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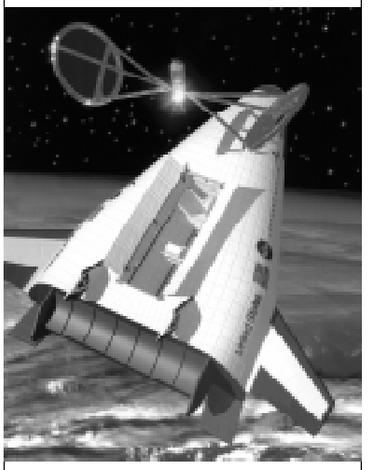
Spaceport News

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

John F. Kennedy Space Center

Venturestar: a bright look at the future



This is one artist's conception of the VentureStar, a potential successor to the X-33 now in development.

A new launch vehicle could join the fleet of rockets blasting off from Florida's Space Coast — and in the not-too-distant future. Managers from Lockheed Martin Skunkworks in Palmdale, Calif., will visit KSC and Cape Canaveral Air Station in June to look at potential launch sites here for their planned reusable launch vehicle (RLV) dubbed VentureStar.

"This is an opportunity for KSC and Cape Canaveral Air Station to showcase our excellence," said KSC Director Roy Bridges. "We'll show them creative ways that we can meet their needs and feature the proven launch, payload and landing support infrastructure in place here on the Space Coast."

The goal of the RLV program is to improve U.S. competitiveness in the worldwide launch market by increasing reliability and lowering the cost of space access to $1,000 per pound of payload. Currently, payload customers pay about $10,000 per pound for the Space Shuttle's reliable escort to orbit.

Four months ago, Lockheed Martin hosted a briefing that expressed their requirements for a prospective VentureStar launch site. Florida was well

(See RLV, Page 6)

KSC takes one giant leap toward ISO 9001certification

From May 11 through 15, three auditors from Det Norske Veritas (DNV), one of the leading international ISO certification organizations, visited KSC to audit NASA staff and determine if the space center's management system is compliant with ISO 9001 standards.

The audit included all Kennedy Space Center personnel working at KSC, Cape Canaveral Air Station, Patrick Air Force Base, and Vandenberg Air Force Base in California.

ISO 9001 is the most detailed, comprehensive set of standard requirements for quality programs established by the International Standards Organization (ISO).

Based on their findings, the audit team will recommend certification with the ISO 9001 standard for NASA at the space center, pending DNV acceptance of a KSC plan of action to corrent seven minor non-conformities.

Celebrating the recommendation was the Business Innovation Group, or BIG, at KSC.

BIG's charter is to develop and support a long-term business system for the center, and BIG was instrumental in preparing the center for and coordinating the ISO audit.

About 500 KSC people were directly involved in the development and internal audits of the system. As KSC positions itself for the future,

(See ISO, Page 3)

STS-91 — first Mir docking for Discovery closes door for Phase One of Space Station and opens window on antimatter research

More than two years of continuous U.S. presence aboard the Russian Space Station Mir will draw to a close when NASA astronaut Andrew Thomas, Ph.D., transfers to the orbiter Discovery during docking operations on mission STS-91. When Dr. Thomas leaves Mir, Phase 1 of the joint U.S.- Russian International Space Station (ISS) program will conclude, and NASA astronauts will have lived and worked with their Russian crewmates continuously for more than 800 days on orbit.

The STS-91 crew recently prepared for their mission during Terminal Countdown Demonstration Test activities at KSC. In the back, left to right, are Pilot Dominic Gorie, Mission Specialist Wendy Lawrence, Commander Charles Precourt, and in the front are Mission Specialists Franklin Chang-Diaz, Valery Ryumin, and Janet Kavandi.

The ninth and final Mir docking is scheduled for Flight Day 3 of Discovery's mission set for launch June 2 at 6:10 p.m. Dr. Thomas will board Discovery for the return flight home within hours after the hatches between the two 100-ton spacecraft are opened. Docking operations then will continue for four days and will include the transfer of 2,600 pounds of Russian supplies and logistics equipment to Mir from a SPACEHAB Single Module in Discovery's payload bay and 1,400 pounds of water from the orbiter's fuel cells.

Major highlights of this 91st Shuttle flight are the first Mir docking for Discovery, the first on-orbit test of the Alpha Magnetic Spectrometer (AMS-01), and the first flight of the new Space Shuttle super lightweight external tank.

Other STS-91 investigations include experiments in human life sciences, biology, protein crystal

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Briefing to community leaders on KSC's progress and local projects

Kennedy Space Center's annual Community Leaders Breakfast and Briefing was held the morning of Wednesday, May 6, at KSC's Visitor Complex before more than 200 invited guests. Mayors, bank presidents, leaders in education, representatives from local police departments, members of Canaveral Port Authority, and others all gathered to hear from KSC's leaders about what the future holds for the space center. The briefing informed community leaders of the activities, changes, and value-added products and services KSC offers to Brevard and its surrounding counties.

After a breakfast gathering, Center Director Roy Bridges opened the briefing in the IMAX II Theater with an overview of NASA strategic goals and KSC's guiding principles, which include:

◆ safety and health first;

◆ satisfy our customers' needs anytime, anywhere;

◆ build reliance and teamwork everywhere; and

◆ environmental leadership.

"As we at KSC advance space exploration and commerce," Bridges noted, "our guiding principles govern all of our plans and actions."

Bridges then introduced his top management team and turned the program over to them.

The speakers painted a detailed picture with a broad brush of the center's work over the past 16 months and gave a glimpse of the future.

Jim Jennings, deputy director for business operations, described how KSC is committed to continued community outreach and service. Some of his points included:

▼ Visitor Complex visitation growth of 35 percent since 1994;

▼ consistently increased participation from last year in educational areas such as the Spacemobile program and educator workshops; and

▼ Combined Federal Campaign results over goal, with more than 90 percent participation. KSC is consistently the largest government contributor in Brevard County.

Deputy Director for Launch and Payload Processing Loren Shriver discussed KSC's Centers of Excellence.

He talked about the details of crafting the center's future role in developing new technologies for spaceport architecture and operations development, environmental and bioregenerative systems, and integrated intelligent test and simulation capabilities.

"Although we've been assigned lead center responsibility in launch and payload processing," Shriver noted, "we now need to focus on technology development in order to sustain that Center of Excellence. We must employ KSC's unique expertise to partner with universities and other outside groups in developing new technologies."

Other KSC speakers discussed last year's accomplishments and achieved goals. They also laid out KSC's plans for the future — both short- and long-term.

Michael Leinbach, deputy director, Space Station Hardware Integration Office, provided International Space Station statistics and noted how the station will benefit Brevard County. He said that:

▲ assembly completion is slated for 2003-2004;

▲ 16 nations are participating (all of which will send representatives to Brevard County to watch their respective elements launched into space); and

▲ approximately 90 U.S. and Russian missions are needed for assembly and outfitting.

Leinbach said that 300 NASA and 900 contractor employees are working locally on the ISS and that those numbers are expected to grow in upcoming years. He added that KSC's role has increased in the past decade to include final test, integration, and assembly.

Leinbach encouraged the community leaders to take their grandchildren outside in the evenings five years from now to catch a glimpse of the brightest light in the sky, second only to the Moon — the orbiting International Space Station.

Associate Director for Advanced Development and Shuttle Upgrades JoAnn Morgan said that new industry partnerships will be mutually beneficial to KSC and outside organizations that are paying us to help them explore new technologies. They will benefit from our 15-year Shuttle experience with propellants and reusable launch vehicles.

One of several posters that accompany KSC's award-winning tradeshow exhibit was shown to community leaders.

Together, KSC 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.

Shriver and Jennings receive Meritorious Executive awards

On May 5, KSC's Deputy Director for Launch and Payload Processing Loren Shriver and Deputy Director for Business Operations Jim Jennings were honored in Washington, D.C., with Presidential Rank Meritorious Executive awards.

Shriver and Jennings were the honored guests of Vice President Al Gore and the Office of Personnel Management's new director, Janice LaChance, in a ceremony at Constitution Hall recognizing their achievements. The event was part of Public Service Recognition Week celebrated annually the first week of May.

Presidential Rank awards recognize federal senior executives who have demonstrated exceptional performance over an extended period of time. The Meritorious Executive Rank award is awarded to the top five percent of "sustained accomplishment" performers.

Criteria include career achievements that: are recognized throughout the agency and acknowledged on a national or international level; achieve significant cost reduction; demonstrate personal initiative and innovation in meeting goals and policies; and demonstrate successful efforts in encouraging and maintaining a diverse workforce.

ISO ...

(Continued from Page 1)

the system will serve as a foundation for all improvements.

A pre-assessment at KSC was conducted by auditors in March.

Between that visit and the recent audit, employees in all NASA directorates at KSC were interviewed by ISO auditors.

Last week, the auditors all remarked that a great improvement had been achieved in process development and record-keeping since their initial visit.

They also praised KSC workers for their dedication, skills and knowledge.

"The enthusiasm and pride that each employee has with the documentation and execution of their procedures is readily apparent throughout the center," noted DNV Lead Auditor Thomas Dadson.

The auditors also commented that the personal involvement and leadership of the center director and his top management team in the development of the system were critical to the center's positive audit result.

Following 88 hours of interviews, auditors identified only seven minor non-conformities.

The KSC Business Innovation Group intends to submit the corrective plan of action by May 22.

Cutting the ribbon at the blockhouse renovation ceremony are, left to right, KSC Deputy Director for Launch and Payload Processing Loren Shriver, Comedian Bill Dana (the "8th Mercury astronaut"), Mercury 7 astronauts L. Gordon Cooper and Scott Carpenter, Brigadier General Randy Starbuck, Betty Grisholm, and Major Rory Maynard.

Renovations complete at historic Mercury launch blockhouse

The blockhouse for the Mercury-Atlas and unmanned Atlas-Agena Gemini target missions at Cape Canaveral Air Station's Space Launch Complex 14 has been renovated. The 45th Operations Support Squadron (OSS) led the effort to preserve the historic launch blockhouse that will be used as a conference center.

"It was a shame to see such a historic site being reclaimed by nature," said Lt. Col. Dennis Hilley, Operations Support Squadron commander. "The 45th OSS decided to reverse this and find a use for the complex to try and save it."

John Glenn launched from Complex 14 on his historic orbital mission aboard Friendship 7 in Feb. 1962. Glenn was followed by Scott Carpenter's Aurora 7 mission in May 1962 and Wally Schirra's Sigma 7 mission in October of the same year.

The last Mercury 7 astronaut to fly alone into space was Air Force Colonel L. Gordon Cooper, who lifted off in his spacecraft Faith 7 in May 1963.

Painting and cleaning of the blockhouse wre accomplished by volunteers. Extensive repairs were made by Johnson Controls and Boeing, while Lockheed Martin and Brown and Root provided additional assistance. Other agencies also provided support.

Irene Long named SNFS President

Irene Long, M.D., director of KSC's Biomedical Office, was installed as president of the Society of NASA Flight Surgeons (SNFS) at the group's annual luncheon on May 20. The event occurred during the Aerospace Medical Association's Annual Scientific Meeting in Seattle May 17-22. Dr. Long's term will run through May 1999.

"Since the society is dedicated to the advancement of the aerospace medical profession to extend everyone's useful role in space exploration, it's truly an honor for me to serve as the society's president this year," said Dr. Long.

In 1995, Dr. Long received the society's President's Special Award in recognition of her contributions to aerospace medicine and of her serving as an outstanding role model for others.

Irene Long, M.D., Director, Biomedical Office

Orlando Melendez receives NASA administrator's fellowship

Orlando Melendez, materials science engineer, Logistics Operations

Orlando Melendez, Ph.D., an engineer with the Materials Science Laboratory in KSC's Logistics Operations, was announced as a participant in the 1998-99 NASA Administrator's Fellowship Program. The program aims to enhance the professional development of mid-career science, mathematics and engineering faculty at historically black colleges and universities, Hispanic-serving institutions, and tribal colleges and universities.

Dr. Melendez, who holds a doctorate in chemical engineering, will teach during the 1998-99 school year at the University of Puerto Rico and will spend the second year of the fellowship in professional development. He will divide the second year between interning at NASA headquarters in Washington D.C. and at the International Space University in France.

The fellowship program also helps universities better assist NASA in its research and development mission.

Mark your calendar for Super Safety Day on Thursday, July 16 ! Safety is always our priority, but on Super Safety Day the entire center will learn together why and how to improve our safety record each and every day. More information will be available in future issues of *Countdown* and *Spaceport News*.

KSC's All-American Picnic brought smiles for miles...

James Stickley, 5 years old, demonstrates how much fun take off and landing can be!

The KSC All-American Picnic held May 16 at KARS Park One drew an enthusiastic crowd — *more than 5,000!* — on a spectacularly beautiful day.

Managed this year by a committee of NASA and contractor staff, the event offered a few changes from years past — including a fishing tournament for the kids, a chowder cookoff, and an exotic wildlife exhibit!

Proceeds from the cook-off — held this year for the seventh time — go to the YMCA of Titusville, which was the favorite charity of the People's Choice Award winner, "Clams R Us." More than $480 was raised for Titusville's YMCA at this year's picnic.

As the pictures tell, all picnic participants were happy as clams!

Jenna Tower, 3 years old, prefers snow cones to freeze-dried ice cream.

The Rascals won out of four teams competing in early morning matches on the volleyball court.

Astronaut Frank Caldiero congratulates Amanda Lampert, 12 years old, who took third place in her age group in the coloring contest.

Center Director Roy Bridges has the eye of the tiger, which came with the rest of this number one land predator in the world, a 450-pound Siberian-Bengal tiger. Thunderhawk Directors flanking the feline with Benita and Roy Bridges are, left to right, Eddie Bealle, Lou Gunther, and Ray Thunderhawk. The tiger, incidentally, is the first in the world to have had successful cataract surgery!

Alyse Mullon adds finishing touches to the already bright face of Chancey Wyhuskens.

Parents of triplets are experts at fighting fires! Just ask Nancy and Dave Johnson with their brood of three 20-month-olds, Gregory (in dad's arms), Claire (standing on seat) and Matthew. The Johnsons are enjoying a brief moment on a genuine 1938 firetruck (the Dalmation is not quite that old).

Catching some rays as well as fish are the Burman family, doubling their chances with both Cliff, 5, and Gineva, 2, at the poles. Mom Melinda and Dad Terry provide assistance to the young team, who were among 170 children participating.

Lindsay Marshall, left, and Lucy Stevenson, both 4 years old, wonder if balloons are as much fun in microgravity as they are on Earth!

Above, Kelsey McMonagle, 6 years old, catches one fish that won't make it into the seafood chowder competition. Below, only Dale Nash (right), USA director of Ground Systems Support, knows the fishy recipe that garnered the Peoples Choice award. Presenting one of three awards to the "Clams R Us" team are JoAnn Morgan and Rick English. The NASA/Boeing Space Station Team won the Judges Choice award.

There was plenty of space at the picnic, but not enough time. This future astronaut found it hard to say goodbye to his new friend.

RLV ...

(Continued from Page 1)

represented at the meeting, but other U.S. states and foreign countries have also expressed a keen interest.

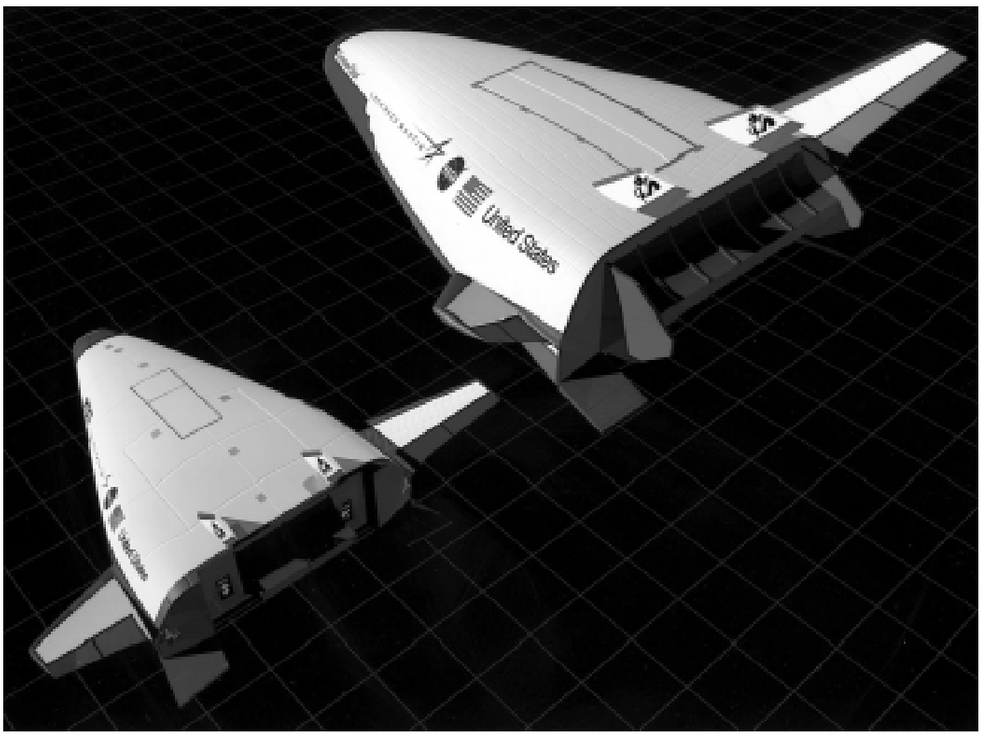
The 127-foot-tall, wedge-shaped vehicle does not sport an external fuel tank or solid rocket boosters that fall back to Earth during ascent. This makes Florida's ocean-site location only one of several options available to VentureStar.

Since the briefing, officials from Spaceport Florida Authority, KSC and Cape Canaveral Air Station have thoroughly reviewed Lockheed Martin's launch site requirements and are prepared to present both basic and creative options to the Lockheed Martin site visitors.

"This is an exciting time for Florida," said Ed O'Connor, Spaceport Florida Authority director. "The teamwork that's going on between the state, Kennedy Space Center, Cape Canaveral Air Station and state business leaders reflects our high level of commitment to supporting the VentureStar program."

Areas being reviewed as possible RLV launch sites include locations on the west and east sides of the existing Shuttle Landing Facility, toward the south end of the runways. Also being studied are sites northwest of Shuttle Launch Pad 39B and southeast of the Cape Canaveral Air Station skid strip. VentureStar developers hope to have launch sites near a landing strip to facilitate quick RLV turnaround, supporting about 40 flights a year.

Thus, initial designs call for the launch pad to be located near a landing strip. The facility will have a unique processing feature that will roll away from the vehicle just prior to its rotation to a vertical launch position.



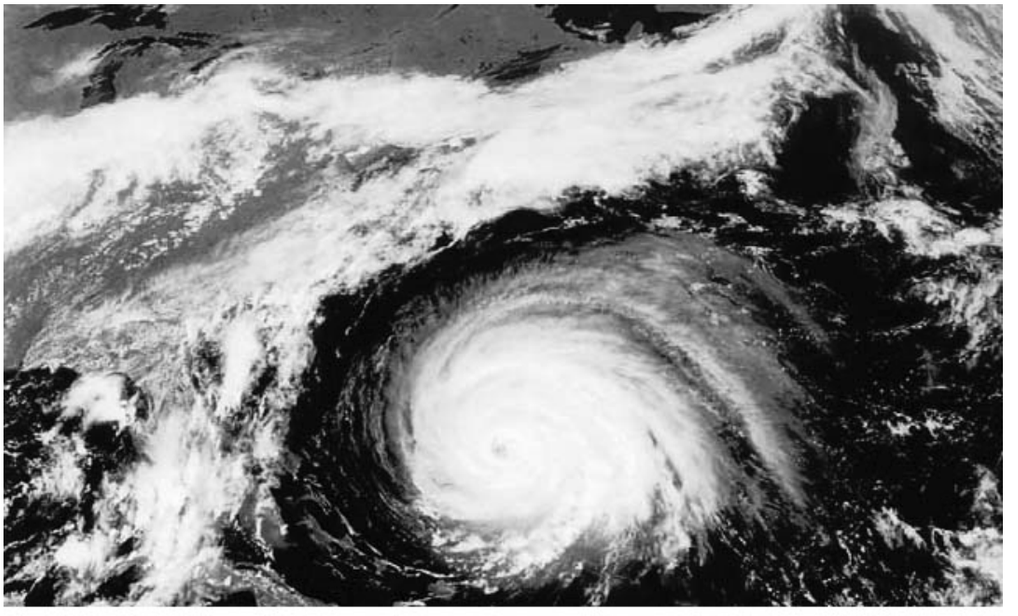
This comparison of X-33, at left, and the VentureStar demonstrates the size difference between the two vehicles under development. VentureStar is a reusable launch vehicle that potentially represents the future of U.S. spaceflight. The X-33 and the VentureStar will be powered by a unique engine called the linear aerospike engine.

"Right now we're conducting studies to determine what areas on both sides of the (Banana) river would be feasible launch, landing and payload processing sites. We're considering safety issues, environmental impacts and the needs of the customer," said Warren Wiley, KSC's RLV director.

The state of Florida has already committed $4 million for the construction of a multi-purpose vehicle processing hangar at the SLF's south-side apron. Construction of the hangar is slated to begin later this year. Lockheed Martin is currently building a subscale prototype of VentureStar called X-33 under a cooperative agreement with NASA. It will demonstrate advanced technologies to be used on an operational RLV.

Test flights for X-33 are slated to begin in mid-1999 from Edwards Air Force Base, Calif. With up to 15 X-33 test flights and related research under their belt, Lockheed Martin and industry will decide by the year 2000 whether to proceed and build a full-scale RLV such as the VentureStar.

Hurricane season starts June 1 and runs through November



Hurricane Luis in late1995, as seen from the National Oceanic and Atmospheric Administration's GOES-8 satellite.

Are you prepared? The hurricane season runs June through November. Check your supply of boards, tools, batteries, and non-perishable foods. Remember, plan your moves in advance, before a storm arrives, and avoid last-minute details that could leave you marooned or unprepared.

Check your battery-operated equipment; your radio may be your only link with the outside world. Keep your car fueled (service stations may be inoperable for several days depending on the severity of the storm), and have cash available.

Store drinking water in clean bathtubs, jugs, bottles. Your town's water supply could be contaminated by flooding during a storm.

Monitor the storm's position through National Weather Service advisories, and beware of the eye of the hurricane.

If you have questions, KSC's Hurricane Center can be reached by calling 867-9200 or -9201.

Building robots builds bridges between KSC and local schools

KSC recently participated for the second year in a row in FIRST, which means *For Inspiration and Recognition of Science and Technology*. FIRST is a national competition to encourage student interest in science and technology. Students work with sponsors to design and build a robot. The competition features a goal in the center of a playing field. This year, teams competed against each other and the clock by remotely directing their robots to pick up balls and deposit them in the designated goal.

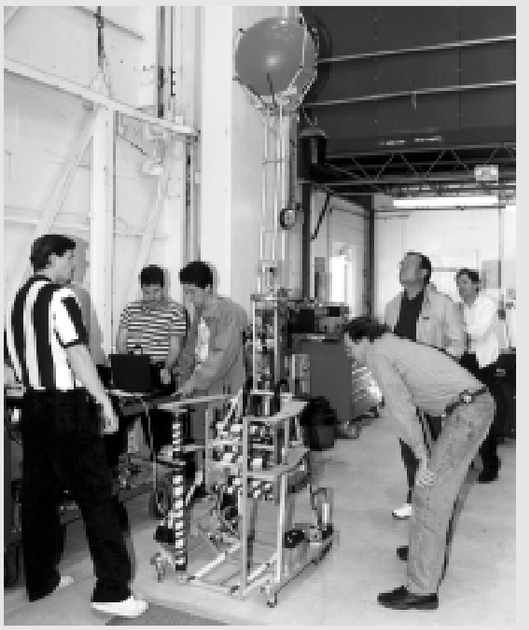
The tournament format came complete with referees, spectators and cheerleaders.

Working with NASA/KSC on this year's effort were contractors Dynacs, Boeing, United Space Alliance, EG&G Florida, Visitor Complex concessionaire Delaware North, Brevard architectural firm BRPH, the Brevard School Foundation, Brevard School Board, Satellite High School and Merritt Island High School. A second Brevard County team led by Mike Sklar and Brenda Bell of Boeing also took part, and won the Most Photogenic Award at the regionals, held at Johnson Space Center's Visitor Center in Houston. NASA KSC worked with this team as well, which included students from Astronaut and Titusville High Schools. The finals were held again at Epcot Center in Orlando last month. The Space Coast FIRST team finished 53rd out of 199 national teams, and placed fifth among 18 teams sponsored by NASA.

"Our agency's vision includes words like: investment in America's future, exploration, innovation, inspiration and benefit," said Eduardo Lopez del Castillo, a NASA engineer who has led the KSC effort for the past two years. "The way we nurture and guide our youth will determine the strength of our country and our ability to lead a highly technical world economy. It is our duty to develop their values and their skills." Call Lopez, 867-8005, to learn about volunteering.

TOP photo, right, EG&G Florida Engineering Director Tim Thurston works with students on the robot's design. Above, Dynacs Technician Brad Ayers describes the manufacturing process. Right, NASA Engineering Technician Ron Fox (left) shows Satellite High student Albert Ramirez fabrication techniques.

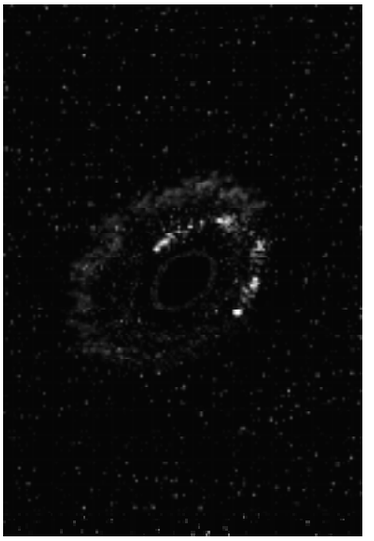
ABOVE — In late February, the robot was still taking shape. Here, (left to right) students Trevor Hitt, of Merritt Island High School; Samit Thakkar, also from Merritt Island High; Rob Mueller, a KSC engineer; Art Hendren, with Dynacs; and B.J. Jones, a student at Satellite High School, examine the structural frame of the robot outside the weld shop in the Industrial Area. Many of the students plan to study engineering in college, so the opportunity to work at KSC gave them a taste of the real thing.



ALMOST THERE — The robot's control system is put through its paces by Robert Morrison (left), NASA; Andy Bradley, NASA; Chris Porter, Satellite High; Tom Lippitt, NASA; and Bill Jones, NASA, chief, Automated Ground Support Systems.

Huge gamma ray burst detected

A recently detected cosmic phenomenon has wowed researchers and turned scientific theory on its ear. The gamma ray burst, as bright as the rest of the entire universe, is unprecedented in astronomy, except for the Big Bang.



BIG BANG from a small speck — This still star was at the center of the gamma ray burst. The energy release came from a galaxy about 12 billion light years from Earth (one light year is about 5.9 trillion miles). Gamma ray bursts are flashes of high-energy radiation, first discovered by U.S. Air Force satellites in the 1960s. Their cause is not yet known.

"The energy released by this burst in its first few seconds staggers the imagination," said Shrinivas Kulkarni, one of two principal investigators on the team from California Institute of Technology in Pasadena that detected the distance of the enormous energy release.

The burst appears to have released several hundred times more energy than an exploding star, called a supernova, which until now was the most energetic phenomenon in the universe known to scientists.

The burst was detected Dec. 14 by two orbiting spacecraft. Follow-up observations were conducted with ground-based telescopes and the Hubble Space Telescope.

The team's findings appear in the May 7 issue of the journal *Nature*.

STS-91 ...

(Continued from Page 1)

growth, materials science, radiation monitoring and physics.

The crew

One Russian cosmonaut and six American astronauts comprise the STS-91 crew. Mission Commander Charles Precourt is on his fourth space flight and third trip to Mir, whereas Pilot Dominic Gorie is flying his first Shuttle mission. Mission specialists include Wendy Lawrence; Franklin Chang-Diaz, Ph.D.; Janet Kavandi, Ph.D.; and Andrew Thomas, Ph.D. Russian Cosmonaut Valery Ryumin, director of the Russian Shuttle-Mir program, completes the crew.

Mission Specialist Thomas began his stay on Mir on Jan. 25 during the STS-89 mission. The Australian-born scientist was selected as an astronaut candidate in 1992. While awaiting his space flight assignment, Dr. Thomas supported shuttle launch and landing operations as an Astronaut Support Person at KSC.

What can the matter be?

Anti-matter is the opposite of matter, and when the two come in contact, they release a burst of energy in the form of gamma rays, which can be detected outside Earth's shielding atmosphere.

A prevailing theory of creation is that the Big Bang produced approximately equal amounts of matter and antimatter, which promptly annihilated each other, but that a small excess of ordinary matter was enough to create the universe as we know it, with very little surviving antimatter. Moreover, scientists recently discovered a gamma-ray burst that they're calling the most powerful explosion since the Big Bang. (See page 7.)

The three-ton AMS-01 is the first large magnet experiment ever to be flown in space and could be the first experiment to detect minute quantities of antimatter in cosmic rays coming from outside our galaxy. This antimatter could be an indication of the existence of antimatter galaxies.

The data gathered by AMS may lend clues about the mysterious 'dark matter' that may make up 90 percent or more of the universe. The experiment also will measure normal matter, as well as cosmic and gamma rays.

The 7,050-pound AMS will search for antimatter and dark matter to understand cosmic ray propagation.

This first flight is designed to verify AMS performance under actual space conditions prior to its three-year deployment on the International Space Station.

The AMS is an international collaborative project involving 37 research institutions in the U.S. and 12 countries.

STS-91 tanking test goes well

Engineers at KSC conducted a pre-launch cryogenic test of the Shuttle's first super lightweight external tank (SLWT) on May 18. The tank, mated to the orbiter Discovery at Pad 39A, is scheduled for launch on mission STS-91.

The primary difference of this test from standard pre-launch tanking operations is that the liquid oxygen and liquid hydrogren propellants were not loaded simultaneously, but one after the other. For this reason, the tanking test took longer than a typical pre-launch tanking.

The primary objectives of the test were to evaluate the strut loads between the tank and the solid rocket boosters and to verify the integrity of the new components of the tank.

Developed to increase the Shuttle payload capacity on International Space Station flights, the first SLWT is more than 7,000 pounds lighter than conventional metal alloy external tanks.

Major changes to the lighter tank include the use of new materials and a revised internal design. The weight reduction is due to the use of aluminum lithium in the construction of the tank's internal liquid hydrogen and liquid oxygen tanks. Aluminum lithium is a lighter, stronger material than the metal alloy used in the original tanks. The new external tank holds a maximum of 143,351 gallons of liquid oxygen and 385,265 gallons of liquid hydrogen. The redesign also provides additional strength and stability.

Mir Reflections

STS-89 Mission Specialist David Wolf, above left, returned to KSC on Apr. 30 to personally thank the many workers who assisted in his STS-86 liftoff to the Russian Space Station Mir as the sixth U.S. astronaut to stay there. Wolf completed 128 days on orbit and preceded Andy Thomas, who returns to Earth in June during STS-91. **The first U.S. astronaut to stay on Mir was Norman Thagard**, below left, who also visited KSC recently to participate in a Pioneer Productions broadcast on space. It will air as a two-hour documentary on British television's Discovery channel in the near future.

John F. Kennedy Space Center

Spaceport News

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