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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

Fortieth Anniversary
Pioneering the Future

The proof is in the pudding

During the week of June 14, an auditor from Det Norske Veritas (DNV), one of the world's leading ISO certification organizations, visited NASA directorates throughout KSC, Cape Canaveral Air Station (CCAS) and Patrick Air Force Base to assess the space center as part of its certification process.

The audit also included a thorough assessment of the Joint Performance Management Office, a newly formed organization with Air Force and NASA personnel to manage the Joint Base Operations Support Contract.

NASA Business Management System enhancements incorporated into the system were also subject to review.

"We concluded this second audit of KSC's Business Management System without a single finding of non-compliance," noted Rey Diaz, business systems manager with KSC's

(See ISO, Page 3)

Lighting a FUSE for astronomical research

For hundreds of years, astronomers observed the universe using only visible light.

However, visible light is a tiny portion of a much broader range of light energy known as the electromagnetic spectrum, which includes everything from energetic X-rays and gamma rays to infrared radiation and radio waves.

Much of this "invisible" light gets blocked by the Earth's atmosphere, but in the last 40 years, astronomers have been using telescopes above the atmosphere to obtain entirely different perspectives on the universe.

A new perspective, one that has only been glimpsed a few times before, will be provided by a telescope known as the Far Ultraviolet Spectroscopic Explorer, or FUSE.

At press time, the launch of FUSE was scheduled for no earlier than June 24 from Cape Canaveral Air Station's Launch Pad 17A, with a launch window extending from 11:39 a.m. to 12:57 p.m.

(See FUSE, Page 5)

At Hangar AE on Cape Canaveral Air Station (CCAS), workers attach a solar panel to NASA's Far Ultraviolet Spectroscopic Explorer (FUSE) satellite. FUSE was developed to investigate the origin and evolution of the lightest elements in the universe — hydrogen and deuterium. At press time, FUSE was set for launch no earlier than June 24.

QuikSCAT: Built to chase the wind

Built in record time in just 12 months, the Quick Scatterometer (QuikSCAT), NASA's new ocean-observing satellite, was launched on a Titan II rocket from California's Vandenberg Air Force Base at 7:15 p.m. Pacific Daylight Time on June 19.

KSC Director Roy Bridges, representatives of senior management and other KSC launch support personnel traveled to California to support the launch.

QuikSCAT is intended to replace the NASA Scatterometer instrument on Japan's Midori satellite (previously known as the Advanced Earth Observation Satellite), which lost power in June 1997 nine months after launch in September 1996.

The QuikSCAT satellite will be NASA's next "El Niño watcher" and will be used to better understand global weather abnormalities.

QuikSCAT will provide climatologists, meteorologists and oceanographers with daily, detailed snapshots of ocean winds as they swirl above the world's oceans.

The mission should also greatly improve weather forecasting. This is because winds play a major role in every aspect of weather on Earth. They directly affect the turbulent exchanges of heat, moisture and greenhouse gases between Earth's atmosphere and the ocean.

To better understand their impact on oceans and improve weather forecasting, the satellite carries a state-of-the-art radar instrument called a scatterometer for a two-year science mission.

(See QuikSCAT, Page 2)

QuikSCAT ...

(Continued from Page 1)

"Knowledge about which way the wind blows and how hard is it blowing may seem simple, but this kind of information is actually a critical tool in improved weather forecasting, early storm detection and identifying subtle changes in global climate," said Dr. Ghassem Asrar, associate administrator of NASA's Office of Earth Science, Washington, D.C.

The mission will help Earth scientists determine the location, structure and strength of severe marine storms — hurricanes in the Atlantic, typhoons near Asia and mid-latitude cyclones worldwide — which are among the most destructive of all natural phenomena.

The National Oceanic and Atmospheric Administration (NOAA), a chief partner in the QuikSCAT mission, will use mission data for improved weather forecasting and storm warning, helping forecasters to more accurately determine the paths and intensities of tropical storms and hurricanes.

As NASA's next "El Niño watcher," QuikSCAT will be used to better understand global El Niño and La Niña weather abnormalities. Changes in the winds over the equatorial Pacific Ocean are a key component of the El Niño/La Niña phenomenon.

QuikSCAT will be able to track changes in the trade winds along the equator.

Scatterometers operate by transmitting high-frequency microwave pulses to the ocean surface and measuring the "back-scattered" or echoed radar pulses bounced back to the satellite. The instrument senses ripples caused by winds near the ocean's sur-face, from which scien-tists can compute the winds' speed and direction. The instru-ments can acquire hun-dreds of times more observa-tions of surface wind velocity each day than can ships and buoys, and are the only remote-sensing systems able to provide continuous, accurate and high-resolution measurements of both wind speeds and direction regardless of weather conditions.

This artist's rendering of NASA's Quick Scatterometer (QuikSCAT) satellite shows the large, dish-like feature at the bottom of the satellite, which is the scatterometer instrument that will measure winds over the ocean surface. The instrument will collect data over ocean, land and ice in a continuous, 1,800-kilometer-wide band, making approximately 400,000 measurements per day.

QuikSCAT's Sea Winds radar may help improve the response time of emergency preparedness agencies during fast-moving weather fronts, floods, hurricanes, tsunamis and other natural disasters, such as supertyphoon Yuri. This photograph of Yuri was taken during STS-44 on Dec. 1, 1991, in the western Pacific Ocean — approximately 1,000 miles east of the Philippine Islands. At the time this photo was taken, Yuri was about 1,000 nautical miles in diameter and had estimated maximum sustained wind speeds of 145 mph, gusting to 170 mph. This oblique view shows the well formed eye of Yuri and the raised segment of clouds at the cusp of the eye, indicating very high wind speeds within the vortex.

The primary instrument on the QuikSCAT spacecraft is "Sea Winds," a specialized micro-wave radar to collect frequent, high-resolution measurements about the speed and direction of winds near the ocean surface. It is part of NASA's Earth Observing System, which is designed to address global environmental changes, regional weather patterns and climate.

The satellite is the first obtained under NASA's Indefinite Delivery/Indefinite Quantity program for rapid delivery of satellite core systems.

The procurement method provides NASA with a faster, better and cheaper method for the purchase of satellite systems through a "catalog," allowing for shorter turnaround time from mission conception to launch.

Total mission cost for QuikSCAT is $93 million.

Fifteen times a day, the satellite will beam down collected science data to NASA ground stations, which will relay them to scientists and weather forecasters.

SeaWinds will provide ocean wind coverage to an international team of climate specialists, oceanographers and meteorologists interested in discovering the secrets of climate patterns and improving the speed with which emergency preparedness agencies can respond to fast-moving weather fronts, floods, hurricanes, tsunamis and other natural disasters.

"By combining QuikSCAT's wind data with information on ocean height from another ocean-observing satellite, the joint NASA-French TOPEX/Poseidon mission, scientists will be able to obtain a more complete, near-real-time look at wind patterns and their effects on ocean waves and currents," said Dr. Timothy Liu, QuikSCAT project scientist at NASA's Jet Propulsion Laboratory, Pasadena, Calif.

He added that QuikSCAT will complement data being collected by other Earth-monitoring satellites such as NASA's currently orbiting Tropical Rain Measurement Mission (TRMM) and Terra, which will be launched later this year.

The 1,910-pound QuikSCAT satellite, provided by Ball Aerospace & Technologies Corp., Boulder, Colo., with its 450-pound radar instrument, called SeaWinds, will be placed in a circular, near-polar orbit with a ground speed of 14,750 miles per hour. The satellite will circle Earth every 101 minutes at an altitude of 500 miles.

QuikSCAT is managed for NASA's Office of Earth Science, Washington, D.C., by the Jet Propulsion Laboratory, which also built the Seawinds radar instrument and will provide ground science processing systems.

NASA's Goddard Space Flight Center, Greenbelt, Md., managed development of the satellite, designed and built by Ball Aerospace & Technologies Corp., in Boulder, Colo.

NASA's Earth Sciences Enterprise is a long-term research and technology program designed to examine Earth's land, oceans, atmosphere, ice and life as a total integrated system.

Columbia poised for launch on STS-93

To the human eye, space appears serene and void. It is neither.

To the eye of an X-ray telescope, the universe is totally different — a violent, vibrant, and ever-changing place.

Temperatures can reach millions of degrees.

Objects are accelerated by gravity to nearly the speed of light and magnetic fields more than a trillion times stronger than the Earth's cause some stars to crack and tremble.

The Chandra X-ray Observatory, scheduled to launch the third week of July on STS-93, will obtain X-ray images of these and other exotic environments to help scientists better understand the structure and evolution of the universe.

The observatory also will serve as a unique tool to study detailed physics in a laboratory that cannot be replicated here on Earth – the universe itself. Chandra will provide unique and crucial information on the nature of objects

(See STS-93, Page 8)

The Space Shuttle Columbia was rolled out to KSC's Launch Pad 39B on June 7, fewer than two weeks after the liftoff of Discovery on mission STS-96. Columbia is at the pad in preparation for the launch of STS-93, scheduled for the third week in July. Then, the Chandra X-ray Observatory, the world's most powerful X-ray telescope, will be launched, along with the first female Space Shuttle commander, Eileen Collins. The observatory will allow scientists to see previously invisible black holes and high-temperature gas clouds, giving the observatory the potential to rewrite the books on the structure and evolution of our universe.

Community Leaders' Breakfast details KSC's progress

Kennedy Space Center's annual Community Leaders Breakfast and Briefing was held June 22 at KSC's Visitor Complex for about 200 invited guests.

Mayors, bank presidents, leaders in education, representatives from local police departments, members of Canaveral Port Authority, and others all gathered in the IMAX II Theater to hear from Center Director Roy Bridges and KSC senior management about what the future holds for the space center.

The theme of the briefing was "Taking the Leap: A New Millenium of Space Exploration."

After the breakfast gathering and a video presentation, Bridges informed community leaders of the activities, changes, and products and services KSC offers to Brevard and its surrounding counties.

Following Bridges' remarks, senior members of his staff joined him on a panel to answer questions from the audience.

Panel members included Deputy Director for Business Operations Jim Jennings, Deputy Director for Launch and Payload Processing Loren Shriver and other key members of KSC senior management.

Together, the executives provided local leaders with a good look at how the center has progressed over the past year and how, through future partnerships, the center's resources will continue to provide unparalleled developmental and operational expertise.

Following the briefing, community leaders were treated to a tour of the Visitor Complex's new attractions — Robot Scouts, the Universe Theater's "Quest for Life," and the Merritt Island Wildlife Exhibit.

ISO ...

(Continued from Page 1)

Business Innovation Group (BIG).

This is the second periodic audit since KSC met the requirements for ISO 9001 certification in May 1998. ISO 9001 comprises the most detailed, comprehensive set of standard requirements for quality management systems. Periodic audits are performed every six months to assess compliance with ISO standards.

"We completed the first periodic audit in December of 1998 with only one minor non-compliance, which has been completely resolved," Diaz noted, "so it's encouraging that we're continuing on this path of performance excellence upholding KSC's management system."

KSC's certification applies to management of space systems, test and launch techniques, development of associated technologies and enhancement of core capabilities.

Super Safety and Health Day held June 17 at KSC

On June 17, Kennedy Space Center and Cape Canaveral Air Station 45th Space Wing held the second annual Super Safety and Health Day, suspending all normal work activities with the exception of mandatory services.

Federal and contractor employees joined together to focus on safety and health issues.

The theme of the day — Safety and Health Go Hand in Hand — called to everyone's attention that safety and health are united at KSC as the center renewed its commitment to place the safety and health of the public, astronauts, employees and space-related resources first.

A panel of NASA and U.S. Air Force executives fielded questions from the audience on safety and health issues affecting the space center.

United Airlines Pilot and Instructor Captain Dennis "Denny" Fitch delivered the keynote address to audiences at KSC's second annual Super Safety and Health Day. He stressed the importance of teamwork and how it lead to the survival of 184 individuals involved in the United Airlines Flight 232 crash landing on July 19, 1989, in Sioux City, Iowa. Fitch was one of 296 people on board the DC-9 aircraft when it sustained a catastrophic failure of one engine and all hydraulic controls. Fitch offered his assistance to the crew during the crisis and was commended by then President George Bush and in Senate Resolution 174 of the 101st Congress for his outstanding effort, poise and courage during the tragic landing. He and the crew hold the distinguished record of the longest time aloft without flight controls who lived to tell about it. His poignant and sometimes humorous remarks at KSC were a highlight of the Super Safety and Health Day.

Lunar Prospector launched from KSC set to make a big splash

The mission of NASA's Lunar Prospector will end on July 31, 1999, when ground controllers attempt to direct the spacecraft to impact the surface of the moon inside a permanently shadowed crater near the lunar south pole.

Lunar Prospector was launched with a one-year primary and six-month extended mission to explore the lunar surface remotely.

The mission began at Kennedy Space Center when it launched Jan. 6, 1998, from Cape Canaveral Air Station's Launch Complex 46 (LC-46). It was the inaugural launch of Lockheed Martin's Athena II launch vehicle and the first launch from LC-46, operated by Spaceport Florida Authority.

In March 1998, mission scientists announced that science instruments aboard Lunar Prospector had detected sufficiently large quantities of hydrogen at the lunar poles to infer the presence of water ice.

In September, scientists estimated that up to six billion metric tons of water ice may be buried in the permanently shadowed craters of the moon's poles.

Although the Lunar Prospector spacecraft will weigh only 354 pounds at mission end, the energy at impact will be the equivalent of crashing a two-ton car at more than 1,100 miles per hour.

Scientists hope that the direct impact into a lunar crater will liberate up to 40 pounds of water vapor that may be detectable from ground- and space-based observatories. A positive detection of water vapor or its byproduct, OH, would provide definitive proof of what some scientists have long suspected — the presence of water ice in the lunar polar regions.

"While the probability of success for such a bold undertaking is low, the potential science payoff is tremendous," said Dr. Guenter Riegler, Director of the Research Program Management Division in the Office of Space Science at NASA Headquarters, Washington, D.C.

"External peer reviews of this plan have been very favorable, and we have concluded that it is both

(See Lunar, Page 6)

NASA's Lunar Prospector spacecraft launched successfully on its way to the moon from Launch Complex 46 (LC-46) at Cape Canaveral Air Station on Jan. 6, 1998. It was the inaugural launch of Lockheed Martin's Athena II launch vehicle and the first launch from LC-46, operated by Spaceport Florida Authority.

FUSE ...

(Continued from Page 1)

Funded by NASA as part of its Origins program, FUSE will be launched into orbit aboard a Delta II rocket for at least three years of operations.

FUSE was developed for NASA by the Johns Hopkins University, which has the primary responsibility for all aspects of the project, including both the development and operational phases of the mission.

This is the first time that a mission of this scope has been developed and operated entirely by a university.

FUSE also was developed in collaboration with the space agencies of Canada and France, who will share in the observing time.

FUSE is designed for a very specialized and unique task that is complementary to other NASA missions.

FUSE will look at light in the far ultraviolet portion of the electromagnetic spectrum that is unobservable with other telescopes.

FUSE will observe these wavelengths with much greater sensitivity and resolving power than previous instruments used to study light in this wavelength range.

NASA's newest space telescope is designed to scour the cosmos for the fossil record of the origins of the universe.

Scientists will use FUSE to study the earliest relics of the Big Bang — hydrogen and deuterium — to unlock the secrets of how the primordial chemical elements of which all the stars, planets and life evolved, were created and distributed since the birth of the universe.

With this information, astronomers in effect will look back in time at the infant universe, and they hope to better understand the processes that led to the formation and evolution of stars, including our solar system.

"We think that as stars age deuterium is destroyed," said NASA's Dr. George Sonneborn, Goddard Space Flight Center, Greenbelt, Md., the FUSE project scientist.

"Mapping deuterium throughout the Milky Way will give us a better understanding of how elements are mixed, distributed and destroyed," he continued.

"The big questions are these: Do we understand the origins of the universe, and do we understand how galaxies evolve?" said Dr. Kenneth Sembach, a FUSE science team member from the Johns Hopkins University, Baltimore, Md.

"Because FUSE can observe ultraviolet light that other telescopes can't, we can test in unique ways how deuterium and other elements are circulated within galaxies. That in turn may test the limits of the Big Bang theory," Sembach said.

Among the cosmic questions FUSE will tackle are:

- What were conditions like in the first few minutes after the theoretical Big Bang?
- What are the properties of the interstellar gas clouds out of which stars and planets form?
- Does the Milky Way have a vast galactic fountain that gives birth to stars, spews hot gas, circulates elements and churns out cosmic material over and over?

The 3,000-pound FUSE satellite consists of two sections: the spacecraft and the science instrument.

The spacecraft and the science instrument each have their own computers, which coordinate the activities of the satellite. The FUSE satellite arrived at NASA's Hangar AE on Cape Canaveral Air Station on April 1 for prelaunch processing.

FUSE will be launched from Cape Canaveral Air Station, Fla., aboard a Boeing Delta II rocket into a circular orbit 477 miles above Earth, and will orbit about every 100 minutes.

The satellite must operate on its own most of the time, moving from target to target, identifying star fields, centering objects in the spectrograph apertures and performing observations.

The Goddard Space Flight Center, Greenbelt, Md., manages FUSE, one of the first missions in NASA's Origins program, for NASA's Office of Space Science, Washington, D.C.

Information on the FUSE mission and NASA's Origins Program can be found at *http://fuse.pha.jhu.edu* , *http://fusewww.gsfc.nasa.gov/fuse/* , and *http://origins.jpl.nasa.gov/* .

The FUSE satellite (left) was processed for launch in NASA's Hangar AE at Cape Canaveral Air Station shortly after its arrival on April 1. Above, the second stage of a Boeing Delta II rocket was lifted up the launch tower at Cape Canaveral Air Station (CCAS)'s Launch Pad 17A on June 7. FUSE was developed by The Johns Hopkins University under contract to Goddard Space Flight Center, Greenbelt, Md., to investigate the origin and evolution of the lightest elements in the universe: hydrogen and deuterium. In addition, the FUSE satellite will examine the forces and process involved in the evolution of the galaxies, stars and planetary systems by investigating light in the far ultraviolet portion of the electromagnetic spectrum. When *Spaceport News* went to press, FUSE was scheduled for launch on June 24.

Apollo 11 anniversary celebrations afoot

The 30th anniversary of Apollo 11 will be celebrated at Kennedy Space Center, focusing on the people who made the lunar landing program possible.

Several events are planned for the Friday, July 16 anniversary of the launch and the following day. Invitations are in the mail to more than 7,000 former NASA and contractor employees.

NASA Headquarters has arranged for Neil Armstrong and Edwin "Buzz" Aldrin to appear at a dinner at the Apollo/Saturn V Center the evening of July 16, which will be a focal point for recognizing the contributions of the thousands of workers who made the lunar landing program possible. Approximately 1,000 people are expected to attend.

NASA Administrator Dan Goldin, Center Director Roy Bridges and several other Apollo astronauts also are expected to participate in the program at the Apollo/Saturn V Center.

The program will include remarks from the astronauts, NASA officials and the premiere performance of a new musical composition commemorating the Apollo Program by composer and performer Jonn Serrie. He is best known as a composer of music for planetariums nationwide and has a number of "space music" albums on the Miramar label.

The astronaut Max-Q and employee Bravo Hotel bands also will entertain during the social hour and dinner.

Dinner and picnic tickets are available from the Apollo 11 Commemoration Association, at Post Office Box 321221, Cocoa Beach, Fla. 32931-1221.

Dinner tickets must be ordered by July 2.

Other events planned for the anniversary celebrations on July 16 include a ground-breaking ceremony for the U.S. Space Walk of Fame Apollo monument at Space View Park in Titusville. A free continental breakfast will be served starting at 9 a.m. Ground breaking will be at 9:32 a.m. — the launch time of Apollo 11.

On July 17, the 30th Anniversary Reunion Picnic will be held from 6 to 11 p.m. at Fox Lake Park in Titusville. Tickets are $15 and are limited to the first 1,200 people to make reservations.

Former Grumman employees and their families also have a reunion scheduled on July 17 at the Comfort Inn and Suites in Cocoa Beach. Tickets are $10 each.

Special events for the general public will be held at the KSC Visitor Complex on July 17.

The Apollo 11 Commemoration Association is working with *Florida TODAY* newspaper in sponsoring an essay contest for young people on the subject of "the impact of the lunar landing program on our civilization and the role space exploration should play in the future." Three $500 scholarships will be awarded at the dinner on July 16.

Close-up view of an astronaut's footprint in the lunar soil photographed with a 70mm lunar surface camera during the Apollo 11 space walk on the moon.

The Apollo 11 Commemoration Association is made up of representatives of the Florida Chapter of the National Space Club, the NASA Alumni League, the Astronaut Scholarship Fund, the Astronaut Hall of Fame, Space Camp, the Astronaut Memorial Foundation, Delaware North Park Services, Lockheed Martin, United Space Alliance, Boeing, Grumman, Brevard County chambers of commerce, the Space Walk of Fame and the Brevard Economic Development Foundation.

Lunar ...

(Continued from Page 4)

technically and operationally feasible," Riegler said. "Since the implementation costs are minimal and the mission is scheduled to end anyway, it seems fitting to give Lunar Prospector the chance to provide scientific data right up to the very end of its highly successful mission."

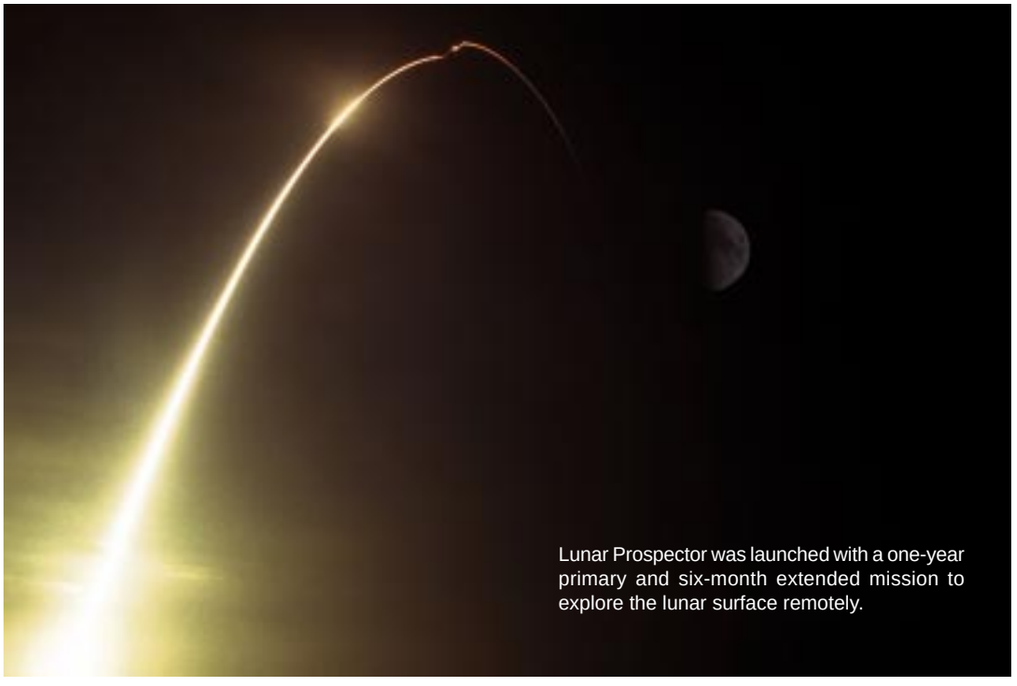
The current plan calls for a controlled impact of the Lunar Prospector spacecraft in the early morning hours of July 31 directly into a small crater, located at the southern lunar pole.

This crater is ideal for the proposed experiment. It is only 31 to 38 miles across and has a rim which is high enough to provide a permanent shadow, yet it is low enough to provide for a suitable spacecraft impact trajectory.

Data from other observations suggest that the crater could contain a high concentration of water ice. Finally, the crater is observable at impact time from Earth-based observatories and orbiting platforms.

"A positive spectral detection of water vapor or its photo-dissociated byproduct, OH, would provide definite proof of the presence of water ice in the lunar regolith," Goldstein said.

However, scientists warn that the failure to observe the desired signal does not mean that water ice is not present. The model could be wrong, the spacecraft may not impact the desired region or the impact energy may be insufficient to liberate an observable plume of water vapor or OH. The overall probability of success is estimated to be about 10 percent.



Lunar Prospector was launched with a one-year primary and six-month extended mission to explore the lunar surface remotely.

Observing time has been granted at the University of Texas McDonald Observatory and on the Hubble Space Telescope.

It is also being sought at other sites from which the moon is clearly visible in the early morning hours of July 31.

Lunar Prospector was the first of NASA's Discovery class of "faster, better, cheaper" space exploration missions. The $63 million mission is managed by NASA Ames Research Center, Moffett Field, Calif.

More information about Lunar Prospector can be obtained at the project website at *http://lunar.arc.nasa.gov* .

International Space Station center truss segment at KSC

The 'backbone' trust segment of the International Space Station (ISS), arrived Saturday morning, June 12, at KSC's Shuttle Landing Facility aboard the "Super Guppy" transport aircraft. It was flown from a division of the Boeing Company in Huntington Beach, Calif.

After landing at KSC's Shuttle Landing Facility, the "Super Guppy" transport aircraft opens to reveal its cargo, an S0 (S Zero) truss segment from Boeing in Huntington Beach, Calif. The truss segment, which will become the backbone of the orbiting International Space Station, is a 44- by 15-foot structure weighing 30,800 pounds when fully outfitted and ready for launch.

This truss segment, called "S Zero," (S0) is a 44-by-15 foot structure weighing 30,800 pounds when fully outfitted and ready for launch.

This segment will be at the center of the 10-truss, girder-like structure that will ultimately extend the length of a football field.

Scheduled for launch in the Spring of 2001, astronauts will attach the S0 truss in space to the U.S. Laboratory named "Destiny."

Later, from each side of the center truss, the astronauts will attach the other trusses.

During processing at KSC, the Canadian Mobile Transporter will be installed on the truss structure. During on-orbit assembly of the International Space Station, Canada's Mobile Service System will move its 55-foot robotic arm along tracks attached to the truss.

Other items to be attached to the truss at KSC include power distribution system modules, a heat pipe radiator for cooling, computers, and a pair of rate gyroscopes.

Four Global Positioning System antennas are already installed.

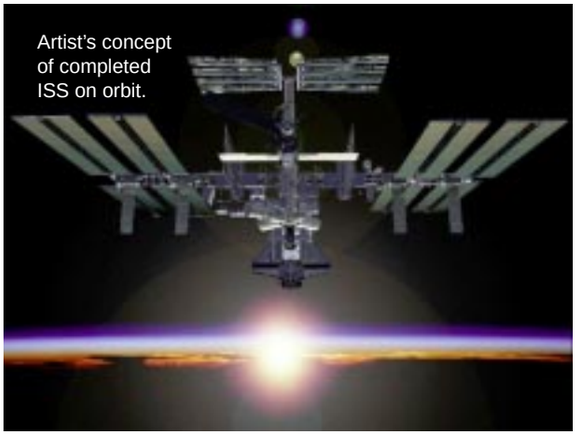
The S0 truss was transported to the Operations and Checkout Building, which has recently been reconfigured from processing Spacelab modules to processing ISS trusses.

At KSC's Shuttle Landing Facility, workers watch as the S0 (S Zero) truss segment is moved out of the "Super Guppy" aircraft. The truss segment will be at the center of the ISS 10-truss, girderlike structure that will ultimately extend the length of a football field. Eventually the S0 truss will be attached to the U.S. Lab, "Destiny," which is scheduled to be added to the International Space Station in April 2000. The S0 truss is scheduled to be launched in the Spring of 2001.

International Space Station awaits next mission

The International Space Station is back on its own after the recent visit of Space Shuttle Discovery to deliver supplies and logistics in preparation for the arrival of the first crew to live on the station early next year.

All systems on the complex are in excellent shape with the station orbiting in its routine, unstaffed position with Unity pointed at the Earth and Zarya pointed toward space.



Artist's concept of completed ISS on orbit.

Available power levels currently are about 865 watts to provide thermal conditioning to the Early Communications System on Unity that was restored to full service by the astronauts during STS-96.

The mission evaluation team confirmed the failure of the Early Communications System return link was due to a switch inside the power distribution box.

The actual cause of the switch failure remains under investigation.

The other major in-flight maintenance work that was performed by the crew during Discovery's mission was to change 18 small voltage regulators for Zarya's six batteries.

Telemetry from the ISS shows all are working properly.

Russian flight controllers now need only charge and recharge the batteries once every six months.

The next Shuttle flight to visit the ISS is scheduled for December following the launch, docking and checkout of the Zvezda Service Module living quarters in November.

Updates on the status of Shuttle launch preparations are available on the Internet at *http://www-pao.ksc.nasa.gov/kscpao/status/status.htm*

The International Space Station is in an orbit with a high point of 252 statute miles and a low point of 240 statute miles, circling the Earth once approximately every 92 minutes.

The station has completed more than 3,150 orbits of Earth since its launch.

As it passes overhead at dawn or dusk, the station is easily visible from the ground.

Space station viewing opportunities for locations worldwide are available on the Internet at *http://spaceflight.nasa.gov/realdata/sightings/*

Ellison appointed examiner

Robert Ellison, corrective and preventive action manager in KSC's Business Innovation Group, has been appointed by the director of the National Institute of Standards and Technology to the 1999 Board of Examiners for the Malcolm Baldrige National Quality Award.

The award, created by public law in 1987, is the highest level of national recognition for performance excellence that a U.S. organization can receive.

As an examiner, Ellison will be responsible for reviewing and evaluating applications submitted for the award. The board is comprised of about 400 leading experts selected from industry, professional and trade organizations, education and health care organizations and government.

Awards may be given annually in each of five categories: service, manufacturing, small business, education and health care.

Center Director Roy Bridges congratulated Ellison, noting that "this is a significant achievement" and applauded Ellison's initiative and dedication to excellence.

STS-93 ...

(Continued from Page 3)

ranging from comets in our solar system to quasars at the edge of the observable universe.

The observatory should provide long-sought answers to some major scientific questions, such as:

• **What and where is the 'dark matter' in our universe?**

The largest and most massive objects in the universe are galaxy clusters — enormous collections of galaxies, some like our own. These galaxies are bound together into a cluster by gravity. Much of their mass is in the form of an incredibly hot, X-ray emitting gas that fills the entire space between the galaxies.

Yet, neither the mass of the galaxies, nor the mass of the hot X-ray gas is enough to provide the gravity that we know holds the cluster together. X-ray observations with the Chandra X-ray Observatory will map the location of the dark matter and help us to identify it.

• **What is the powerhouse driving the explosive activity in many distant galaxies?**

The centers of many distant galaxies are incredible sources of energy and radiation — especially X-rays. Scientists theorize that massive black holes are at the center of these active galaxies, gobbling up any material — even a whole star — that passes too close.

Detailed studies with the Chandra X-ray Observatory can probe the faintest of these active galaxies, and study not only how their energy output changes with time, but also how these objects produce their intense energy emissions in the first place.

Since X-rays are absorbed by the Earth's atmosphere, space-based observatories are necessary to study these phenomena.

Chandra will complement two other space observatories now orbiting Earth —the Hubble Space Telescope and the Compton Gamma Ray Observatory.

Named in honor of the late Indian-American Nobel Laureate Subrahmanyan Chandrasekhar, the observatory was formerly known as the Advanced X-ray Astrophysics Facility (AXAF).

Chandra will be carried into low Earth orbit by the Space Shuttle Columbia.

The observatory will be deployed from the Shuttle's cargo bay at 155 miles above the Earth. Two firings of an attached Inertial Upper Stage rocket and several firings of its own on-board rocket motors after separating from the Inertial Upper Stage will place the observatory into its working orbit.

Unlike the Hubble Space Telescope's circular orbit that is relatively close to the Earth, the Chandra X-ray Observatory will be placed in a highly elliptical (oval-shaped) orbit.

At its closest approach to Earth, the observatory will be at an altitude of about 6,200 miles. At its farthest (87,000 miles), it will travel almost one-third of the way to the Moon.

Due to this elliptical orbit, the observatory will circle the Earth every 64 hours, carrying it far outside the belts of radiation that surround our planet.

The 45-foot-long Chandra X-ray Observatory was mated to its Inertial Upper Stage in KSC's Vertical Processing Facility on June 2.

This radiation, while harmless to life on Earth, can overwhelm the observatory's sensitive instruments.

The X-ray observatory will be outside this radiation long enough to take 55 hours of uninterrupted observations during each orbit.

During periods of interference from Earth's radiation belts, scientific observations will not be taken.

Chandra will provide images that are 50 times more detailed than previous X-ray missions. At more than 45 feet in length and weighing more than five tons, the observatory will be one of the largest objects that the Space Shuttle has ever carried to orbit.

Take Our Sons to Work Day at KSC

Renee Allen, a lieutenant with SGS Security, points out some of the controls in a van to her nephew, Jeffrey Allen, 8, as mom Elizabeth Allen (far left) looks on. Jeffrey joined his mom and aunt on June 8 for Take Our Sons to Work Day, when KSC employees brought their boys to work to encourage them to stay in school and set goals for the future.

John F. Kennedy Space Center

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