



**Foolin' around**

This year's JSC Picnic was a big success, with some 3,000 people shuttling in for fun, food and foolishness. Photos on Page 3.



**Near the edge**

NASA's Voyager spacecraft have discovered the first tangible evidence of the edge of the solar system. Story on Page 4.

# Space News Roundup

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## You say you ought to be an astronaut?

By Barbara Schwartz

NASA is accepting applications for mission specialist and pilot astronaut positions effective immediately.

Interested individuals may apply until the cut-off date of July 1.

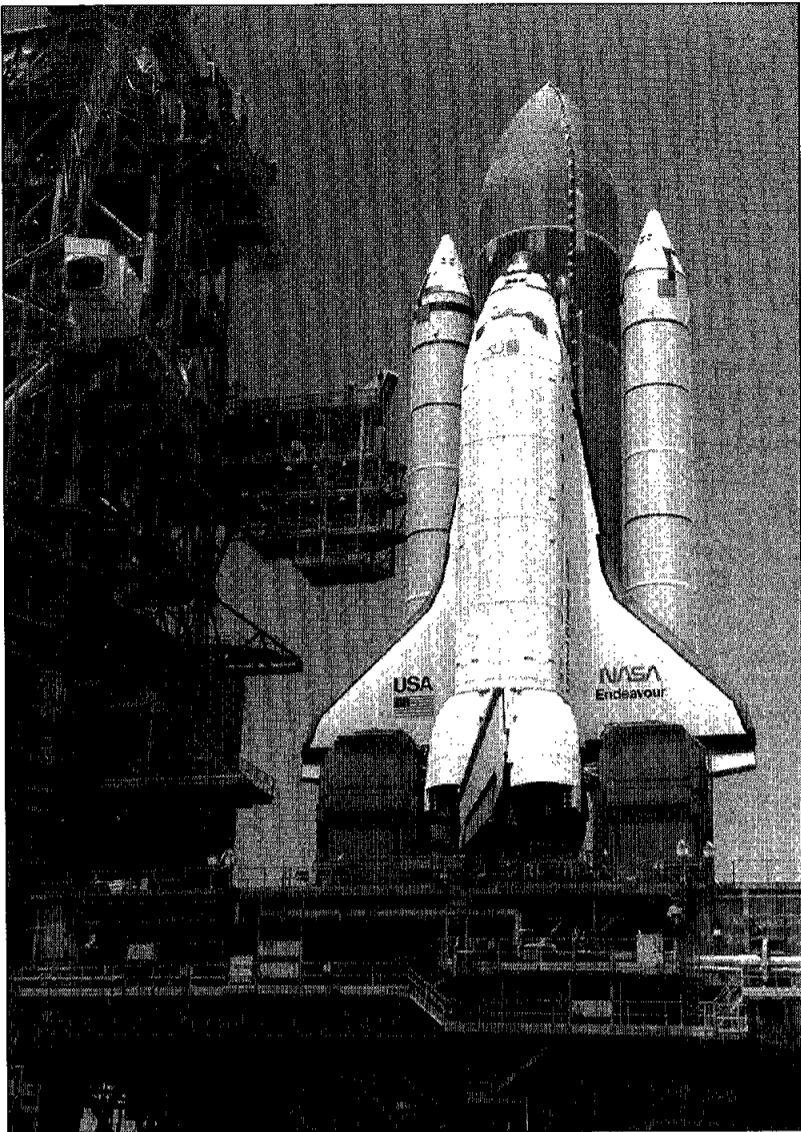
"We are looking for multi-faceted individuals who are not only outstanding in their chosen disciplines but who will be able to handle various technical assignments, maintain spacecraft systems and experiments, work well with others and have excellent communications skills. We also like to have a balanced skill mix and a culturally diverse group in the astronaut corps," Flight Crew Operations Director David C. Leestma said.

Successful pilot applicants typically have extensive piloting experience in high-performance jet aircraft and flight test experience.

Successful applicants for the mission specialist positions typically have significant backgrounds in the sciences (materials science, Earth science, medical science and space science) or engineering.

After a six-month process of screening, interviews and medical evaluations, selections will be announced in the spring of 1994 with the new astronaut candidates reporting to JSC in July 1994.

To get an application package, write Mail Code AHX, visit the Astronaut Selection Office in Bldg. 259 or call x35907.



The Space Shuttle *Endeavour* sits on Launch Pad 39B at Kennedy Space Center. Technicians this week are expected to wrap up a swap of turbopumps on main engine No. 2, which would put *Endeavour* in position for launch on STS-57 in the third week of June.

## Endeavour gets new turbopump; launch mid-June

By James Hartsfield

Kennedy Space Center technicians should be wrapping up their replacement of the high-pressure oxidizer turbopump in one of the shuttle's three main engines early this week.

Shuttle managers decided late May 27 to postpone the launch of *Endeavour* on STS-57 at least two weeks, until mid-June, to allow the changeout.

The turbopump is being replaced because a spring that helps align bearings around the pump's drive shaft may have been weakened by an improperly placed identification mark stamped on it by the manufacturer.

The spring is a curved piece of metal, not a coiled type of spring, and the stamp is located inside the curve, the point at which the spring takes the greatest stress. Engineers who analyzed the spring could not prove that it would cause any type of problem for *Endeavour*, however, managers decided to replace the pump to be prudent.

Technicians at KSC began removing the old pump from *Endeavour*'s No. 2 main engine

early last week, and began installing the new pump late in the week. The installation job was predicted to last through the weekend and be finished this week. After that is completed, technicians will begin normal activities to close out the shuttle's engine room for the flight and a firm target date for the launch can be set.



Also May 27, managers cleared a problem with a loud noise heard at the launch pad while *Endeavour* was being readied for launch early last month. The banging noise was traced to a stuck joint in the spacecraft's 17-inch fuel line that feeds liquid hydrogen from the external liquid tank to the main engines.

Engineers duplicated the problem in a lab test, and it is believed the ball-and-socket joint popped loose while the fuel line was being pressurized with helium for a leak check. The joint has been proven to be unharmed by the incident and is working well now.

The noise was narrowed to the fuel line joint following inspections of all equipment and structure on *Endeavour* that could have been Please see *DISCOVERY*, Page 4

## Station redesign options go to White House today

By Kyle Herring and Kelly Humphries

In less than three months, a NASA team made up of employees from across the agency has settled on three options that will be formally turned over to a White House advisory panel in a day-long presentation today.

Led by Associate Administrator for Space Flight Bryan O'Connor, the Space Station Redesign Team has met each day just outside of Washington, D.C., brainstorming on three designs that would meet a White House mandate to reduce the overall cost of putting the space sta-

tion in orbit and also reduce the operating costs once the facility is operational.

Supported by engineering teams from JSC, Marshall and Langley, which worked on the details of the three options, and other groups that studied areas from engineering research to science applications and technology to transportation and program management, the team collected and presented data to the White House Advisory Panel twice monthly keeping it informed of the team's progress. The White House panel is headed by Dr. Charles Vest, president of the

Massachusetts Institute of Technology.

The work of the NASA team, which began with a letter from Administrator Daniel Goldin on March 11, culminates with today's final presentation of the three options—listed as Options A, B and C—requested by the White House with guidelines to streamline the program meeting three cost goals of \$5, \$7 or \$9 billion.

At JSC, strategic planners have begun shifting their focus to contingency planning in an effort to position the center for quick response to whatever decision is made regard-

ing the space station by President Clinton and the Congress.

Lyn Gordon-Winkler, manager of the Strategy and Planning Office in JSC's New Initiatives Office, is leading the effort that is an outgrowth of the work already under way by the Total Quality Steering Committee's Strategic Planning Subcommittee.

"We're developing a set of scenarios that fall within the range of likely outcomes," Gordon-Winkler said. "We're trying to figure out what each scenario means to the center and what we can do now to be prepared for each scenario."

The contingency planners will

concentrate only on the most basic of scenarios and avoid trying to deal with all the possible tangents.

Following today's presentation, hearings on Capitol Hill will commence to review the design options. The House Space Subcommittee, chaired by Ralph Hall, D-Texas, will hear from Goldin, Vest and O'Connor tomorrow.

Later, NASA Associate Administrator for Space Systems Development Arnold Aldrich will serve as a witness on the agency's space station budget request for fiscal 1994.

Next week, hearings will continue Please see *SPACE*, Page 4

## Musgrave frostbitten during Hubble training

By Barbara Schwartz

Astronaut Story Musgrave developed a mild case of frostbite on the fingers of his right hand during a recent equipment test in the Thermal Vacuum Chamber B.

Musgrave reported his hand feeling cold during the 8-hour training session, but he elected to finish the test. Musgrave was in a pressure suit testing equipment and tools in the vacuum chamber in preparation for the December Hubble Space Telescope servicing mission.

After leaving the chamber, Musgrave reported numbness and discoloration of his fingers. He was examined by a NASA physician and appropriate therapy was instituted. Musgrave's condition is expected to improve quickly with little impact to training and no impact to the mission.

"The crew is going to Marshall later this month for exercises in the NBS (Neutral Buoyancy Simulator) to validate the space walk timelines. Story may be limited in his suited activities, but he is already way ahead of other crew members as far as training is concerned because of his long involvement with the Hubble servicing mission," crew Commander Dick Covey said.

In related news, The Hubble Space Telescope's new Wide Field/Planetary Camera, designed by NASA's Jet Propulsion Laboratory to replace the current camera, was shipped this week, two years after the major redesign began.

The camera will be delivered to Goddard Space Flight Center, where it will be tested before being shipped to Kennedy Space Center for integration with *Endeavour* in mid-September.



JSC Photo by Benny Benavides

STS-61 Mission Specialist Story Musgrave participates in a dry run for thermal vacuum tests of the tools that will be used in the Hubble Space Telescope repair mission. The test in Bldg. 32's Thermal Vacuum Chamber B will verify that the tools being designed for the mission will work in the cold vacuum of space. From left are Test Directors Andrea Tullar and Donna Fender, Acting Engineering Director Leonard Nicholson, Mission Specialists Tom Akers and Kathy Thornton, and Musgrave.

## Gem of new award for going extra mile

JSC's Human Resources Office is starting a gem of a new awards program designed to provide fast recognition for employees who "go the extra mile."

The Go the Extra Mile, or GEM, award will be an immediate small cash award ranging from \$50 to \$200. All JSC civil service employees will be eligible, but the primary aim is to reward non-supervisory employees.

Here's how the GEM award will work:

When an employee gives a task that extra "E" for effort, supervisors at lower management levels will present a GEM certificate and a voucher that can be exchanged for cash at the Imprest Fund Cashier in Bldg. 1 the next day. Each organization will have an awards budget and may present vouchers ranging from \$50 to \$200 (before taxes) in \$25 increments.

Although approval is at the direction of the... Please see *PEERS*, Page 4





# Shuttling Into Fun

**F**rom the minute they exchanged their tickets, JSC workers were treated to an afternoon of fun, food and foolishness at the 1993 JSC Picnic. This year's theme was "Shuttle Into Fun."

More than 3,000 people attended the May 1 event at the Gilruth Center, a large number of them ferried to and from their cars by Space Center Houston trams.

Among the popular activities at

this year's picnic were a first-time booth where picnickers could watch as astronauts autographed photos for them, a Spaceball ride that put riders through a stomach-churning set of twists, turns and flips, and a Velcro wall that let participants become flies on a wall.

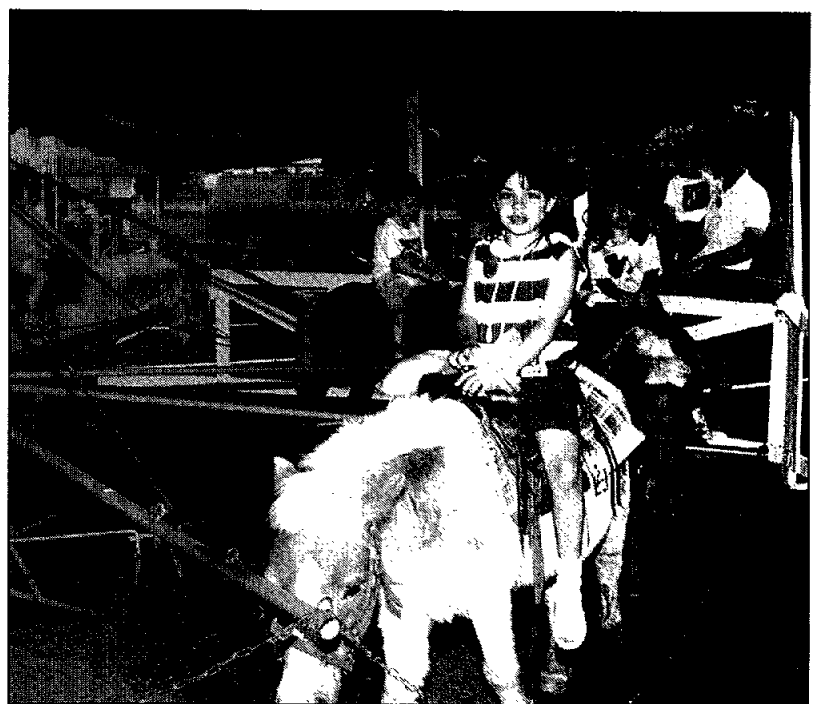
Among the children, the petting zoo, pony rides, obstacle course and balloon-shaping magician were favorites.

The dunk tank, which featured people including Astronaut Charlie Bolden, also drew a continuing crowd.

Mariachi musicians helped provided a festive spirit, and high-kicking dancers put on a show.

A company called Successful Events provided many of the party services, and James Coney Island provided food.

Photos by Dale Martin and David DeHoyos



# Voyagers find clues that point to edge of solar system

Nearly 15 years after they left home, the Voyager 1 and 2 spacecraft have discovered the first direct evidence of the long-sought-after heliopause—the boundary that separates Earth's solar system from interstellar space.

"This discovery is an exciting indication that still more discoveries and surprises lie ahead for the Voyagers as they continue their journey to the outer reaches of our solar system," said Voyager Project Scientist Edward Stone, director of NASA's Jet Propulsion Laboratory.

Since August 1992, the radio antennas on the spacecraft, called the plasma wave subsystem, have been recording intense low-frequency radio emissions coming from

beyond the solar system. For months the source of these radio emissions remained a mystery.

"Our interpretation now is that these radio signals are created as a cloud of electrically charged gas, called a plasma, expands from the Sun and interacts with the cold interstellar gas beyond the heliopause," said Dr. Don Gurnett, principal investigator of the Voyager plasma wave subsystem and a professor at the University of Iowa.

The solar wind is a stream of electrically charged particles that flows steadily away from the Sun. As the solar wind moves out into space, it creates a magnetized bubble of hot plasma around the Sun, called the heliosphere. Eventually, the expand-

ing solar wind encounters the charged particles and magnetic field in the interstellar gas. The boundary created between the solar wind and interstellar gas is the heliopause.

"These radio emissions are probably the most powerful radio source in our solar system," Gurnett said. "We've estimated the total power radiated by the signals to be more than 10 trillion watts. However, these radio signals are at such low frequencies, only 2 to 3 kilohertz, that they can't be detected from Earth."

In May and June 1992, the Sun experienced a period of intense solar activity which emitted a cloud of rapidly moving charged particles. When this cloud of plasma arrived at the heliopause, the particles interact-

ed violently with the interstellar plasma and produced the radio emissions, according to Gurnett.

"We've seen the frequency of these radio emissions rise over time. Our assumption that this is the heliopause is based on the fact that there is no other known structure out there that could be causing these signals," Gurnett continued.

Because of the Voyagers' unique positions in space, they serendipitously detected and recorded the radio emissions. "Earth-bound scientists would not know this phenomenon was occurring if it weren't for the Voyager spacecraft," Gurnett added.

Exactly where the heliopause is remains one of the great unan-

swered questions in space physics.

"It's this Voyager radio data combined with the plasma measurements taken at the spacecraft that give us a better guess about where the heliopause is," said Dr. Ralph McNutt, a co-investigator on the Voyager plasma science experiment. "Based on the solar wind speed, the time that has elapsed since the mid-1992 solar event and the strength of the radio emissions, my best guess for the upper limit of the heliopause currently is about 90 to 120 astronomical units (AU) from the Sun."

One AU is equal to 93 million miles (150 million kilometers) or the mean distance from the Earth to the Sun.

## Murder mystery comedy will get audience into act

If you like murder mysteries and think you're pretty good at figuring out "whodunit," the Employee Activities Association is tailoring a new social event just for you.

Here's the scenario: Five contestants show up for the finalists competition at Vinnie's Belly Laugh Club. Unfortunately, Vinnie is murdered and contestants become suspects. Each has a motive and an iron-clad alibi. The question is, which one did the dastardly deed?

If you love detective stories, don't miss the murder mystery comedy "Knock 'em Dead" at the Gilruth Dinner Theater on June 26. As a member of the audience, you will participate in the play and it will be your responsibility to find the killer. A detective will be on hand to help guide you along the way.

The evening begins at 7 p.m. with a social hour, followed by a chicken California dinner at 8 p.m. and the play from 9:30-11:30 p.m. Audience movement will be restricted during the performance.

Tickets will go on sale for \$15 each at 10 a.m. Wednesday at the JSC Exchange Store in Bldg. 11, and continue through 2 p.m. June 23; limit four tickets per badged employee.

For more information, call the nearly famous Italian theatrical producer, Maestro Saverio Gaudiano, at x38318.

## More on hurricanes

Here's some additional news about hurricane preparedness efforts at JSC.

Level 1 readiness also includes an inspection of building roofs to ensure that all equipment and roof-mounted items such as antennas, data sensors and microwave dishes are securely anchored.

Pat Kolkmeier of Center Operations' Plant Engineering Division said all user-owned equipment on JSC roofs must be capable of withstanding hurricane force winds of 120 miles an hour, sustained, as per JSC Management Directive 8823.1C.

Organizations are responsible for ensuring that each item has an identification tag, or for sending an annual validation of need memorandum to the Plant Engineering Division by June 1.

## Discovery work ahead of schedule; shuttle may reach pad by June 24

(Continued from Page 1)

responsible for the noise. Upon inspecting the joint with a fiber optic camera, engineers noted scratches on the ball inside the joint that were likely caused by its being stuck.

Meanwhile, preparations of *Discovery* are being finished up in the Bay 3 processing hangar at KSC for a launch on STS-51 in mid-July. Workers are getting ready to install the three main engines, one of which also will have a turbopump replaced due to an improperly stamped bearing spring. Other work included tests



**FOLDED ARM**—Astronauts Norm Thagard and Greg Harbaugh help with deployment and maintenance testing of a Canadian-built folding robot arm mockup in the Bldg. 29 Weightless Environment Training Facility. The space station remote manipulator system, is being developed for use on a mobile servicing platform that would be able to move about freely outside the station to perform maintenance and repairs, or assist space walking astronauts with their work.

# Space station option assessment begins

(Continued from Page 1)

before subcommittees in both the House and Senate. The full House takes up the NASA budget and the station redesign in floor debates scheduled for June 15 on the authorization and June 25 on the appropriations prior to the scheduled August recess.

The possibility exists for the Senate to take up the agency's budget before the recess as well.

Once both houses of Congress

have settled the budget authorization and appropriations, any differences will be worked out through a conference committee before any presidential actions.

The presentation today will detail each of three basic options.

Option A, the modular approach, focused on the lowest cost design that would build up slowly using the shuttle in a long-duration capacity, but protecting the ability to be added to provide increased capability.

Option B, the Space Station *Freedom* derived option, is the high-end of the cost constraints and explored the use of current space station elements, scaled back to meet the redesign team's requirements on cost and schedule.

Option C, the single launch core vehicle, focuses on a design that can be placed into orbit with a single launch using much of the existing shuttle components to reduce the launch costs.

Last week, the NASA Station Redesign Team, or SRT, compiled the rough drafts of the options and wrote the final report for today's presentation.

From this point, the White House panel will evaluate the three options and meet with President Clinton's science adviser, John Gibbons, to present the station redesign plan. A date on the White House's decision has not yet been announced.

## Space News Roundup

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.

Dates and Data submissions are due Wednesdays, eight working days before the desired date of publication.

Editor ..... Kelly Humphries  
Associate Editor ..... Kari Fluegel

## Spaceweek seeks local volunteers

Spaceweek National Headquarters is looking for day and evening volunteers to work at its 1110 NASA Road 1, Suite 100, location between now and Aug. 1.

Volunteers also are needed to help with the July 16 golf tournament and Spaceweek National Gala.

Spaceweek is an international public forum on the future of space held each year on the anniversary of the Apollo 11 lunar landing mission, July 16-24. Last year, some 800,000 people in more than 150 cities participated. Anyone who is interested should contact Karol Horne or Cathy Jones at 333-3627.

## Peers may nominate GEM winners

(Continued from Page 1)

torate and program management level, organizations are being encouraged to delegate the authority to lower levels. Organizations also

are encouraged to create a peer nomination process.

For more information, call Helen Harris in the Awards Office at x38411.