Orbital ballet
Discovery will perform a virtuoso pas de deux with its payload during orbital maneuvers. Story on Page 3.

Hot stuff
NASA scientists believe the Earth may have been much hotter when life first appeared. Story on Page 4.

Space News Round
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Discovery rolls to launch pad, crew prepares
By Kyle Henning
The Space Shuttle Discovery was scheduled for an 8:01 a.m. (Pad 39A at Kennedy Space Center early this morning, and the STS-39 crew will fly to the launch site Monday morning for the terminal countdown demonstration test.
Final work toward launch of the unclassified Department of Defense mission, the first of seven planned flights in 1991, should be complete by early March.
Discovery and the STS-39 crew — Commander Mike Coats, Pilot Blaine Hammond, and Mission Specialists Guy Bluford, Greg Harbaugh, Russ Leib, Don McMonagle and Larry Veach — will perform an orbital ballet, executing complicated rendezvous maneuvers with the free-floating Space Shuttle Pallet Satellite. SPAS will carry the Infrared Background Signature Survey package, which is expected to provide the Defense Strategic Initiative with valuable information on how to detect rocket plumes in space.
Discovery and Columbia swapped places Saturday. Discovery was rolled to the Vehicle Assembly Bldg. and mounted to its external tank/booster stack, and Columbia moved to a new position in the Vehicle Assembly Building and was rolled to the launch pad. A new crew is assigned to Discovery for launch, expected to be no earlier than May 12.

TRAC

JSC engineer Inventor of Year
New Initiatives' Leo Monford first to bring title to JSC
By Kelly Humphries
Leo Monford, NASA's Inventor of the Year, is determined to make the space shuttle's robotic arm even more useful than it is, and his inventions could revolutionize orbital docking and robotics use.

The invention that earned him the award is a "Docking Alignment System." U.S. Patent No. 4,850,918. Monford calls it the Targeting and Reflective Alignment Concept, or TRAC.

By itself, the new precision alignment system is a significant improvement. But used in concert with another of Monford's inventions, a Magnetic End Effector, it could change the shape of future robot arms, satellites and space stations.

Monford, who works in the New Initiatives Office's Space Servicing Systems Project Office, is the first JSC engineer to receive the award for Inventor of the Year award since its inception in 1989. The award will be presented March 28 at a NASA Headquarters ceremony, according to NASA General Counsel Edward Franklin, who announced Monford's selection Feb. 5.

"My job is to come up with innovative thoughts and technologies, and stimulate others into producing those products," Monford said. "I honestly can't think of an award I would desire more than this one."

TRAC utilizes a television camera mounted inside the arm's end effector and a monitor on the shuttle's aft flight deck, both with alignment marks, and a flat, mirrored target marked with cross hairs on the target object. If has been tested extensively at the manipulator development facility in Bldg. 9A and is able to routinely insert itself into square holes with 0.03 inch clearance.

Here's how it works: An astronaut operating the remote manipulator system from the aft flight deck moves the arm to within range of the fixed-focus television camera inside the arm. The operator makes translational corrections with the arm until the cross hairs on the target and the monitor line up. Then, the operator uses rotational controls until the arm can see its own image. Since the camera can see only directly in front of itself, it will not see its own image until the end effector and target are perpendicular to each other. When the camera can see itself and the cross hairs are lined up, alignment is complete.

"It's like looking through a rife scope," Monford said. "Once you understand the idea of aligning the cross hairs, it just comes naturally to you."

The existing alignment system uses a target with a protruding post. The main advantage of Monford's system is that it is target-free. Many proposed space operations for the shuttle's arm or a space station arm involve stacking and unstacking objects for construction purposes.

"When you try to make things fit," Monford said, "it's not a matter of as well as you can."

Forge new alliances
The Black History Month, which this year pays tribute to NASA's 1990 Inventor of the Year, is a perfect opportunity to forge new alliances and partnerships.

Scott Wells/Photo

Black History Month focuses on education
By Karl Fluegel
Education is the focus of this year's observance of Black History Month at JSC set for 1:30 p.m. Feb. 22 in the Teague Auditorium.
Black History Month has been observed in February at JSC since the early 1970s. The theme for the 1991 nationwide observance is "Education America: Historically Black Colleges and Universities."

"The Black History Committee here chose to adopt the national theme for our program because of NASA's and JSC's continuing efforts to provide funding for research and development grants, fellowships and scholarships to HBCUs in an effort to increase the numbers of black scientists and engineers graduating from these educational institutions," said Freda Marks, speaker's committee chair.

Keynote speaker for the event is Patricia Russell-McCloud of Russell-McCloud and Associates. Russell-McCloud is a nationally recognized speaker on race issues and inconsistencies in public affairs. Her speech "If Not You, Who?" was entered into the Congressional Record of the United States.

Dr. Harold Martin, dean of engineering at North Carolina A&T State University, also will discuss the variety of programs available at historically black colleges and universities. He will also focus on the relevance of science and engineering programs at those institutions to the space flight programs.

All employees are invited to attend, and the program is open to the public.

JSC's Black History Committee gets together to plan this year's observance. In the foreground, from left, are Carla Guidry, John Moore, Spurgeon Richardson, Freda Marks and Baley Davis. In the background is Lucille McGaskey.

Magellan images show geiser-like eruption evidence
By Mark A. Lawrence
Magellan scientists said Wednesday day that they have discovered that some volcanic structures on Venus spit ash into the sky like geysers, a far cry from the planet's typically molten lava flows.
The Magellan spacecraft hasn't yet taken an image of a volcanic eruption, but the spatial resolution of its cameras has found signs that the landscape in three areas has been exposed to ash by earlier volcanic plumes.

Those eruptions were about the same intensity as those from Alaska's Redoubt Volcano or Mount Vesuvius in southern Italy, said John Guest, a geologist from University College London.

"At first glance this activity looked to be like eruptions on Venus, you'd put a layer of ash all over Naples," Guest said.

Please see INVENTOR, Page 4
Today
HSS meeting—The Houston Space Society will meet at 7:30 p.m. Feb. 25 in the Space Center Underground, Pacific Room, 3001 NASA Access Rd. Dr. Paul J. Charette, president, will present "The Case Against Nuclear Power." The meeting is free, but parking is $2. For more information, call Warren Frazier at 624-4330.


Monday

Tuesday
HyperCard seminar—The Ameri- can Institute of Aeronautics and Aeronautics Software Systems Technical Committee and the Object-oriented Environment presented by Stephen Detrovsky at 11:45 a.m. in the Classroom Building at JSC.

For more information contact Karen Leiken at 713-344-4658.

Cafe menu—Special: smoo- thed steak with dressing. Entrees: beef stew, liver and onions, shrimp


Wednesday
AIAA meets—The American Insti- tute of Aeronautics and Aeronautics Simulation Technical Committee and JSC will present "AIAA 93 Held June 20 in the Bldg. 3 cafeteria. For more information, call Dr. Sivaram Aneapal at 333-6910.

Astronomy Seminar—The JSC Astronomy Seminar will be held noon Feb. 20 in Bldg. 30, room 333. For more information contact Al Jackson 333-7079.


Thursday

Feb. 22
Supercomputer conference—John Ericson, chief scientist in JSC's Automation and Robotics Division, will be a featured speaker at an Supercomputer Conference and Exhibition sponsored by the Quantitative Technol- ogy Corp., Research Institute and the Oregon Advanced Computing Project.

For more information contact Catherine "Carrie" Wilson, 301-359-7002.
Ballet in the Sky
Orbital choreography adds complexity to Discovery's next flight

By Jeff Carr

Those involved have called it the most dynamic, complex shuttle mission ever attempted.

Highlighted by a virtual orbital ballet of multiple free-flying satellites across the vast test range of low-Earth orbit, STS-39 promises something old, something new and certainly something special.

The next flight of Discovery offers something new in the form of revolutionary sensor technologies that will be tested on orbit for the Department of Defense — technologies that could change the face of global security for decades

To carry out the complex research mission, planners have gone to the textbooks, employing the basic principles and theories of orbital mechanics and rendezvous.

A unique aspect of the mission is its incorporation of a dynamic operating concept that will challenge astronomers and flight controllers to work together in a most precise fashion to achieve their objectives.

"We've set our sights extremely high on this mission," said Lead Flight Director Ron Dittemore. "We'll utilize every operational capacity of vehicle, crew and control team with the exception of EVA. Everyone is turning the gain up to notch."

The mission timeline, ambitious in itself, is packed to the limit, with crew members alternating shifts aboard Discovery around the clock.

"It represents a significant amount of effort, balancing the needs of two primary payloads," Dittemore said.

Orbital Flight Director Rob Kelso concurred. "We are going to be hopping for eight days," Kelso said.

The U.S. Air Force's fixed, pallet-like infrared/television observatory, AFF-STS, will require precise attitude control using Discovery as the course pointing system. "Innovative use of the shuttle's communications network will provide unique insight on the ground for DOD investigators in the Mission Control Center," he said.

Discovery's robotic arm will flex in a classic deployment and retrieval of the free-flying Shuttle Pallet Satellite, bearing the Strategic Defense Initiative Organization's sophisticated imaging platform, the Infrared Background Signature Survey.

During the dynamic rendezvous photos, Discovery and crew will make targets of themselves to conduct the SDO's rocket plume research at close and long range. Maneuvering to precise distances from the free-flying high-tech imaging platform, the crew will take one of Discovery's two Orbital Maneuvering System engines up to 20 seconds for continuous plume observations.

"Simultaneously, the crew will track the orbiter by maneuvering the SPAS by remote control and activating IBSS sensors from the flight deck of Discovery."

The observation burns will propel Discovery north, off its original groundtrack, requiring quick correction to set up the next observation.

"We'll be tracking more objects than we've ever tracked at once," Kelso said.

As each canister carrying a different chemical commonly used in rocket propellants reaches its target distance from the SPAS, Air Force ground controllers at Vandenberg AFB will instruct each to release its contents while astronauts train IBSS sensors to observe and record it.

Crew members will release the third CRO canister later in the mission while the SPAS is attached to the orbiter.

On the ground, rotating flight control teams in Houston will carefully track the objects using data from shuttle and ground-based radar systems, as they orchestrate each move and plot the next, always keeping an eye to the upcoming sequence of events.

"All team members must contribute," said Dittemore. "There are no support teams. Everyone is a major player."

On board Discovery, the extra crew of seven astronauts will be required, at times, to work in careful harmony on the crowded flight deck, synchronizing orbiter and SPAS maneuvers and documenting key events.

Success with this complex operating plan, flight directors said, may well rely on the team's skillful response to the unexpected.

"The greater challenge won't necessarily be the mechanics, but adding further complexity to the orbital choreography, a third and fourth free-flying object will be introduced when two of the three Chemical Release Observation canisters are ejected from Discovery's payload bay at key times during the 36-hour rendezvous."

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Crew members will release the third CRO canister later in the mission while the SPAS is attached to the orbiter.

"We know what you want to accomplish and you build your itinerary around it," he said. "But things happen, and you make the most of your time to do the most important to you."

Flight controllers, however, are ready to meet the challenges of STS-39.

"Our objective is to test and, we hope, validate new technologies that could be important to our national defense," Dittemore said. "We look forward to the challenge."

Diagram does not represent true orbital altitude.

Three times at the far field position and twice at the near field point, Discovery will fire one of its Orbital Maneuvering System engines — as depicted in this retouched SPAS photo from STS-7 — to allow the IBSS to record data on the engine plume.

After about 36 hours of detached operations, the STS-39 rendezvous will come to a close when Discovery begins maneuvers for the eventual grappling and retrieval of the SPAS/IBSS spacecraft as pictured in this STS-7 photo.
‘Space Basics’ educational film to debut

NASA employees are invited to join NASA-JSC Director Aaron Cohen and the STS-41 crew for a Tuesday premiere of a new educational film. 'L' is the first in a series called "L’Roff to Earth," which uses the large organic molecules that are the building blocks of life. In light of these conclusions, scientists are looking at sites other than the Earth's surface for places where life could originate, said Dr. James Kasting, a member of the group. Kasting has reported his most recent findings in a paper on the role of microgravity on the effects of the star. Beads, which are reflective of the atmosphere and the impact of meteorites and comets. Beads and everyone else who attended the 'House gas,' traps heat radiating from the earth's surface, temperatures soared to 100 degrees Fahrenheit.

These seemingly minor factors may provide the clues that are changing the view of the origin of life. Some scientists are looking at sites other than the Earth's surface for places where life could originate. However, little is known about the large organic molecules that are the building blocks of life. In light of these conclusions, scientists are looking at sites other than the Earth's surface for places where life could originate, said Dr. James Kasting, a member of the group. Kasting has reported his most recent findings in a paper on the role of microgravity on the effects of the star. Beads, which are reflective of the atmosphere and the impact of meteorites and comets. Beads and everyone else who attended the 'House gas,' traps heat radiating from the earth's surface, temperatures soared to 100 degrees Fahrenheit.

Atlas-2 mission would move ahead of Astronautics has issued a call for sc

Conference canceled

The third annual Space Technology, Commerce & Communications Symposium scheduled for March 5-7 has been canceled. Conference organizer said budget cuts and reduced attendance had made the event impossible or impossible to gather otherwise. The 1990s were also a difficult time for the industry as hundreds of new companies were created. However, the conference has been canceled due to the current economic conditions. The theme of this year's conference was "Space and Society: The Interface of Technology and Society." The conference organizers said they were disappointed by the cancellation but noted that the event will continue in the future.

Correction

A story about the new Mixed Float Manifest in the Feb. 8 Roundup incorrectly reported that the STS-57 Atlantis is expected to be the payload on the March 1993 STS-56 launch. STS-57 and STS-56 will follow STS-56 in April 1993. STS-57 and STS-56, which will carry the Shuttle Radiator Absorber System, are scheduled to be launched as a Phase Two Integrated Thermal System payload, will fly next, in May 1993.

Inventor of Year says he’s an ‘idea generator’

Proposed MEEs would give different sized arms the capability to grasp and common target plates, add the ability to transfer both power and data to payloads and provide a method of attaching a variety of power tools that could help alleviate the need for extravehicular activity space walks by astronauts. One idea was that the space in the station area, the type of an end effector will be baseline, "Monford said. The TRAC, MEE, a JPL Torque Sensor that provides a representation of the end effector on the arm, and a Carter Latch Assembly that uses electromagnetic force to help the satellites in the payload bay, are scheduled to fly by part of the D Extrusive End Effector High Definition Survey on STS-56. "I’m looking forward to some other exciting flight experiments that would leapfrog from this one," Monford said. Monford, who was working at JSC in 1963 as a co-op in the measurements laboratory, began working on these associated ideas when he took over as project manager for the Force Torque Sensor, a joint project for NASA and the Shock and Vibration Laboratory, three years ago. "Right now, we only use the RMS for aides, not for the biggest jobs," Monford said. "The thing we need is to make them operate more efficiently, so we can do better work on the release of the tool."

JSC Fellowship application due

Interested employees have until March 5 to apply for the JSC Fellowship which can grant them a year-long opportunity to further their education. JSC officials strongly support academic training through a variety of avenues. Under this program, the fellow's area of interest will be selected by the committee based on the candidate's education and preparation. While application and acceptance to the graduate school is the responsibility of the applicant, tuition and related fees, as well as travel, will be paid. Fellows will be required to continue their work at JSC for a period of three times the length of the fellowship. Interested employees should request an application from Laura Goerner at x3687. The completed application along with references and the graduate school director's approval must be submitted to Ruth Hell in the Human Resources Office, AN3.

Magellan mapping

The Roundup is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every Friday by the public Affairs Office for all space center employees.

Editor...Kathy Humphries
Assistant Editors...Paul Adaway, Karl Flanagan

Magellan mapping (Continued from Page 1)

working on the Magellan mission at NASA’s Kennedy Space Center. The Magellan mission will create a global topographic map of Venus, mapping the planet’s surface to a resolution of 100 meters. The Magellan mission will also map Venus’ gravitational field, which is expected to be the key to understanding the planet’s internal structure. The Magellan mission will use a new type of radar, called synthetic aperture radar, which can create detailed images of the planet’s surface even in the presence of thick clouds. The Magellan mission will also study Venus’ atmosphere, which is one of the densest in the solar system, and will look for evidence of life on the planet. The Magellan mission will use a new type of radar, called synthetic aperture radar, which can create detailed images of the planet’s surface even in the presence of thick clouds. The Magellan mission will also study Venus’ atmosphere, which is one of the densest in the solar system, and will look for evidence of life on the planet.