



STS-78 crew members share photos of their record-setting mission. Photos on Page 3.



The "Allpanchis" entertain employees during lunch in the Bldg. 3 cafeteria. Photo on Page 4.

Space News Roundup

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Test chamber quartet ready to stay longer

Four JSC volunteers emerged from their temporary home last Friday with plans to spend time outdoors but said they would have been happy to stay in their recycled environment longer.

"I'm going to go out and hug a tree, look at the sun and probably find my fly fishing rod and go fishing," said Doug Ming, test crew lead for the Advance Life Support System.

Ming along with John Lewis, lead engineer, Pat O'Rear, lead electrical engineer and Katy Hurlbert an aerospace engineer and thermal systems expert, have been living inside the three-story, 20-foot diameter chamber 24 hours a day since June 12. The four JSC volunteers spent 30 days sealed in a converted vacuum chamber in Bldg. 7, continually recycling a week's worth of air and water to test technology that may one day become a cornerstone of human survival beyond Earth orbit.

"It was really very easy, surprisingly easy," Hurlbert said. "I'd do it again."

Ming said it never bothered the volunteers that their drinking water was recycled from several sources, including urine. "I know the chemical makeup of the water, and I know it was purer than anything we get in Houston. The air composition was definitely a lot better." Please see **TWO**, Page 4



JSC Photo by Robert Markowitz

Four JSC volunteers emerge from their temporary home last Friday after spending 30 days in a sealed test chamber in Bldg. 7. The team entered the chamber June 12 and continually recycled a week's worth of air and water to test technology that may one day become a cornerstone of human survival beyond Earth orbit.

Booster change under way, new launch date set

By James Hartsfield

Atlantis remains in Kennedy Space Center's Vehicle Assembly Bldg. following a decision July 12 by managers to destack the STS-79 solid rocket boosters and remate *Atlantis* to the STS-80 boosters.

The change in boosters will mean an approximate six-week delay in *Atlantis*' launch on STS-79, the fourth shuttle-Mir docking mission, from July 31 to around Sept. 12. STS-79 will bring Astronaut Shannon Lucid home from the Russian Mir Space Station and drop off Astronaut John Blaha for a four-month stay.

The solid rocket booster swap came as the result of an investigation of charring and sooting found during post-flight inspections of interior J-joints in the STS-78 solid rockets. The J-joints are where rubber insulation on the interior of the solid rocket casings meets at each of the three field joints. Inspections of the STS-78 boosters found the rubber charred in places and soot reaching near the actual field joint and capture-feature O-ring, the first of three O-rings in each joint.

Although the J-joint was not

designed to seal against pressure, it has always done so. On STS-78 and on the STS-79 boosters, a new adhesive was used during assembly of the J-joints and is thought to have been the cause of the problem. The new adhesive had been used because the original adhesive was no longer manufactured. As a result of the investigation, shuttle managers decided to destack and use the STS-80 boosters, now being stacked with remaining supplies of the original adhesive. Enough supplies of the original adhesive are still available at KSC to last two years.

Stacking of the STS-80 boosters has been accelerated, and work this week included the stacking of the left-hand booster's center and forward segments. Stacking of the left booster is expected to be completed by today, and work on the right booster will begin next week.

Meanwhile, *Columbia* is being readied for STS-80, the third flight of the Wake Shield Facility. The impact of the solid rocket booster swap on *Columbia*'s launch date is continuing to be assessed. Work this week on *Columbia* included removal of the Spacelab module and main engines.



Lucid's extended stay to break female flight record

By Natasha Calder

Cosmonaut Researcher Shannon Lucid broke the U.S. record for the longest space flight Monday and also could break the longest flight by a woman now that her stay on the Russian outpost is extended.

But Lucid said she sees her record as only one in what she hopes will become a long series of records to be set by American's in space.

"I feel very honored and very proud that I have this opportunity to be here on board the Russian Space Station Mir representing America," Lucid said Monday in a news conference. "I just hope it is not a record that holds very long because I hope that in the next few years, quite a few Americans will have the opportunity to spend a long time in space and that NASA, that America, will be

able to gain a lot of experience with long-duration space flight."

In putting this record-setting experience in perspective, Lucid spoke about what she has learned aboard the space station that she feels is significant.

"I think the most important thing you can learn from an experience like this is that the crew has to be compatible and get along and work together," she said. "And the other thing that I think is absolutely of vital importance, is that you have very strong family support. My family has supported me all the way and still supports me and that has been vital to my well-being and having a good time here on Mir."

That support will now have to continue from Lucid's family for an additional six weeks. The decision to delay the launch of STS-79 and

therefore extend Lucid's stay aboard Mir was made last Friday after inspections of the STS-78 solid rocket boosters found the rubber insulation charred in places and soot reaching near the field joint and the capture-feature O-ring. Although investigations concluded that the risk of a field joint failure on the STS-79 boosters was improbable, mission managers decided to replace boosters, delaying the rendezvous until mid-September.

Lucid is taking the extended stay and the new challenges the extension will bring in stride.



"Of course, when July arrived, then I started counting the days down until I'd be home again with my family and with my friends. But I am going to stay up here a little longer," Lucid said. "I think it was a good decision and I support NASA all the way with the decision that they made."

The extra time Lucid will now have aboard Mir will provide her an opportunity to work with the Mir 22 crew—Commander Gennady Manakov, Flight Engineer Pavel Vinogradov and French Cosmonaut Researcher Claudie Andre-Deschays. The Mir 22 crew will arrive at the station in mid-August on the Russian Soyuz, minus Astronaut John Blaha, who will wait to replace Lucid on STS-79.

The extra time also will allow Lucid to start on work that is planned for the next flight, as

Please see **LUCID**, Page 4

Galileo spacecraft makes discoveries at Ganymede

NASA's Galileo spacecraft has returned stunning close-ups of Jupiter's moon Ganymede, revealing that the face of the huge satellite has been extensively bombed by comets and asteroids and is dramatically wrinkled and torn by the same forces that make mountains and move continents on Earth.

"These images have exceeded our wildest expectations," said Michael Belton, of the National Optical Astronomy Observatories.

At the same time, scientists studying data from space physics instruments on the spacecraft have made the discovery that Ganymede possesses its own magnetosphere—a bubble-shaped region of charged particles that surrounds many of the planets but has never been found to exist around a moon. Possible

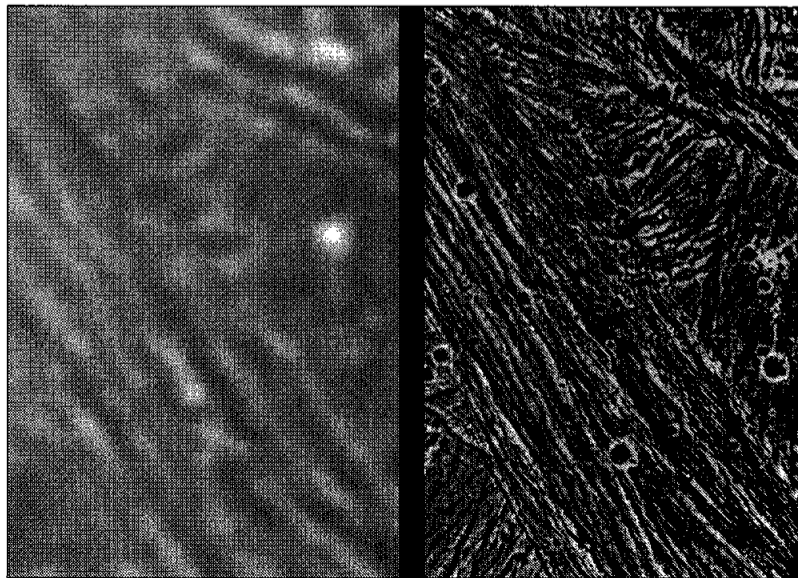
sources of a magnetic field include a molten iron core or even a thin layer of conducting salty water underneath its icy crust.

"What we've found is a magnetosphere within a magnetosphere," said Galileo Project Scientist Torrence Johnson at NASA's Jet Propulsion Laboratory. "While we expected some degree of interaction between Ganymede and Jupiter's magnetic environment, the size and the effect at Ganymede was completely unexpected."

The crisp new images and magnetospheric findings were revealed in data returned by Galileo in the days since its first flyby on June 27, when the spacecraft came within just 519 miles of the big moon.

The discoveries are based on just

Please see **GALILEO**, Page 4



NASA Photo

NASA's Galileo spacecraft is returning images that show a dramatic improvement in the resolution of pictures compared to previous images of the Jupiter system taken by the Voyager 2 spacecraft when it flew by in 1979. The image is clearer due to the close proximity of Galileo to Ganymede—only 519 miles.

Four round out sixth Mir docking

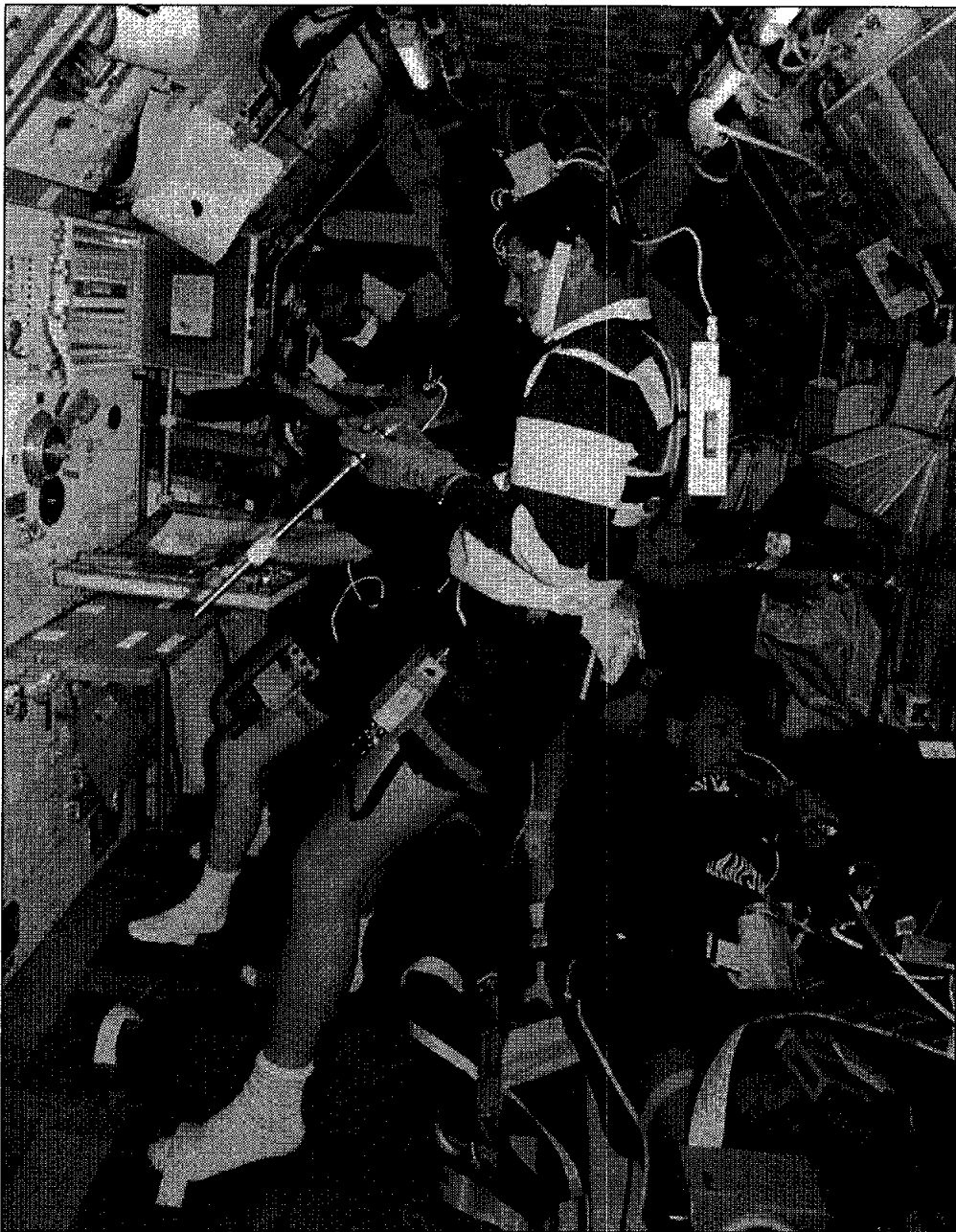
By Eileen Hawley

Four crew members have been named to join Commander Charlie Precourt on board *Atlantis* for the sixth scheduled docking mission between the space shuttle and the Russian Mir Space Station.

Joining Precourt on the flight deck will be Pilot Eileen Collins, Mission Specialist Carlos Noriega and Edward Lu, the first mission specialists from the 1995 astronaut class to be assigned to a shuttle flight. Rounding out the crew is European Space Agency astronaut Jean-Francois Clervoy.

Precourt was named commander of the mission last February. *Atlantis* also will carry Mission Specialist Mike Foale to Mir to begin a planned four-month stay as part of NASA's Phase 1 Program. Foale will replace

Please see **ROOKIES**, Page 4



Spacelab Science

Record-setting mission records cache of life, materials science data

The STS-78 mission is one historians and scientists will not soon forget. Commander Tom Henricks, Pilot Kevin Kregel, Mission Specialists Susan Helms, Rick Linnehan and Chuck Brady and Payload Specialists Jean-Jacques Favier and Bob Thirsk returned to Earth on July 7 with a record 16 day, 21 hour and 48 minute flight and enough science data on the 41 principal investigations to keep scientists busy evaluating the results of the data. Through it all, the crew captured photos to share. From top to bottom, left to right:

1) Favier prepares a sample for the Advanced Gradient Heating Facility while wearing instruments that measure upper body movement. Rick Linnehan, right, tests his muscle response with the Handgrip Dynamometer.

2) Thirsk, representing the Canadian Space Agency, performs a test on his arm using the Torque Velocity Dynamometer. Thirsk was measuring changes in muscle forces of the biceps and triceps. The TVD hardware also is used to measure leg muscle forces and velocity at the ankle and elbow joints.

3) Henricks checks cables on a computer underneath the floor of the Spacelab. The crew performed several in-flight maintenance tasks that helped keep all of the mission's science instruments working well.

4) Five NASA astronauts and two international payload specialists take a break from a shuttle duration record-breaker flight to pose for the traditional in-flight crew portrait. Beginning at bottom center and moving clockwise are Kregel, Brady, Linnehan, Henricks, Helms, Favier and Thirsk.

5) On the mid-deck, Brady talks to students on Earth via amateur radio. Some of the crew members devoted off-duty time to continue a

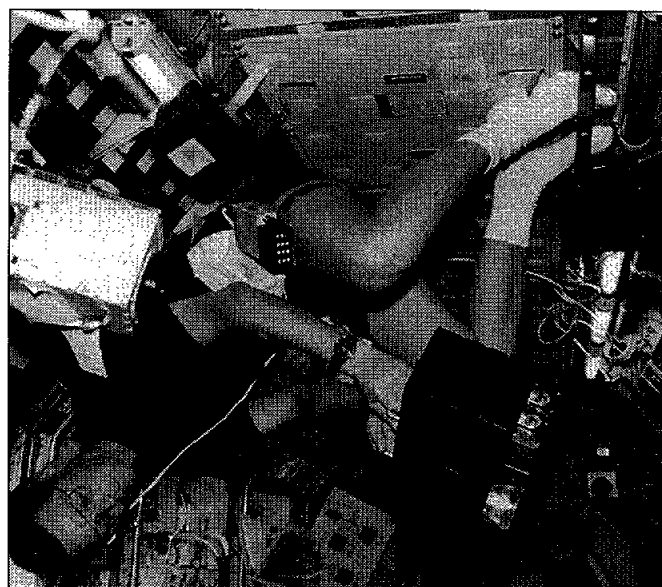
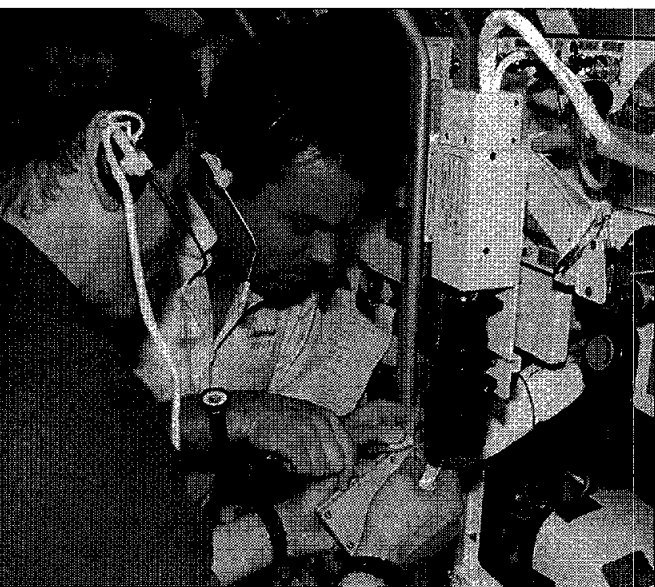
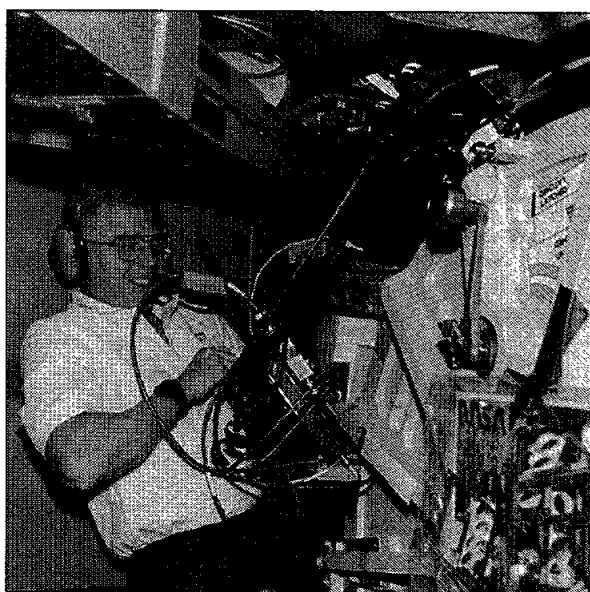
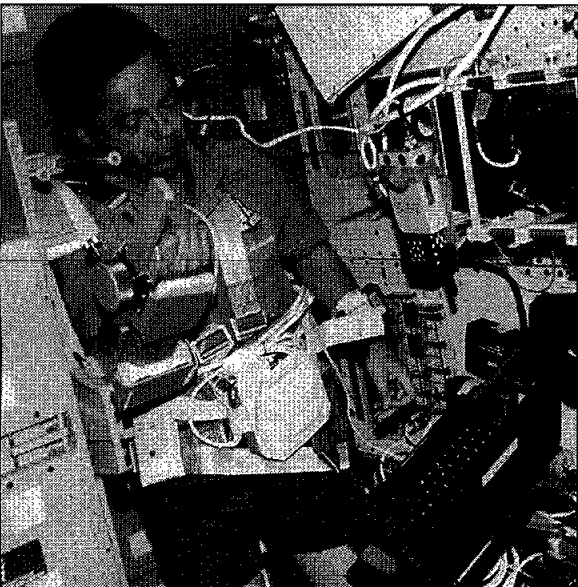
long-standing shuttle tradition of communicating with students and other "hams" between their shifts of assigned duty.

6) Linnehan works out in the Life and Microgravity Spacelab module. With an almost 17-day mission away from Earth's gravity, crew members maintained an exercise regimen above and beyond their LMS-1 duty assignments.

7) Favier, left, representing the French Space Agency, and Kregel perform some in-flight maintenance on the Bubble Drop Particle Unit. The technique was performed initially on the ground at the Marshall Space Flight Center by alternate Payload Specialist Pedro Duque of the European Space Agency with the procedure being recorded on video and uplinked to the crew of *Columbia* to aid in the repair.

8) Favier holds up a test container to a Spacelab camera. The test involves the Bubble Drop Particle Unit which Favier is showing to ground controllers at the Marshall Space Flight Center in order to check the condition of the unit prior to heating in the BDPU facility. The test container holds experimental fluid and allows experiment observation through optical windows. BDPU contains three internal cameras that are used to continuously downlink BDPU activity so that behavior of the bubbles can be monitored.

9) Payload Commander Helms takes measurements on Favier during the Voluntary Head Movement experiment. The VHM, part of the Canal and Otolith Interaction Study, is meant to characterize how the coordination of head and eye movement change as a result of space flight. Since most vestibular functions are influenced by gravity, the COIS experiment is meant to measure response differences in microgravity. □



Engineering establishes new Advanced Development Office

The Engineering Directorate this week announced creation of an Advanced Development Office to focus and consolidate advanced development project planning and implementation.

The Technology and Project Implementation Office was abolished and replaced by the new office.

"This office will be responsible for providing leadership in establishing human space exploration road maps and supporting technology plans in coordination with other center

and agency organizations," said Engineering Director Leonard Nicholson. "Advanced projects within this office include the Experimental Crew Return Vehicle Office, or X-CRV, which is under development, and the Orbiter Upgrade and Human Lunar Return projects which are in the definition phase."

Other responsibilities include technology program definition and system engineering and integration for major advanced development projects, Nicholson said.

Elric McHenry has been assigned in a dual

capacity as manager of the Advanced Development Office and manager of the Human Lunar Return Project Office.

"Advanced projects leads the way to future lunar space flight," McHenry said. "X-CRV development is demonstrating innovative approaches to buildup and testing new spacecraft with shorter development schedules and much lower costs. Other advanced projects and technology development efforts will lay the ground work for the next phase of space exploration in the early 21st century."

John Muratore is deputy manager of the Advanced Development Office and manager of the X-CRV Project Office. Claude Graves will be assistant manager of the Advanced Development Office and acting manager of the System Engineering and Integration Office. Ronald Kahl will be manager of the Technology Planning Office and Lili Moore, deputy chief of Engineering's Propulsion and Power Division, will serve in a dual capacity as manager of the Orbiter Upgrade Project Office.

NASA changes travel policies

JSC employees are now dealing with two new NASA policy changes regarding official government travel.

The General Services Administration revised the reimbursement amounts allowed when employees use of a privately owned vehicle. If employees use their own automobile, the reimbursement is .31 cents per mile and .25 cents per mile for motorcycles. Employees who use their own airplane will receive a reimbursement of .85 cents per mile.

The second policy change increases the receipt requirement for many travel expenses to \$75 from \$25. JSC travelers may claim up to \$75 on a travel voucher without submitting a supporting receipt. Items such as ATM fees, gas receipts for rental cars, personnel telephone calls, taxicabs, parking fees and actual subsistence meals will no longer require a receipt. Receipts are still required for all lodging, transportation changes and miscellaneous expenses in the Financial Management Manual 9772-5.

Employees with questions regarding these changes may call Nancy Porter at x34011.

Lucid begins new projects

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well as gather data on experiments she has already been performing.

This week, Lucid and her crewmates, Commander Yuri Onufrienko and Flight Engineer Yuri Usachev, continued work on the Candle Flame in Microgravity investigation. The CFM experiment studies how candles burn in space and looks at how the flames react in microgravity environments. This experiment has been particularly interesting for the Mir crew, as Lucid explained during Monday's interview.

"It has been very fascinating because we have been able to make a lot of visual observations and see what is going on," Lucid said. "That is another important lesson. The people who are working on the space station need to be able to have interaction with the experiments that they are doing."

The sixth scheduled session for the Anticipatory Postural Activity investigation was successfully completed last week. That session fulfilled the performance requirements for POSA, however, additional sessions are now being planned due to the increased time of the mission.

Two chamber tests set for next year

(Continued from Page 1)

purer than city air as far as pollution goes," he said.

The test is the second phase of the Advanced Life Support Program's Early Human Testing Initiative. Mechanical and chemical means were used to recycle all air and water, including urine, for the four people in the chamber. This test follows a two-week, one-person test conducted in August 1995 that used a crop of wheat plants to recycle the test subject's breathing air. Next year two more tests—one lasting 60-days, another lasting 90-days—will be conducted with a final test in 2005 that will recycle solid waste as well as air and water.



INCAN INTERPRETATION—The cultural group, "Allpanchis," performs native South American music for the lunch crowd in the Bldg. 3 cafeteria. The group specializes in sounds that reflect the cultural heritage of the native Indian, or Incas, and the coastal regions of Colombia with contemporary sounds of salsa and merengue mixed in.

JSC Photo by Robert Markowitz

American Express to report delinquent employee accounts

The coordinator of JSC's credit card program for travelers reports that American Express has begun exercising its contract option to report delinquent government cardholders to national credit reporting bureaus.

The cardholder accounts that are being reported are those that are at least 120 days delinquent, have been canceled and have balances greater than \$100.

In an attempt to help cardholders avoid such bad marks on their records, American Express will send letters to all cardholders that fall into this category notifying them of the delinquent account and extending them a 45-day grace period. Letters also will be sent to cardholders when accounts are 75 and 90 days past due.

All government cardholders will be notified of the credit reporting policy through an article from American Express in the Cardholder

Newsletter Dispatch. The article will clearly define the criteria for credit bureau reporting, as well as provide ways to avoid the problem.

Cardholders are reminded of the agreement signed when applying for the government American Express Card. Only official travel and official travel-related expenses away from your official duty station, including lodging, meals and incidentals, are to be charged to the card. Cash travel advances taken from automated teller machines may not be withdrawn earlier than three days prior to departure and no later than the last day of travel. The card is not to be used for personal purposes.

Cardholders who have delinquent accounts caused by extenuating circumstances should contact the JSC American Express Program Coordinator, Nancy Porter, at x34011 for assistance in avoiding credit bureau reporting.

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Galileo images show volcanic, tectonic activity

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a small portion of the data gathered and returned from the Ganymede flyby and mark the start of a steady stream of images and other information to be returned from Galileo over the next 18 months.

The data were returned using new software radioed to the spacecraft earlier this year that allows Galileo to send back its scientific findings in shorthand form. This helps compensate for the loss of the use of Galileo's high-gain antenna and allows Galileo to return its findings via the smaller low-gain antenna also on the spacecraft.

These first images show two of the regions selected for close photographic study. The areas, called Galileo Regio and Uruk Sulcus, show ancient cratered ice fields adjacent to or overlain by younger ice, volcanic plains, ridged ice mountains, deep furrows and smooth broad basins that are products of tectonic forces. Half of Ganymede's older surface appears to have been resurfaced by younger

volcanic and tectonic activity.

"These images reveal fundamental details about how features seen by Voyager formed and show us age relationships and sequences that turn our previous thinking upside down," said imaging team member James Head of Brown University. The discovery of Ganymede's magnetosphere was made by space physicists using data from Galileo's plasma wave spectrometer and from the magnetometer.

Both instruments were sending data to Earth during the Ganymede flyby while recording even more detailed information to be returned later this month. The plasma wave spectrometer also showed that the densities of charged particles around Ganymede increased by a factor of more than 100 near Galileo's closest approach.

"This indicates that Ganymede is surrounded by a thin ionosphere," said Donald Gurnett of the University of Iowa and principal investigator on the plasma wave spectrometer. "The existence of an

ionosphere suggests that Ganymede also probably has a tenuous atmosphere."

As the spacecraft approached Ganymede, the magnetometer found the measured field was as expected at that position in Jupiter's powerful field—fairly uniform and pointed in a southerly direction. But as the spacecraft crossed into the region where the plasma wave spectrometer sensed signals characteristic of a magnetosphere, the field increased in strength by a factor of nearly five and abruptly changed direction to "point" at Ganymede itself, said Margaret Kivelson of UCLA, principal investigator of the magnetometer experiment. Taken together, these two measurements strongly suggest that Ganymede is the first known moon with its own magnetosphere and the first example ever seen of a "magnetosphere within a magnetosphere."

"We knew Ganymede was an interesting place," said Johnson. "What we have just found makes it even more exciting."

In flight maintenance group hangs plaque

Jeff Stone of the In-flight Maintenance group in the Mission Operations' Systems Division was chosen to hang the STS-78 mission plaque.

"Jeff and the rest of the IFM group were recognized for their outstanding efforts during STS-78 to develop and verify procedures that fixed four different pieces of hardware," said Lead Flight Director John Shannon.

The IFM team worked with Marshall to provide an oxygen source to astronauts participating in the Astronaut Lung Function Experiment, bypass a shorted connector in the Bubble Drop and Particle Unit, secure a backrest on the Torque Velocity Dynamometer, and repair a test sample for the Advanced Gradient Heating Facility, Shannon said.

"Stone and the rest of the IFM team directly contributed to the accomplishment of all of the pre-planned science objectives and the decision to extend the flight to a 17th day," Shannon said. Other IFM team members were Paul Lloyd, Randy Barckholtz, Victor Lucas, Ronnie Rogers, and John Shimp.



Stone

Fun run to close some streets

Traffic on JSC streets will be restricted Saturday for the 18th annual Loral Lunar Rendezvous Run.

JSC employees planning to work Saturday morning should be aware that Second St., from the Gilruth Center to Avenue B, and portions of Avenue B and Fifth St. will be closed from approximately 7:15 a.m. to 9 a.m. Access to and from parking lots along these streets may be restricted during this time.

The 18th annual Loral Lunar Rendezvous Run will start at 7:15 a.m. Saturday at the Gilruth Center with a 5-kilometer race and a 5-kilometer walk. Runners may register on race day.

Entry fee for the race is \$18 and includes T-shirts and refreshments for all participants. All entrants will be eligible for door prizes. For more information, contact Willie Vanderbrink, race director, at 470-6715.

Rookies to fly on STS-84

(Continued from Page 1)

Jerry Linenger, scheduled to arrive at Mir in January during the STS-81 mission. Linenger will return to Earth on board *Atlantis* as a member of the STS-84 crew.

Collins, 39, will be making her second journey into space; Noriega, 36, and Lu, 33, will be making their first flights; and Clervoy, 37, flew previously on *Atlantis* during STS-66. Foale, 39, has spent the past year in Russia training for his stay on board Mir. He has three previous space flights to his credit.

Atlantis will carry the Spacehab double module and will remain docked with Mir for five days, transferring supplies and experiments between the two spacecraft in addition to the astronaut exchange.