



Fortieth Anniversary
Pioneering the Future

Final stages before launch



Workers inside the launch tower at Pad 17-A, Cape Canaveral Air Station, guide the third stage of a Boeing Delta II rocket and the Stardust spacecraft connected to it through an opening to the second stage of the rocket below. Stardust is destined for a close encounter with the comet Wild 2 in January 2004. Stardust is scheduled for launch Feb. 6 at 4:06 p.m.

Shuttle missions update



STS-93

Shuttle managers await information from Chandra spacecraft officials to determine Columbia's target launch date and any impacts to downstream Shuttle flights. The target launch date is now no earlier than mid-May. See story: *Files from the X-ray observatory*, page 3.

STS-96

As of press time, the launch date for Shuttle Discovery on the second International Space Station flight is May 20, a date currently under review. This flight will carry interior supplies as well as U.S. and Russian cranes to be installed on the exterior of the station.

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

KSC experience and expertise help with X-33

KSC workers are well known for successfully preparing Shuttles for launch and landing, but are seldom recognized as research and development experts.

Now, with projects like the X-33 laser-guided Vehicle Positioning System (VPS) under their belts, KSC engineers have an added claim to fame.

Tests at the X-33 launch site in



Artist's rendering of the X-33

California last month validated the new KSC-developed VPS to help Lockheed Martin meet its goal for rapid turnaround of future reusable launch vehicles (RLVs) between flights.

Under construction at Lockheed Martin SkunkWorks in Palmdale, Calif., the X-33 is a half-scale prototype of Lockheed Martin's planned operational RLV dubbed VentureStar.

Horizontal preflight processing of the technology demonstrator calls for a system to quickly position X-33 on a platform that rotates it to a vertical launch-ready position.

Before vertical rotation, cryogenic fuel lines and rigid holddown posts must be connected to the vehicle.

These crucial steps call for operational experience.

"With an assertive effort to hand over routine Shuttle operations to the contractor, we've recently been able to apply a wealth of launch processing expertise to research and development projects like this one," said Warren Wiley, KSC's RLV programs manager. "You will be pleasantly surprised when you see our many advanced technology projects come to fruition."

The VPS combines three pneumatic jacks, air-bearing pallets and a laser alignment system to move the estimated 75,000-pound X-33 to its rotating launch platform.

During recent tests, a KSC-designed weight simulator called the 'iron bird' was lowered by crane onto the VPS in place of the X-33, lifted by the pneumatic jacks to platform height and then moved laterally into position above the platform by the air-bearing pallets. The laser beams confirm vehicle alignment.

Once rotation begins, it takes about 30 minutes for the unsightly 'iron bird' to stand upright, marking the test's successful completion. The entire operation takes about one hour.

"One of our overall program objectives is to demonstrate quick turnaround of a launch vehicle," explained Steve Black, Lockheed Martin's RLV program manager over KSC operations.

"This system will transition the X-33 from its wheels to the launch mount without the intense manual labor required by conventional systems. It will eventually be completely automated."

X-33 and its support systems are being developed through a cooperative agreement between Lockheed Martin and NASA.

This approach has allowed

NASA budget for the new millennium

On Feb. 1, NASA Administrator Dan Goldin announced a proposed budget for NASA for fiscal year 2000.

"For the sixth year in a row, NASA's budget has declined while productivity improves," Goldin told reporters. "Doing more with less money and fewer people is consistent with the President's vision of a federal government that works better and costs less.

"I can say that even though our budget request for fiscal year 2000 will be slightly below this year's funding level, we have more money for space science, for exciting new missions and for the research and advanced technologies that will enable bold, new ventures in the future."

The proposed budget includes funding over the next two years for KSC projects, including \$10.2 million allocated to connecting KSC to

Cape Canaveral Air Station's wastewater treatment plant; repairing and modernizing the HVAC System, Central Instrument Facility; replacing high voltage load break switches; and upgrading the utility annex chilled water plant.

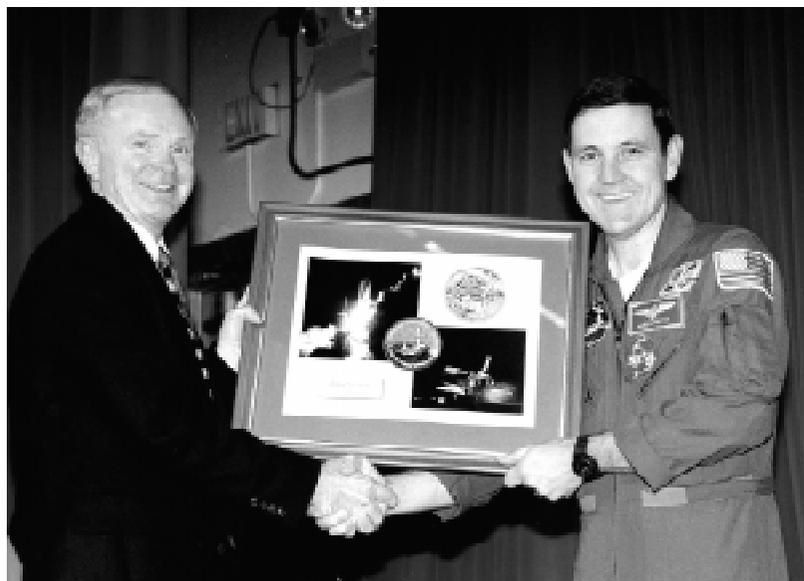
The NASA budget summary released at the press conference included a total budget for the year 2000 of \$13,578.4 million, with \$2,482.7 million allocated to the International Space Station and \$3,155.3 million allocated to launch vehicles and payload operations.

"We have not targeted reductions in the Shuttle program because we have already taken steps to make it safer and more efficient," he said. "The Shuttle is safer than ever before, and because of our continuous improvement programs and Shuttle upgrades,

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(See X-33, Page 3)

STS-88 crew return to America's spaceport



In a ceremony in KSC's Training Auditorium, Center Director Roy Bridges (left) presents STS-88 Commander Robert Cabana with a framed mission photo. The STS-88 crew returned to KSC on Jan. 22 to give employees a review of the mission, which was the first U.S. flight for assembly of the International Space Station. The prime objective of the mission, to mate the U.S.-built Unity connecting module with the Russian-built Zarya control module, was successfully achieved. STS-88 launched Dec. 3 from Launch Pad 39A and, after a 12-day journey, landed Dec. 15 at KSC's Shuttle Landing Facility.

Be heart smart: Register for CPR classes soon

NASA civil service employees are invited to attend a free training class in Cardiopulmonary Resuscitation (CPR) on Friday, Feb. 12, from 8:30 a.m. to noon in the Training Auditorium. The class will also be offered for the next seven consecutive Fridays at the same time and place.

This training is scheduled in part due to a question posed during

KSC's Super Safety Day in 1998.

This training is voluntary and intended for individuals not requiring CPR certification for their job.

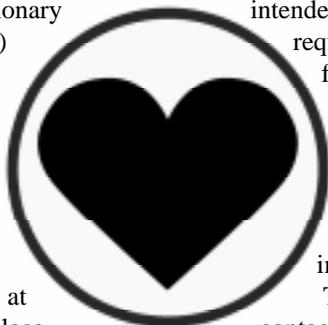
The class size will be limited to the first 36 people who register.

More classes will be arranged if demand indicates greater interest.

To register for the class,

contact Gwen Lewis at

867-2737 and let her know the date you wish to attend.



February employees of the month

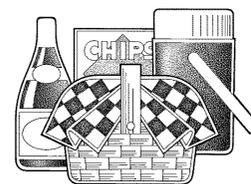


Honored in February are, in the front row from left to right, Liz Wise, Space Shuttle Program Launch Integration; Patricia Davis, Shuttle Processing; Kathy Aglitz, Safety and Mission Assurance; Helen Kane, Administration Office; and Mary Poitier, Office of the Chief Financial Officer. In the back row, left to right, are Chaz Wendling, ELV and Payload Carriers Program Office; Jack Keifenheim, Payload Processing; Allen Miller, Procurement Office; Edrick Jackson, Logistics Operations; Mark Mason, Office of the Chief Information Officer; and Todd Steinrock, Engineering Development. Not shown are Greg Horvath, Space Station Hardware Integration Office; Carol Valdes, Installation Operations; and Rich Lundgren, Checkout and Launch Control System Office.

Mark your calendars for the All-American Picnic

KSC's 1999 All-American Picnic will be held Saturday, Apr. 10, from 10 a.m. to 4 p.m., at KARS Park 1. Tickets will go on sale approximately two weeks before the event. Mark your calendars now and watch for more details in upcoming

issues of *Spaceport News*, as well as on the soon-to-be released Web site on KSC's Internal Home Page.



Annual Community Involvement and Services Exposition was held recently at KSC



KSC Director of Public Affairs Joe Gordon (far left) and Deputy Director for Business Operations James Jennings share a laugh with Trish Moran, NASA payload customer processing support manager, as they tour KSC's annual Community Involvement and Services Exposition, held Jan. 21 in the Operations and Checkout Building's Mission Briefing Room. Coordinated by the KSC Community Relations Council, Community Services of Brevard, Inc., and United Way of Brevard County, the exposition included an impressive number of more than 70 agencies and community groups, providing KSC employees with information on local services available to them and their families.

NKMA announces scholarships

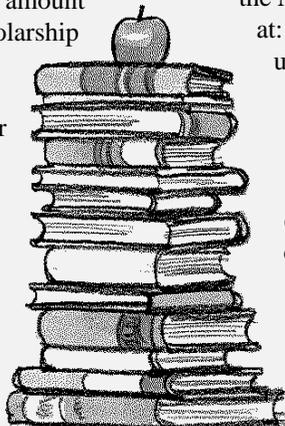
NASA's Kennedy Management Association (NKMA) recently announced that it intends to award scholarships in the minimum amount of \$500 per scholarship to promote educational opportunities for high school seniors, as well as for college and vocational school students who are academically talented and who have

demonstrated a commitment to excellence.

With a due date of Mar. 5, applications are available from the NASA homepage located at: <http://nkma.ksc.nasa.gov> under 'Activities.'

In order to qualify for the scholarship, an applicant must be an active KSC civil service employee, spouse or dependent.

Questions about scholarships may be directed to Maria Lopez-Tellado at 867-9494.



X-33 ...

(Continued from Page 1)

Lockheed Martin to assemble a unique industry/government team that includes KSC engineers who have traditionally focussed on processing the Space Shuttle.

"We are here first and foremost to support a highly successful Space Shuttle program and the new International Space Station and expect those outstanding services to continue for many years, but these budding RLV development programs are important to KSC," said Roy Bridges, KSC director.

"As NASA's Center of Excellence for Launch and Payload Processing Systems, it makes sense that we're helping in this

initiative."

NASA and Lockheed Martin engineers have labored hand-in-hand with United Space Alliance workers and KSC taking advantage of an immense launch support infrastructure.

Lockheed Martin initiates developmental efforts like the Vehicle Positioning System project through individual task agreements with NASA and contractually with industry partners.

The X-33 is intended to prove the cutting-edge technologies required for a full-scale RLV such as Lockheed Martin's VentureStar, which is planned for development after the turn of the century.

The X-33 is scheduled to make as many as 15 test flights from

Budget ...

(Continued from Page 1)

it costs the American taxpayer 21 percent less than it did in 1991.

"We will not make any reductions in the civil service workforce at our aeronautics centers," he noted. "We are committed to maintaining the crucial technical skills in our civil service workforce to assure that our nation has the ability to

continue to lead the way in aeronautics. ...

"We are now embracing an even more aggressive program for the Space Shuttle, which will improve quality and result in even more improvements for safety."

Goldin closed his remarks noting that NASA "doesn't think small, because we plan for the long term, not the short term. This budget is ... designed for the next millennium."

Edwards Air Force Base in California to Dugway Proving Ground in Utah and Malmstrom Air Force Base in Montana.

Although suborbital, the X-33

will fly high enough and fast enough to encounter conditions similar to those experienced on an orbital flight path to fully prove its systems and performance.

Files from the X-ray observatory: *our past is out there*

NASA's Chandra X-ray Observatory, scheduled for launch on STS-93, will be the most sophisticated X-ray observatory ever built. Chandra will help astronomers better understand the structure and evolution of the universe by studying powerful

sources of X-rays, such as exploding stars and matter falling into black holes.

NASA recently announced the delay of the observatory's arrival at Kennedy Space Center. At press time, its arrival at KSC was scheduled for Thursday, Feb. 4.

Due to the delay, STS-93 is now scheduled for launch no earlier than mid-May. The observatory's delayed arrival at KSC allowed Chandra's prime contractor, TRW Space and Electronics Group, to evaluate and correct a potential problem with several printed circuit boards in the command and data management system.

TRW discovered the potential problem with the printed circuit boards during recent testing of another spacecraft. The problem was traced to poor conductivity between different layers of the boards.

Similar boards are used in Chandra's main command and telemetry unit and five remote units. Managers extended testing to

subject the boards to the rigors of on-orbit operations equal to three times the observatory's planned lifetime.

Chandra will provide images that are 50 times more detailed than previous X-ray missions. X-ray astronomy can only be done from space because Earth's atmosphere blocks X-rays from reaching the surface.

At more than 45 feet in length and weighing more than five tons, the observatory will be one of the largest objects ever placed in Earth orbit by the Space Shuttle.

The Chandra X-ray Observatory Program is managed by Marshall Space Flight Center, in Huntsville, Ala., for NASA's Office of Space Science, in Washington, D.C.



Participating in assembly of the Chandra X-ray Observatory's optical bench structure at TRW, Redondo Beach, Calif., workers are dwarfed by Chandra's astronomical size.

Observations of X-rays and Chandra

- Chandra will fly 200 times higher than the Hubble Space Telescope — more than one-third of the way to the moon.
- Chandra will observe X-rays from clouds of gas so vast that it takes light five million years to go from one side to the other.
- During maneuvers from one target to the next, Chandra slews more slowly than the minute hand on a clock.
- Chandra's resolving power is equivalent to the ability to read a newspaper at the distance of half a mile.
- The electrical power to operate the Chandra spacecraft and instruments is two kilowatts, about the same as a hair dryer.
- The light from some quasars observed by Chandra will have been traveling through space for 10 billion years.
- Radio and infrared telescopes observe cool clouds of gas and dust that are a hundred or more degrees below zero.
- The largest cosmic X-ray sources are clouds of hot gas containing enough matter to make several hundred trillion stars!

A walk on the wild side — Merritt Island National Wildlife Refuge

Mention Canaveral and Merritt Island and many people imagine space exploration — the excitement of countdown and the thrill of the launch.

But there is another kind of space here, one that is almost a well-kept secret.

This space can be secluded, where gentle breezes caress miles of primitive beach and endangered sea turtles struggle from their leathery eggs.

The space is also aromatic, as humid air releases the fragrance of tropical blossoms.

The Merritt Island National Wildlife Refuge, which surrounds Kennedy Space Center, has been preserved through the teamwork of three federal agencies.

It was set aside in the late 1950s as a buffer zone for nearby NASA activities.

protecting this land. Of the 140,000 acres owned by NASA, only about 10,000 acres are used for spaceport activities.

“The rest provides a natural habitat for birds, mammals, fish, amphibians and reptiles, including endangered species,” he said.

The Merritt Island National Wildlife Refuge provides habitat for endangered species such as manatees, wood storks, Florida scrub jays and Atlantic loggerhead and leatherback turtles.

You can drive through the refuge on one of its most popular self-guided tours, the six-mile Black Point Wildlife Drive.

The one-way road through the refuge accommodates large recreational vehicles and ends on State Road 406.

Also at the refuge are foot trails, observation tower platforms and



Raccoons gaze attentively at the photographer's camera as if posing for the picture.



Feral boars chow down like hogs on the abundant grasses of the Merritt Island National Wildlife Refuge. The bristly creatures are a common sight in the area, and there are an estimated several thousand of them on the refuge. They are omnivores, which means they will eat anything. The hogs were released into the area by early settlers to Florida and became wild over successive generations.

When the space race launched KSC into world prominence, preservation of this barrier island was ensured.

In cooperation with NASA, the U.S. Fish and Wildlife Service has managed Merritt Island National Wildlife Refuge since 1963, and the National Park Service has managed the Canaveral National Seashore since 1975.

“Of the 514 national wildlife refuges in the United States, only two have more species of birds that we do,” said Dorn Whitmore, a ranger at the Merritt Island National Wildlife Refuge.

“We have 326 species of birds here, thanks in large part to NASA

photography vantage points.

“This is one of our most popular tours in the winter,” said Whitmore, “and bird watching is the fastest growing outdoor recreational activity in the U.S., according to recent surveys.”

Beginning bird-watching tours are offered November through March at the refuge.

This February, tours are available on Thursdays from 9 a.m. to noon and special youth birdwatching tours (for youths accompanied by a parent or guardian) on two Saturdays — Feb. 13 and 27, from 9 a.m. to noon.

Suggested items to bring include binoculars, a camera, spotting

scope, field guides, bug repellent and a snack.

Many of these items are also available for purchase at the refuge gift shop. The refuge's office and visitor information center is located four miles east of Titusville on Route 402.

Here you will find exhibits, publications and information on the

refuge, as well as a gift shop.

The visitor information center is open seven days a week November through March — Monday through Friday from 8 a.m. to 4:30 p.m. and on weekends from 9 a.m. to 5 p.m.

From April through October, the center is closed Sundays.

For more information, call (407) 861-0667.



A black skimmer lives up to its name as it flies low over the water in the Merritt Island National Wildlife Refuge. These birds skim the surface of the water for fish, with the tip of their lower mandibles cutting through the water. Skimmers breed chiefly on sandbars and beaches — feeding in shallow bays, inlets and estuaries.



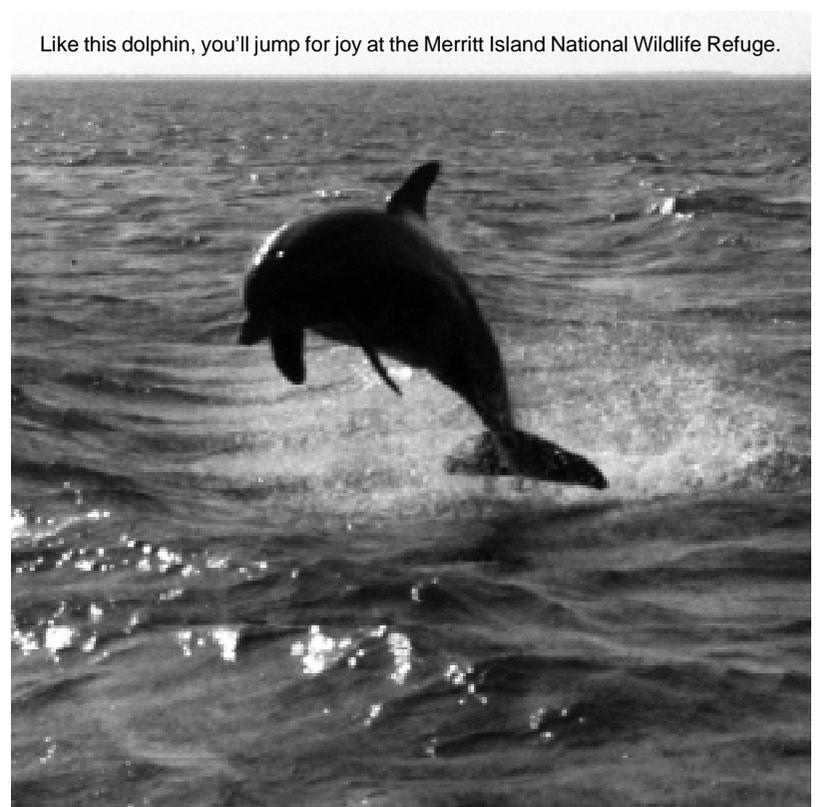
A family of otters, above, fish around in the waters of the Merritt Island National Wildlife Refuge. You can fish at the refuge, too. Just bring your fishing license and gear to the 20-mile stretch of Mosquito Lagoon, where there are no houses or causeways to disturb nature, or along Canaveral National Seashore, where you can enjoy near-tropical water temperatures that attract scrappy bluefish, whiting, pompano and other types of fish.



The Merritt Island National Wildlife Refuge's visitor information center is located four miles east of Titusville on Route 402. The visitor information center is open seven days a week November through March — Monday through Friday from 8 a.m. to 4:30 p.m. and on weekends from 9 a.m. to 5 p.m. From April through October, the center is closed Sundays. For more information, call (407) 861-0667.



This baby white-tailed deer was spotted on the Merritt Island National Wildlife Refuge.



Like this dolphin, you'll jump for joy at the Merritt Island National Wildlife Refuge.



A stuffed raccoon and eagle watch over activities in the visitor information center.

African American History Month

How well do you know American history? Do you know who these two women are? Short biographies follow to give you some clues. (Answers are at the bottom of the page.) The Mars Pathfinder Soujourner rover was named after one of these women.

Help celebrate African American History Month by attending the Black Employees Strategy Team African American Breakfast on Thursday, Feb. 18, at 8 a.m. in the Apollo Saturn V Center. A breakfast buffet will be served to attendees, followed by a program in the Lunar Theater. Major General

Titus Hall, USAF (Ret.), will be the guest speaker. He retired after serving as commander of the Lowry Air Force Base Technical Training Center in Denver and previously flew 115 combat missions in Vietnam as a navigator. Hall is also the founder and chairman of STARSAT 1200, Inc., an organization trying to improve the Scholastic Aptitude Test program.

Tickets are \$8 per person and are available by calling Carol Davis at 867-3190, Alice Smith at 867-2963, Janice Everett at 867-4127 or Wanda Petty at 867-2307.



Which abolitionist fought for the desegregation of public transportation in Washington, D.C. during the Civil War and refused to face the indignities of Jim Crow segregation on street cars?

This person was a traveling preacher and had a reputation as a powerful speaker, being one of the first people in the country to link the oppression of black slaves with the oppression of women.

This powerful speaker also became known for having a quick wit and powerful presence, speaking before Congress and two presidents.

And who was born a slave in 1821 near the eastern shore of Maryland, but escaped to freedom and then led hundreds to do the same?

This person led at least 200 people to freedom.

All of these trips were successful because this person was a master in planning the strategy of each of escape operations.

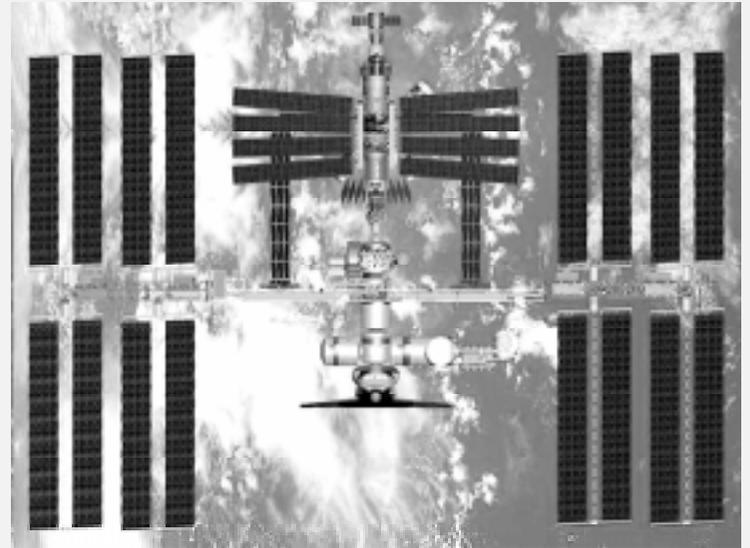
No detail was missed: food, clothing, train tickets and forged passes, even sedatives for crying babies.

On at least one occasion, this person threatened to shoot a passenger who had second thoughts about escaping. The overnight stops on what came to be know as the Underground Railroad were a network of homes and churches.

This person was well known throughout the slave community and was often compared to Moses.



Answers: At top left, Abolitionist Sojourner Truth, nee Isabella Baumfree, had the Jim Crow car removed from Washington D.C. Below her is one of the famed leaders of the Underground Railroad, Harriet Tubman. Both were born as slaves.



No time for a station break on orbit

Flight controllers last month continued to monitor the International Space Station, performing routine housekeeping activities, as well as a test using the Unity module's communications system to command some Zarya module systems.

The test checked the capability to send commands to Zarya through the U.S. Early Communications System installed by Shuttle astronauts during STS-88 in December.

Mission controllers also continued cycling of the six Zarya batteries to maintain them at peak operation, and the power system on the station continued to perform well.

Mission controllers in Houston and Moscow also periodically checked the station's orientation — a naturally stable slow spin that

provides moderate vehicle shell temperatures and conserves fuel — using television camera views from onboard the station as well as other data.

The next station assembly mission will be a visit by the Space Shuttle Discovery planned for launch in May on STS-96.

The International Space Station is in an orbit with a high point of 259 statute miles and a low point of 245 statute miles, circling Earth once every 92 minutes.

Opportunities available for locations worldwide to view the International Space Station from the ground as it passes overhead can be found on the Internet at: <http://spaceflight.nasa.gov/realdata/sightings>



John F. Kennedy Space Center

Spaceport News

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