



Fortieth Anniversary
Pioneering the Future

Shuttle shuffle

As of press time, discussions were under way to decide on the launch dates for the remaining two missions of the year — STS-99 and STS-103.

STS-99 is the Shuttle Radar Topography Mission, which seeks to obtain the most complete high-resolution digital topographic database of the Earth. STS-103 is the Hubble Space Telescope servicing mission, during which astronauts are scheduled to replace portions of the spacecraft's pointing system, which has begun to fail.

A decision was made that STS-101 will move into January and become the first manned spaceflight of the new millennium.

Reusable spacecraft flight tests planned for next year

A new generation of reusable spacecraft that will be less expensive to operate than are current vehicles is slated to begin flight tests next year, NASA officials said Aug. 24 in a press briefing on the "X technology" demonstration program.

NASA and its industry partners are building three experimental space vehicles as part of the program, which is designed to develop reusable spacecraft to put payloads into orbit less expensively than the current generation of launch vehicles.

It now costs \$5,000 to \$20,000 to launch a pound of payload into space. That limits space missions to only the highest priority

government and most profitable commercial ventures, said Gary Payton, NASA deputy associate administrator for space technology.

Payton said the goal of the technology development program is to "bring down the cost of space access by a factor of 10."

There is no way to improve those costs with the present U.S. launch systems, Payton commented. The new generation of spacecraft could reduce the cost of space access to about \$1,000 a pound, officials said.

Flight tests of the X-33 craft, being built by Lockheed Martin Skunk Works in Palmdale, Calif.,

(See X Program, Page 2)

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 2000: assuring our future success

by Kathy Hagood

Center Director Roy Bridges demonstrated Tuesday, Aug. 31, his determination to fulfill the vision of the KSC Roadmap by outlining his plan to take a closer look at the way NASA at Kennedy Space Center is organized and to make changes where needed.

In a closed-circuit televised presentation, "Assuring Our Future," Bridges announced the formation of the KSC 2000 Team.

The team, to be led by Director of Administration Richard Arbuthnot and Director of Logistics Ken Payne, will study NASA's organizational and management structure and create a plan for improving it.

The KSC 2000 Team will submit their findings and implementation plan to Bridges and his Executive Management Team as early as January 2000. No staff reductions are planned.

"No one will lose his or her civil service status, but some people

may have new opportunities to assure our future as a center," Bridges said.

Changes may be needed because the center is having difficulties taking on important new work in technology development, including the high-profile Mars Ascent Vehicle project and would benefit from a more streamlined process for responding to current customers, Bridges said.

A reduced workforce has left NASA with critical skill shortages. Even in the face of those challenges, "we have made significant achievements," Bridges said.

He listed numerous recent accomplishments at the center, including successful Shuttle and expendable launch vehicle (ELV) launches, International Space Station testing, Integrated Vehicle Health Management flight experiments, Checkout and Launch Control System upgrades, X-vehicle projects and the Joint Base Operations Support Contract.

"But to continue with our mission as a Spaceport Technology Center, both in operations and development, we have to make better use of our resources," he



KSC Director Roy Bridges

said. The move is not associated with any new anticipated budget cuts.

The KSC 2000 Team, in addition to team leaders, will include a small core team, a larger group of organizational representatives and several outside consultants.

Core members of the KSC 2000 Team will include Director of Public Affairs Joe Gordon and Chief Counsel Bruce Anderson, as

(See KSC 2000, Page 3)

One-half century of launches celebrated at Cape Canaveral Air Station

Florida Lt. Gov. Frank Brogan and U.S. Representative Dave Weldon joined 45th Space Wing and Kennedy Space Center officials at Cape Canaveral Air Station on Aug. 24 in a ceremony at the Cape's Launch Complex 3/4 — kicking off a yearlong series of events commemorating 50 years of launches from the Space Coast.

The ceremony included the unveiling of a "Bumper Road"

street sign in honor of the first rocket launched from Complex 3/4 at the Cape on July 24, 1950.

"Although the Bumper launch itself is a crucial milestone," noted Weldon, "the real strengths of the Space Coast and indeed our entire nation's space program are the people... The technical and engineering achievements, both

(See Launches, Page 4)



KSC delivers X-33 propellant loading equipment to California

A car needs gas to run and there must be a pump, hose and nozzle to fill its gas tank.

In the case of the X-33 advanced technology demonstrator, a complex system of panels, valves and hoses, known as umbilicals, provide the means to load X-33 with super-cold propellant.

A team of Kennedy Space Center experts developed the X-33's complex umbilical system. The KSC team designed, fabricated and tested the X-33 umbilical system and delivered the finished products to Lockheed Martin in July.

Under construction at Lockheed Martin Skunk Works in Palmdale, Calif., the X-33 is a half-scale prototype of the planned operational reusable launch vehicle (RLV) dubbed VentureStar.

The X-33 is scheduled to begin test flights next year from Edwards Air Force Base, Calif. Just prior to launch, the X-33 will be loaded

with about 70,000 gallons of liquid hydrogen and liquid oxygen.

In a split second, as the X-33 rises from the launch mount, the ground umbilicals that transfer the propellant into the vehicle will retract from the liquid oxygen and liquid hydrogen interface panels and into the protective umbilical tunnels.

"We're excited

about our recent contributions to the X-33 development process," said Warren Wiley, KSC's RLV programs manager.

"Earlier this year we delivered the X-33 vehicle positioning system to the launch site and now the umbilical system has been installed on the vehicle and at the launch site. These success stories showcase KSC's 30 years of experience in launch vehicle handling and ground processing."

KSC engineers began development of the umbilical system in September of 1996 and completed testing this year in July.

The two aluminum interface panels are each three feet wide and four feet long and have already been installed at the tail of the vehicle.

A complex system of latches and actuators ensure all connections are properly aligned and sealed during fueling, and then quickly retract allowing liftoff.

The sophisticated system is protected from the harsh launch environment by two 15-foot tall carbon steel tunnels, which are now part of the launch site landscape.

"Of the umbilical test programs I've been involved with, this was the smoothest," explained Alan Littlefield, NASA umbilical engineer. "It demonstrated KSC's commitment to team work and quality workmanship. It is rewarding to work on a new program like X-33 and to apply the expertise we've gained from the Shuttle program."

The X-33 and its support systems are being developed through a cooperative agreement between Lockheed Martin and NASA. This approach has allowed Lockheed Martin to assemble a unique

industry/government team that includes KSC engineers who have traditionally focused on processing the Shuttle. NASA and Lockheed Martin engineers have labored hand-in-hand with United Space Alliance workers at KSC, taking advantage of an immense launch support infrastructure.

Lockheed Martin initiates developmental efforts like this one 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 Edwards Air Force Base, Calif., to Dugway Proving Ground, Utah, and Malmstrom Air Force Base, Mont.

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.

X Program ...

(Continued from Page 1)

are scheduled to start next year.

Another craft, called the X-34 and being built by Orbital Sciences Corp. of Dulles, Va., will undergo engine and structural tests in 2000.

A third craft, called the X-37, is in an earlier stage of development by the Boeing Co., but is scheduled for two test flights from the Space Shuttle starting in 2002.

X-33 leads the pack

Of the three reusable launch programs outlined Tuesday, the X-33 is furthest along.

The \$1.2 billion joint program between NASA and Lockheed Martin aims to test a design of the VentureStar, a reusable space shuttle that NASA and Lockheed Martin plan to launch in 2005.

VentureStar would be used to transport supplies to the International Space Station and place

satellites in orbit less expensively than the Shuttle. The triangular X-33, with its tiny wings and two rudders, is a scaled-down version of VentureStar. The X-33 is designed for 15 test flights starting in the summer of 2000.

The first test flight is scheduled to launch from Edwards Air Force Base in California and land at one of two test sites. The vehicle is processed horizontally, rotated to a vertical position and then launched.

The plan for the X-33 is to reduce the turn-around time for flights, with two consecutive seven-day flights planned during the test program, said Gene Austin, the NASA X-33 program manager at Marshall Space Flight Center in Alabama.

X-34 is next in line

The X-34 rocket-plane is designed to be carried into space and then released by an L-1011 cargo plane owned by Orbital

Sciences, NASA's industry partner for the project, for flights at Mach 8 at the edge of the Earth's atmosphere.

During the 27-flight program, several launch technologies will be tested in space, including a composite liquid oxygen tank designed by Lockheed Martin, said John London, manager of the Marshall-based Pathfinder program that oversees the X-34.

A model of the rocket plane was towed at high speeds and altitudes earlier this summer after taking off from NASA's Dryden Space Flight Center in California.

X-37 a different breed

Starting in late 2002, space watchers looking skyward will see not the Space Shuttle but something much smaller — about the size of two mini-vans — as the X-37 returns from a rendezvous or Space Station maintenance mission.

The self-navigating craft, a \$173

million joint project of NASA and Boeing, is a solar-powered orbiter designed for release from the Space Shuttle.

The program will put up to 40 state-of-the-art technologies to the test in orbit around Earth.

As designed, the robotic X-37 could carry up to 500 pounds in its cargo bay and reach speeds up to Mach 25 upon re-entry into Earth's atmosphere.

Contractors currently are building pieces of spacecraft for assembly at a Boeing plant in California.

The first flight tests are set for early 2002 as it drops from a B-52 leaving from Edwards Air Force Base. In late 2002, the X-37 will undergo its first release from the Space Shuttle for a two-day flight, with a second space mission set to last for 21 days in early 2003.

The three X-programs outlined will survive any cuts that could result from the upcoming round of budget negotiations, Payton said.



KSC 2000...

(Continued from Page 1)

well as Larry Ellis, deputy director, Propulsion Test Directorate, Stennis Space Center; Jenny Lyons, data analyst, Business Innovation Group; Scott Cilento, Discovery flow manager; Tim Barth, lead Spaceport Technology Development engineer; and Karen Biega, strategic planning manager, Advanced Development and Shuttle Upgrades.

"We need everyone to pull together on this thing," Bridges said. "It's important that team members take off their organizational hats and put on their

Kennedy Space Center hats. We need to think of what's best for the whole center."

While every effort will be made to proceed in a business-as-usual manner, some personnel actions will be delayed, Bridges said. Training and development activities will continue. Other activities, however, such as permanent competitive promotions, reassignment and large-scale reorganizations within the center, will be placed on hold until the KSC 2000 initiative has been concluded.

"We are on a journey," Bridges said. "We've got to keep focused on our goals. This is another step we're taking toward a better future as a Spaceport Technology Center."

Building for the future at KSC



At the construction site of the Reusable Launch Vehicle (RLV) complex at KSC, workers take measurements for one of the buildings. Located near the Shuttle Landing Facility, the complex will include facilities for related ground support equipment and administrative/technical support. It will be available to accommodate the Space Shuttle; the X-34 RLV technology demonstrator; the L-1011 carrier aircraft for Pegasus and X-34; and other RLV and X-vehicle programs. The complex is jointly funded by the Spaceport Florida Authority, NASA's Space Shuttle Program and KSC. The facility will be operational in early 2000.

KSC Intercenter Walk/Run

This year, KSC's Fall Intercenter Walk/Run is scheduled for Oct. 6 at 5 p.m. at the Shuttle Landing Facility. (In the event of rain, the walk/run will be rescheduled for Oct. 28.)

The two-mile walk/run, 5K run and 10K run are all great ways to have some fun and friendly competition with your coworkers.

All civil and contractor personnel are eligible to

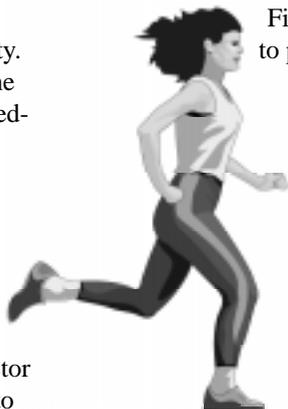
participate and registration is free.

Stop by either KSC Fitness Center by Sept. 29 to pre-register.

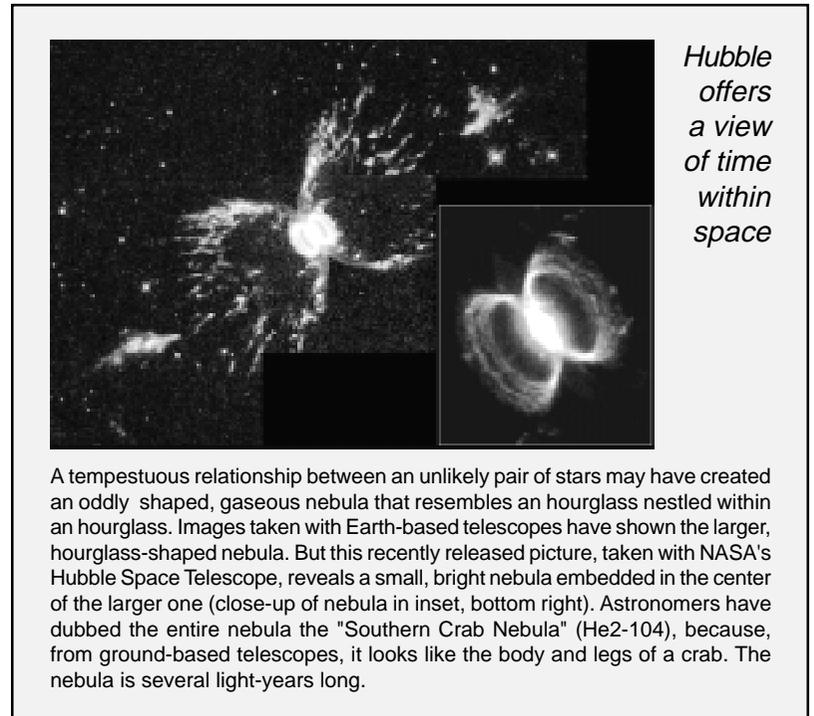
Late registration will take place the day of the race.

Special walk/run t-shirts can be ordered at any NASA Exchange.

Anyone interested in volunteering should call the Fitness Center at 867-7829.



KSC Director Bridges reminded staff that success hinges upon stellar performance.



Hubble offers a view of time within space

A tempestuous relationship between an unlikely pair of stars may have created an oddly shaped, gaseous nebula that resembles an hourglass nestled within an hourglass. Images taken with Earth-based telescopes have shown the larger, hourglass-shaped nebula. But this recently released picture, taken with NASA's Hubble Space Telescope, reveals a small, bright nebula embedded in the center of the larger one (close-up of nebula in inset, bottom right). Astronomers have dubbed the entire nebula the "Southern Crab Nebula" (He2-104), because, from ground-based telescopes, it looks like the body and legs of a crab. The nebula is several light-years long.

Mark your calendars! KSC's CFC is Oct. 1-31



Launches ...

(Continued from Page 1)

then and today, pale in comparison to the personal commitment of the people who have sacrificed for and contributed to the exploration and development of space. Space exploration is a human endeavor, and anyone who has ever witnessed a Saturn V launch or a Space Shuttle launch implicitly understands the value of sending humans to the stars."

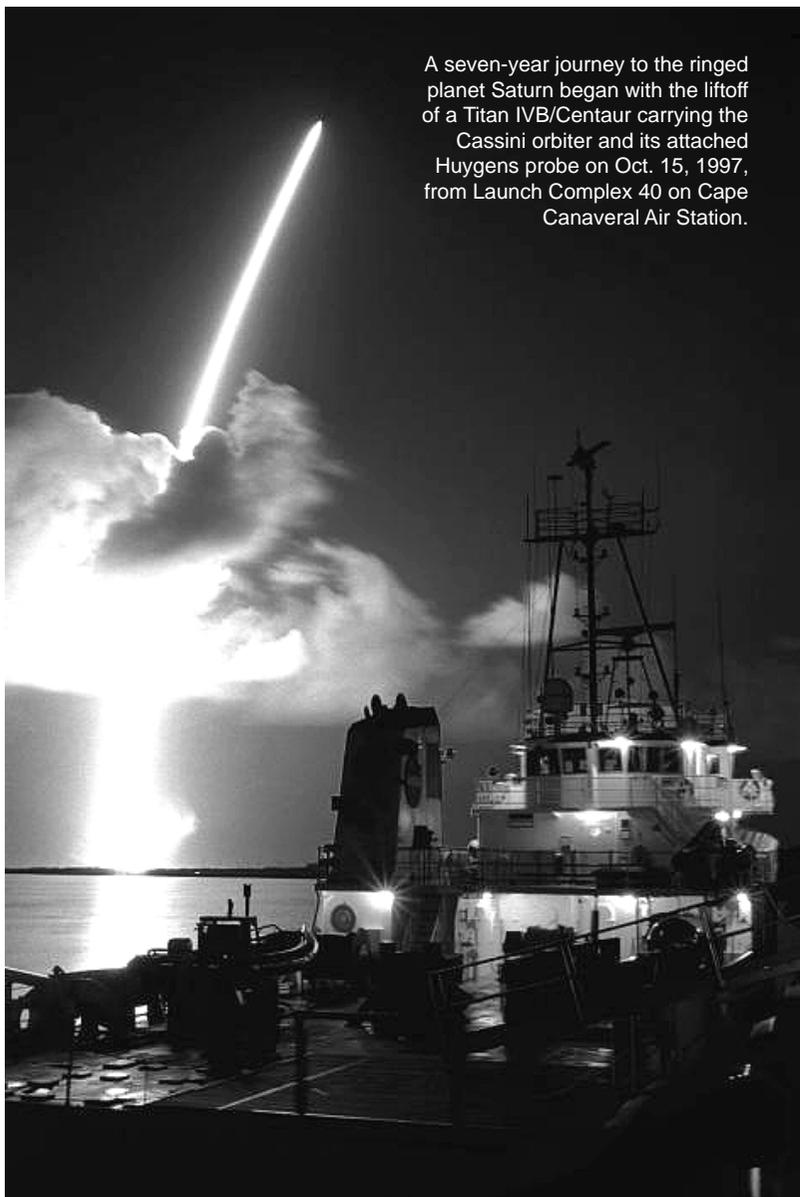
"NASA was not around 50 years ago when the Bumper was launched," said KSC Director Roy Bridges at the ceremony, "but in our 40 years that we have been around, we have certainly benefitted from the decades' worth of experience that people have gained in Cape operations... Today, we're continuing a great partnership out here at this spaceport."

A primary objective of the kick-off event was to announce plans for an art contest for seventh through 12th grade students to design a commemorative drawing. The winning design will be used to develop a 2-by-2-foot black granite plaque to be placed in the U.S. Space Walk Hall of Fame in Titusville, Fla.

To be eligible to compete, contestants must submit their drawings in pencil or pen and ink on 8.5-inch by 11-inch white paper to Mail Code JP, KSC, FL 32899, postmarked by Oct. 31.

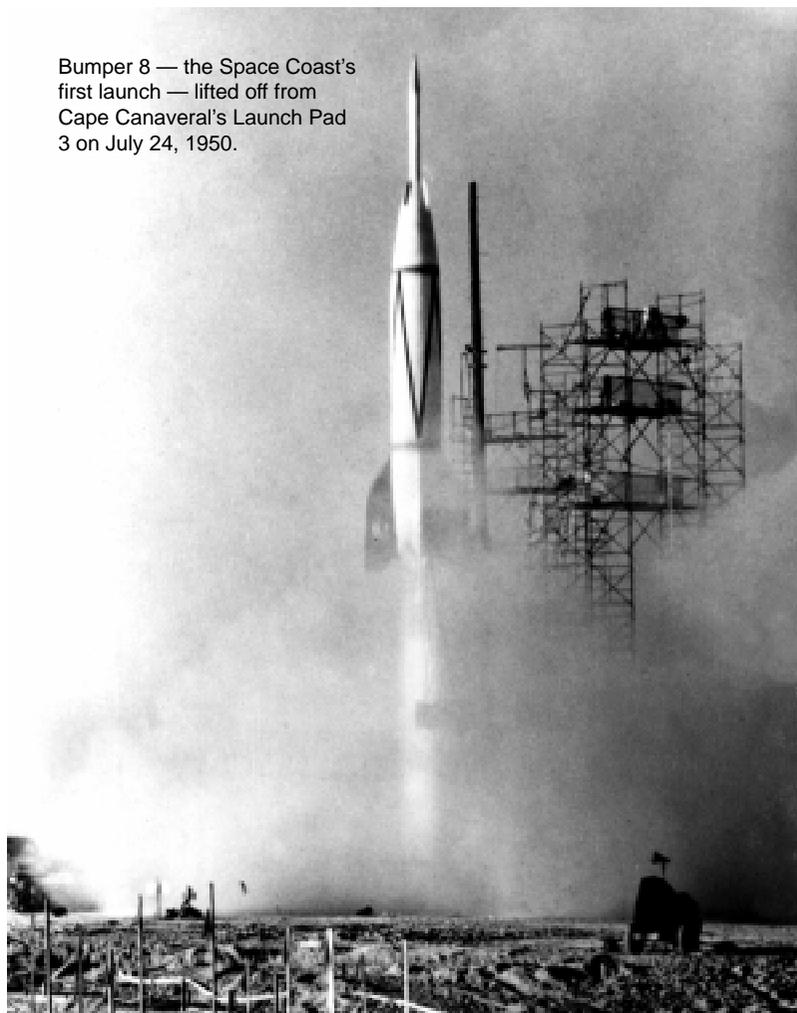
Bumper Road honors history

Although flown just twice from Cape Canaveral, the Bumper-WAC (without attitude control) holds a prominent place in history. The last two Bumper-WAC missiles ever flown, in fact, were the first and second launches from Cape



A seven-year journey to the ringed planet Saturn began with the liftoff of a Titan IVB/Centaur carrying the Cassini orbiter and its attached Huygens probe on Oct. 15, 1997, from Launch Complex 40 on Cape Canaveral Air Station.

Bumper 8 — the Space Coast's first launch — lifted off from Cape Canaveral's Launch Pad 3 on July 24, 1950.



Canaveral's fledgling missile testing grounds.

Bumper rockets were actually a combination of a German V-2 missile acting as the booster or first stage and a U.S. Army WAC

Corporal as the upper or second stage. The WAC Corporal was an unguided rocket used for high altitude research and to provide information and engineering experience to be used in future surface-to-surface missile programs. It was 16 feet long and had a long conical nose. It was 12 inches in diameter, not including the three fins.

The WAC Corporal's liquid-fueled stage was simply mounted on the nose of the V-2 to create the Bumper-WAC. The WAC Corporal second stage remained atop the nose of the V-2 for the first minute of flight. The V-2 then shut down, after providing a high altitude

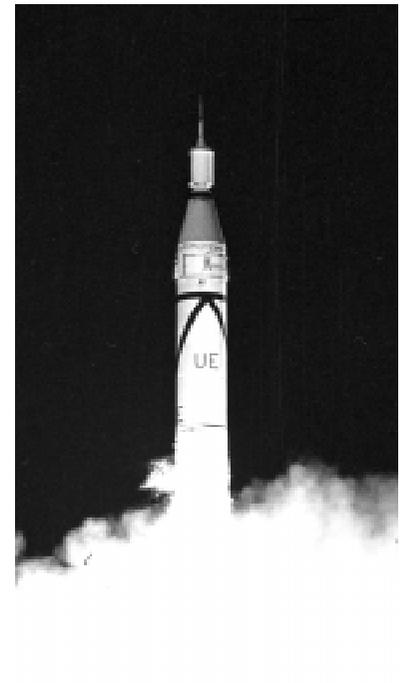


At left, the launch of Pioneer 10 to Jupiter was on March 2, 1972, from Launch Complex 36 on the Cape. It marked the first time the Atlas-Centaur was used in the Pioneer program as well as the first time it was configured as a three-stage vehicle, with a Delta rocket third stage added to the stack. The combination was needed to accelerate the spacecraft to the highest velocity ever for a spacecraft leaving the Earth: 32,400 miles per hour, fast enough to pass the Moon in just 11 hours and speed by Mars some 50 million miles away in just 12 weeks.

On Oct. 27, 1961, the first Saturn I rocket lifted off from Cape Canaveral. This early configuration, 162 feet tall and weighing 460 tons, consisted of the eight-engine S-I stage and dummy second and third upper stages filled with water for ballast. It flew to a height of 85 miles and 214 miles downrange during its eight-minute flight.



Right, America's first satellite, Explorer I, launched from Complex 26 on Jan. 31, 1958. Below, celebrating the launch are, left to right, then Jet Propulsion Laboratory (JPL) Director Dr. James Pickering, Dr. James van Allen of the State University of Iowa, and Army Ballistic Missile Agency Technical Director Dr. Wernher von Braun — all holding a model of the Explorer I. JPL packed and tested the payload, a radiation detection experiment designed by Dr. van Allen. Dr. von Braun's rocket team developed the Juno I launch vehicle, a modified Jupiter-C.



“bump” for the WAC Corporal second stage. This is why the V-2 first stage was given the name “Bumper.”

Following the first stage shutdown, the WAC Corporal second stage ignited and fired for 45 seconds, completing the remainder of the flight.

The first six Bumper-WAC rockets were launched from the White Sands Missile Range in New Mexico — the first of which was launched May 13, 1948.

In 1950, Bumper-WAC tests moved to Cape Canaveral.

On July 19 of that year, Bumper 7's first launch attempt was cut short when the engine ignited at 6:19 p.m., but shut down after only two seconds. The failure was later traced to a stuck fuel valve that had become corroded by salt air and moisture.

The launch of Bumper 7 was rescheduled to follow Bumper 8, the last rocket in the test series.

Bumper 8 launched successfully on July 24, 1950, from Launch Pad 3 — the first launch from Cape Canaveral. Bumper 8 lifted off with 54,000 pounds of thrust and flew



On Nov. 7, 1996, the Mars Global Surveyor (above) launched aboard a Delta II expendable launch vehicle from Cape Canaveral Air Station's Launch Pad 17A. After a 10-month interplanetary odyssey, the spacecraft arrived at Mars.

189 miles downrange. Bumper 7 eventually flew on July 29, 1950.

The primary purpose of Bumpers 7 and 8 was to conduct aerodynamic investigations in the vicinity of Mach 7 at relatively low altitudes.



On May 5, 1961, the United States' first manned space flight, Freedom 7, was launched with Alan Shepard Jr. aboard a Mercury-Redstone 3 rocket from Cape Canaveral's Launch Complex 5 for America's first manned suborbital flight. The main scientific objective of Project Mercury was to determine man's capabilities in space and in environments to which he would be subjected upon going to and returning from space. The Mercury program used two launch vehicles — a Redstone for the suborbital and an Atlas for the orbital flights. Each astronaut named his own capsule and added the numeral 7 to denote the teamwork of the original astronauts. Prior to manned flights, tests of the booster and the capsule, carrying a chimpanzee, were made.

“Days of Caring” scheduled for Sept. 17-18

Join KSC’s NASA and contractor team in “Sprucing up for Seniors” during this year’s Days of Caring project to paint Baxley Manor in Merritt Island.

Baxley Manor is a building of low-income resident apartments for senior citizens.

Last year, many KSC employees volunteered their services to help repair, paint, clean and install carpeting in 29 apartments.

This year, the United Way of Brevard County has requested KSC’s assistance in patching and painting hallways of the facility.

The painting of hallways at Baxley manor is only one of many projects that employees may choose from to lend a hand during the seventh annual Days of Caring on Sept. 17 and 18.

Employees may participate singularly or as a team and are encouraged to participate in any of the worthwhile projects.

Places where help is needed during Days of Caring include The Embers, Yellow Umbrella, the YMCA of Brevard County, PREVENT! of Brevard, Project Response, Salvation Army-South,



Serene Harbor, Space Coast Center for Independent Living, Domestic Violence Program, Family Counseling Center, among others.

A variety of services are needed. Volunteers for all projects will be assigned to activities on a first-come, first-served basis, and the last day to volunteer is Friday, Sept. 10.

This year’s registration is particularly easy, since an on-line registration form can be found at <http://www.uwbrevard.org>.

Once there, select the Days of Caring icon on the right-hand side.

Then select the “click here” statement to find the listing of projects for 1999.

Review the listing and select a project.

Return to the top of the page displaying the listing of projects and select the “click here for Volunteer Participation Form” statement.

Select the website in the Special Note for NASA and contractor volunteers.

Fill out the electronic form and select the “submit” button.

In support of KSC’s commitment to community service, approval has been granted for NASA employees to be authorized for up to four hours of administrative leave during regular duty hours for participation in these activities — subject to management approval.

The KSC Community Relations Council, which consists of NASA and contractor representatives, is organizing KSC’s participation in the United Way’s Days of Caring.

For more information, contact Liz Osborne at 867-4388 or Cindy Coddington at 867-0828.

KSC’s CRC cares

The KSC Community Relations Council (CRC) consists of NASA and contractor representatives and provides a forum for recommending, sharing and coordinating community relations activities.

Carol Cavanaugh, CRC chairperson, invites everyone who can to join KSC’s NASA and contractor team for the 1999 Days of Caring on Sept. 17 and 18.

“There is something for everyone,” said Cavanaugh.

“United Way of Brevard County has identified numerous projects ranging in all types of contributions by employees from reading to school children, painting, or planting flowers — just to name a few.”

Gallagher visits AMF



Tom Gallagher (right), the commissioner of education for the State of Florida, toured the Astronauts Memorial Foundation (AMF) on Aug. 18 to learn more about technology utilized by the foundation to train principals, teachers, technology specialists, school board members and university professors. Above, the commissioner takes advantage of the opportunity to learn from play in the AMF’s “Exploration Station,” a room for both young and old to tour and explore space-related concepts and technologies, as AMF President Stephen Feldman (left) looks on. Feldman conducted the tour for the commissioner in the AMF building, located behind KSC’s Visitors Complex.

September employees of the month



September employees of the month include, left to right, Stephanie Sowards, Space Station and Shuttle Payloads; Bill Dearing, Logistics Operations; Margaret Hinds, ELV and Payload Carriers Program Office; George Hamilton, Space Station Hardware Integration Office; Tammie Hines, Installation Operations; Rey Diaz, Business Innovation Group; and Bridgett Mack, Office of the Chief Financial Officer. Not shown are Sheryl Koller, Advanced Development and Shuttle Upgrades; Tracy Young, Public Affairs Office; Alex Biamonte, Checkout and Launch Control System Office; Scotty Cline, Safety and Mission Assurance; Jonathan Byon, Engineering Development; and Laurel Patrick, Shuttle Processing.

Donald Pettit new CCAS commander

Brigadier General Donald P. Pettit was assigned as commander of the 45th Space Wing, Air Force Space Command, at Cape Canaveral Air Station (CCAS), succeeding Brigadier General F. Randall Starbuck at a ceremony on Aug. 20.

Pettit is also director, Eastern Range, and deputy Department of Defense (DoD) manager, DoD Manned Space Flight Support Operations, Patrick Air Force Base, Fla.



Brig. Gen. Donald Pettit

As commander of the 45th Space Wing, he oversees the preparation and launching of U.S. satellites from CCAS, granting final approval authority for all launches on the Eastern Range.

He also manages wing launch and range infrastructure supporting space launch and missile test operations. The wing also provides launch facilities, property and services to support NASA and commercial space operations from the air station.

The brigadier general is responsible for more than 11,000 government and contractor personnel, eight tenant units and operating sites at the air force base, air station, Jonathan Dickinson Annex in Florida, and a site in Malabar, Fla. There also is an operating site at Antigua Air Station and on Ascension Island, both in the Atlantic Ocean.

Pettit was the director of plans and programs, Headquarters Air Force Space Command, Peterson Air Force Base, Colo. There, he was responsible for planning for the command's force structure, bases, and facilities and managing the command's manpower, international relations, and foreign disclosure programs. He also worked with U.S. Space Command and U.S. Strategic Command to develop integrated priority lists to fulfill warfighting needs.

Pettit enlisted in the Air Force in 1968. From December 1968 to September 1972, he was an enlisted aircraft electronics technician, with the 31st Tactical Fighter Wing, at the Homestead Air Force Base, Fla.

Pettit received his commission as a distinguished graduate of the Reserve Officer Training Corps program in 1974.

He has served in the operations and strategic policy areas within the Joint Staff, Headquarters U.S. Air Force and major commands.

He also has commanded an intercontinental ballistic missile squadron and wing, and is a master missileer.

Pettit received a bachelor of arts degree in education from the University of Miami, Fla., in 1974, and a master of arts degree in counseling, from Pepperdine University, Malibu, Calif., in 1978.

Pettit succeeds Starbuck, who has been assigned as vice commander, 21st Air Force, Air Mobility Command, McGuire Air Force Base, N.J.

Editor's note: To clarify a statement in the Aug. 20 issue of *Spaceport News*, KSC Vehicle Assembly Building modifications will include renovations to high bay 2 in order to store a fully assembled Space Shuttle and to high bay 4 to accommodate horizontal orbiter storage. *Spaceport News* regrets the error.

Cassini successfully swings by Earth on its voyage to Saturn



In this artist's conception, Cassini nears the rings of Saturn during its seven-year voyage.

The Cassini spacecraft successfully completed a highly accurate pass of Earth at 11:28 p.m. EDT on Aug. 18. The flyby gave Cassini about a 12,000-mile-per-hour boost in speed, sending the spacecraft toward Saturn, which is almost one billion miles away.

Engineers at NASA's Jet Propulsion Laboratory confirmed that the spacecraft flew past Earth at an altitude of about 727 miles, passing most closely above the eastern South Pacific. Cassini may even have been visible from small islands in that area.

The spacecraft remains in excellent health as it continues along its seven-year-long journey to the ringed planet. Having completed its cruise among the inner planets, Cassini's future now resides in the cold, dark realm of the outer planets.

The spacecraft will pass by Jupiter on Dec. 30, 2000, and the giant planet's gravity will bend Cassini's flight path to put it on course for arrival into orbit around Saturn on July 1, 2004.

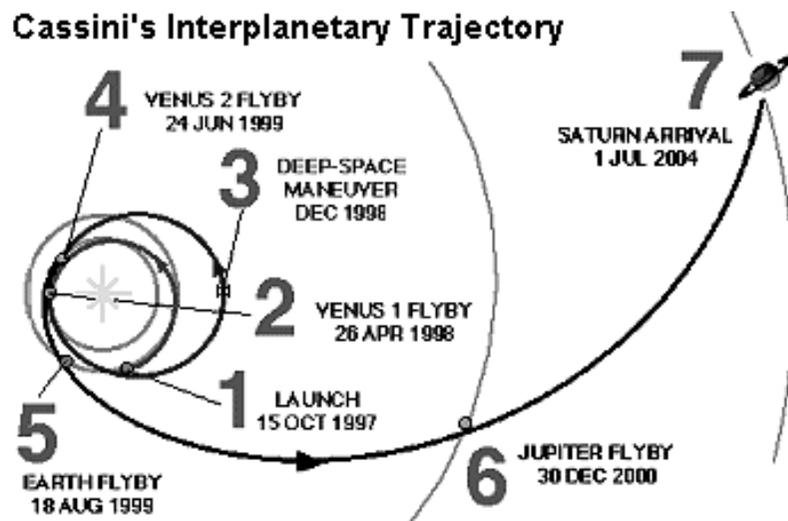
Cassini's mission is to study Saturn, its moons, elaborate rings, and its magnetic and radiation environment for four years.

Cassini will also deliver the European Space Agency's Huygens probe to parachute to the surface of Saturn's moon, Titan.

The Cassini/Huygens program is a joint endeavor of NASA, the European Space Agency and the Italian Space Agency.

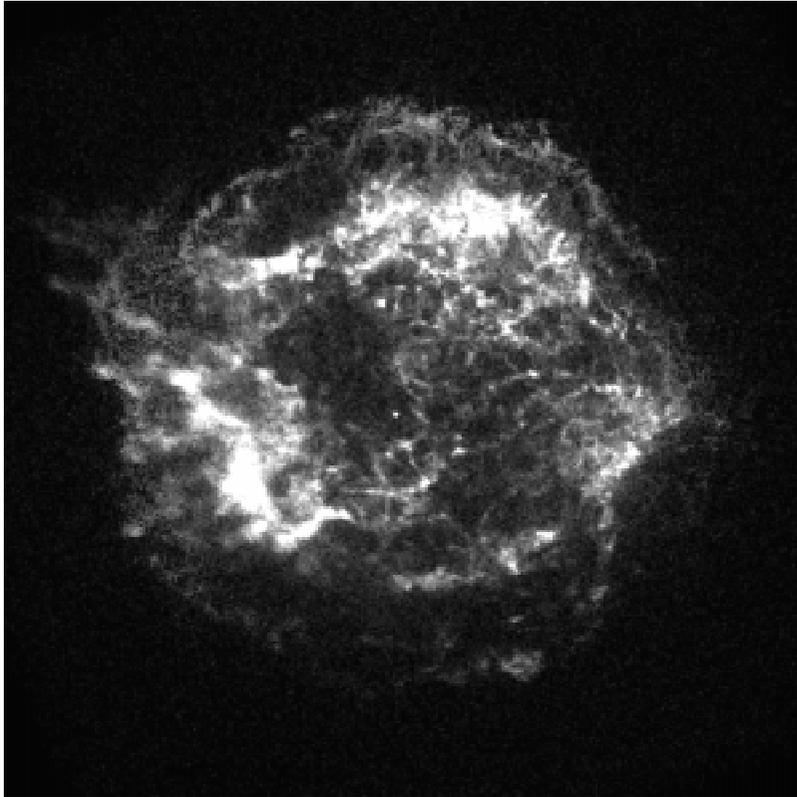
The Cassini orbiter, built by NASA, and the Huygens probe, provided by the European Space Agency (ESA), were launched from Cape Canaveral Air Station on Oct. 15, 1997.

Cassini's Interplanetary Trajectory



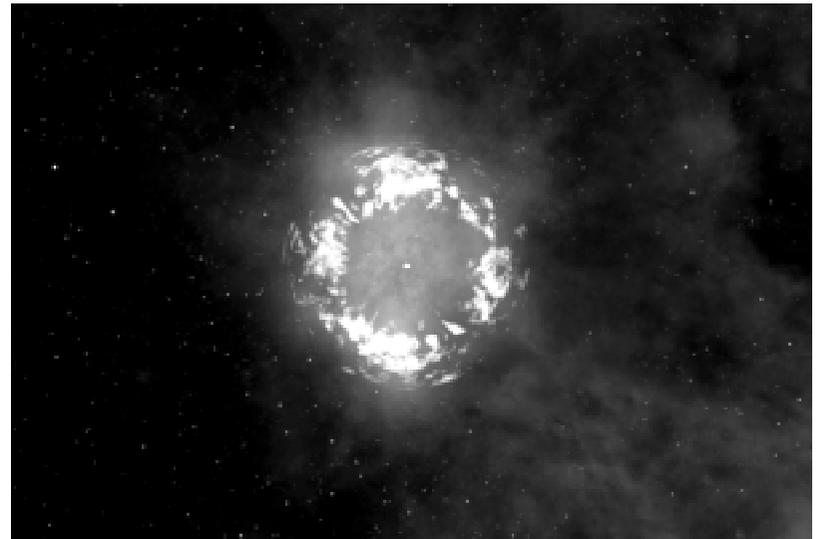
Cassini's voyage includes three "flyby"s — one past Earth and two past Venus.

Chandra X-ray Observatory's stars shine in and around KSC



Above, STS-93 Commander Eileen Collins (right) signed autographs after a mission presentation for KSC employees on Aug. 19. The five-day STS-93 mission released the Chandra X-ray Observatory, allowing scientists from around the world to study some of the most distant and powerful objects in the universe. Since X-rays are absorbed by the Earth's atmosphere, space-based observatories are necessary to study these phenomena and allow scientists to analyze some of the greatest mysteries of the universe. STS-93 was the first mission to have a woman serving as Shuttle commander. Below, when a massive star explodes, it creates a shell of hot gas that glows brightly in X-rays. The kind of strength and accuracy in Chandra could allow you to read a newspaper from half a mile away or see the letters of a stop sign from 12 miles.

Above, this first image from the Chandra X-ray Observatory shows such stunning detail that scientists can see evidence of what may be a neutron star or black hole near the center of a gigantic stellar explosion. Chandra's first X-ray image of the Cassiopeia A supernova remnant reveals a fast outer shock wave and slower inner shock wave. The inner wave is believed to result from material ejected from the supernova explosion colliding with the matter around it, heating it to a temperature of 10 million degrees. Heavy elements in the hot gas produce X-rays of specific energies. Chandra's ability to precisely measure these X-rays tells how much of each element is present. The outer wave may be related to an awesome sonic boom resulting from this collision. The bright object near the center may be the long-sought neutron star or black hole remnant of the explosion that produced Cassiopeia A. Below, a long-range view of Cassiopeia A as seen with an optical telescope. The images, released Aug. 26, confirm that Chandra is in excellent health, and its instruments and optics are performing up to expectations.





John F. Kennedy Space Center

Spaceport News

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