete topographic map of the Earth's surface ever assembled. SRTM is an international project spearheaded by the National Imagery and Mapping Agency and NASA, with participation of the German Aerospace Center DLR.

Mars ...

(Continued from Page 1)

Deep Space Network antenna, the data are transmitted to Earth.

In addition, every third day a second tracking pass is used to transmit data "live" at a very high rate directly to Earth without being put on the recorder. These data, which will contain high-resolution images of Mars, will be transmitted at rates between 40,000 and 80,000 bits per second.

"Having a deployed, steerable high-gain antenna is like switching from a garden hose to a fire hose in terms of data return from the spacecraft," said Joseph Beerer,

flight operations manager for Mars Global Surveyor at NASA's Jet Propulsion Laboratory.

"Up until now, we have been using the high-gain antenna in its stowed position, so periodically we had to stop collecting science data and turn the entire spacecraft to transmit data to Earth," Beerer explained. "Now we have the ability to simultaneously study Mars and communicate with Earth."

Mars Global Surveyor is managed by the Jet Propulsion Laboratory for NASA's Office of Space Science. It was launched from Cape Canaveral Air Station on Nov. 7, 1996.



John F. Kennedy Space Center

Spaceport News

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