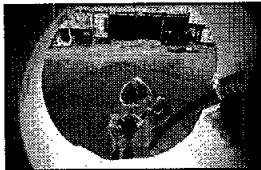


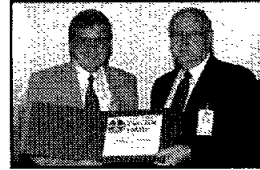


National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
 Houston, Texas



Team training

The STS-79 astronauts spend many hours preparing for their mission. Photos on Page 3.



Earned value

Mission Operations Directorate's contractors earn Certificates of Validation. Photos on Page 4.

Space News Roundup

Vol. 35

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No. 29

Galileo finds changes on Jupiter's moon

A new image of Jupiter's volcanically active moon Io, returned by NASA's Galileo spacecraft, shows that significant changes have occurred on the moon since Io was observed 17 years ago by the exploratory NASA spacecraft Voyagers 1 and 2.

"The changes we are seeing on Io are dramatic," said Galileo camera team leader Michael Belton of the National Optical Astronomical Observatories in Tucson, Ariz. Io's landscape undergoes constant change due to numerous sulfur volcanoes that continually erupt across its mottled orange and white face, he said. "The colors of material on the ground and their distribution have changed substantially since the Voyager fly-

bys of 1979."

One of the most striking changes noted in the image are new deposits of sulfur and sulfur dioxide frost deposited from the volcano Masubi in Io's southern hemisphere. "The sulfur dioxide gas that drives the volcano makes a big plume, condenses, then paints the surface white," Belton said. Masubi was discovered as an active volcano during the Voyager encounters of Io.

Galileo's first color image of Io was taken June 25 at a range of 1.4 million miles during the spacecraft's approach to Jupiter's largest moon, Ganymede. The smallest features that can be discerned in the new image of Io are approximately 14 miles in

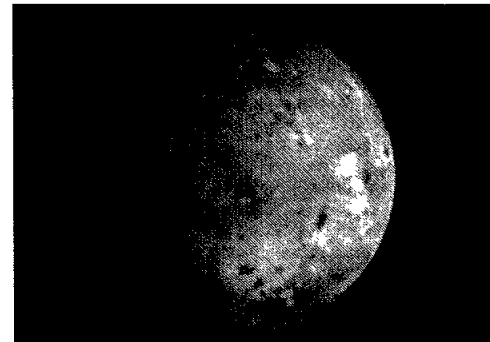
size, a resolution comparable to the best Voyager images of the same face of Io.

Galileo promises to return new views of volcanic activity on Io throughout the spacecraft's remaining 17-month mission orbiting Jupiter. Higher resolution images of Io will be taken in coming months.

Launched in October 1989, Galileo entered orbit around Jupiter on Dec. 7, 1995. The spacecraft's mission is to conduct detailed studies of the giant planet, its largest moons and the Jovian magnetic environment.

More information on the Galileo mission is available on line at URL:

<http://www.jpl.nasa.gov/galileo>



NASA Photo

The mottled face of Jupiter's volcanically active moon Io, viewed by the camera onboard NASA's Galileo spacecraft, shows dramatic changes since it was seen 17 years ago by the exploratory NASA spacecraft Voyagers 1 and 2.

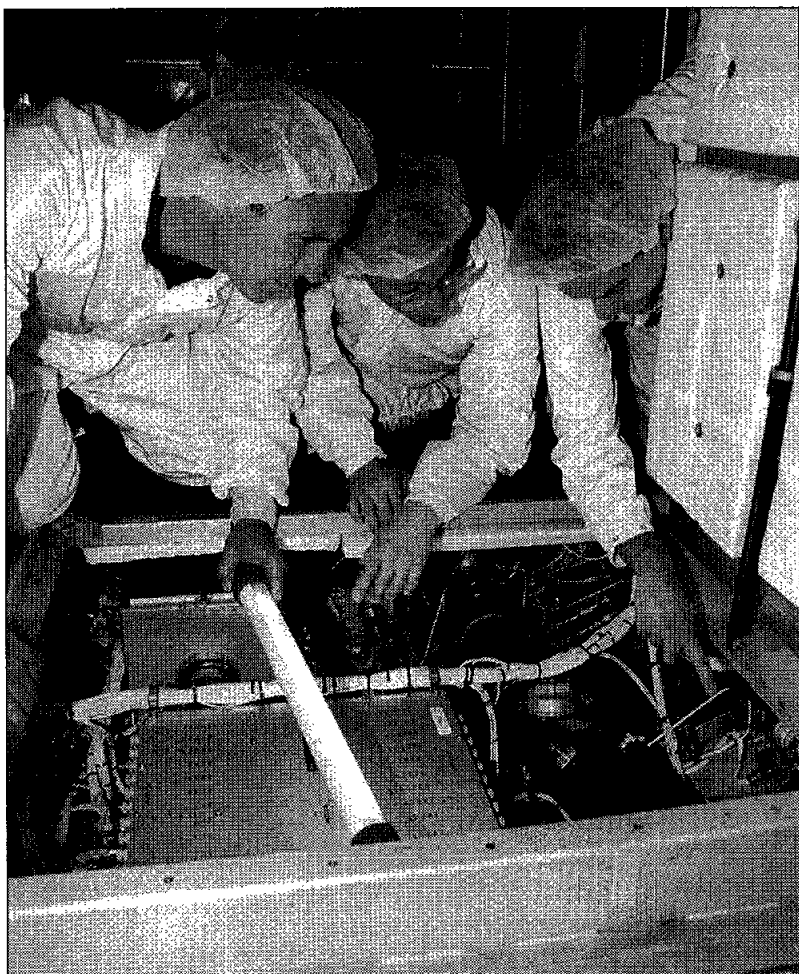
Chamber team shares memories

The four JSC volunteers who spent 30 days sealed in a special, air-tight chamber in Bldg. 7 as part of the Advanced Life Support Early Human Testing Initiative will share memories with employees, family and friends Wednesday in Teague Auditorium.

Test Team Lead Doug Ming, Lead Engineer John Lewis, Lead Electrician Pat O'Rear and Thermal Systems Expert Katy Hurlbert will discuss living inside the three-story 20-foot diameter chamber recycling air and water during their stay. Two additional tests are planned for 1997, a 60-day and 90-day test, with the latter using both plants and physiochemical means for recycling air and water.

In addition to the briefing by the crew, JSC Director George Abbey and Engineering Director Leonard Nicholson will recognize key individuals and groups who contributed to the success of the Regenerative Life Support Program and discuss future plans for extended duration testing.

The invitation is being broadened to include not only JSC employees, but their friends and family members and off-site contractors and their guests. Visitors are encouraged to use JSC Gate 2 (in front of Bldg. 1 off of NASA Road 1).



NASA Photo

From left, STS-79 Mission Specialists Carl Walz and Jay Apt check out the layout of the double Spacehab module with Chris Jaskola of McDonnell Douglas. The double module configuration will be flown for the first time on STS-79, allowing for more room for experiments and supplies for the Russian Mir Space Station. This is one of the many training requirements the astronauts perform before a mission. For more details see page 3.

Atlantis awaits new solid rocket boosters in VAB

The change out of *Atlantis*' solid rocket boosters continues to go smoothly as engineers prepare to mate the orbiter in the next few weeks.

Atlantis remains in the Vehicle Assembly Bldg. at Kennedy Space Center and engineers completed leak checks and joint close-out work on the new left booster mid-week. Work began Wednesday to stack the right booster segments. Booster stacking operations are expected to be completed Monday and engineers will then begin work to mate the boosters to the external tank Tuesday. On Wednesday, technicians will demate *Atlantis*' boosters to prepare the orbiter for its new set of boosters.

Atlantis is scheduled to roll from the VAB to the Orbiter Processing Facility Aug. 13 to await the completion of the mating of the boosters to the external tank. The orbiter will then roll back to the VAB to be mated with the new set of boosters

and external tank.

Roll out to KSC's Launch Pad 39A is scheduled for Aug. 20 and a final dress rehearsal of the launch countdown with Commander Bill Readdy, Pilot Terry Wilcutt, Mission Specialists Tom Akers, Jay Apt, Carl Walz and John Blaha is scheduled for Aug. 27 and 28.



The tentative launch date of Sept. 12 is set for the fourth docking to the Russian Mir Space Station. The nine-day mission will retrieve Astronaut Shannon Lucid from Mir and drop off Blaha who will begin a four-month stay on the Russian outpost. Blaha will join the Mir 22 crew—

Commander Gennady Manakov, Flight Engineer Pavel Vinogradov and French Cosmonaut Researcher Claudie Andre-Deschays.

During the mission, *Atlantis*' astronauts and the Mir cosmonauts will focus on a variety of microgravity and life science experiments in the Spacehab double module—the first

Please see **DISCOVERY**, Page 4

Lucid writes home about space walking protocol

(Editors note: Mir 21 Cosmonaut Researcher Shannon Lucid recently sent a letter home from the Russian Mir Space Station as the crew begins to wrap up its science work in anticipation of the journey home to Earth. The following is the text of her letter.)

Dear Everybody,

Another week, another EVA—or at least that is what it seems like right now here on the space station Mir. Yuri and Yuri have just finished their fourth EVA in less than three weeks and are busy at this very moment getting ready for their fifth. There may even be a sixth. Even by Russian standards, that is a lot. Their fourth EVA was done on their 100th day in space. In answer to your question, no, it is not a routine, business as usual activity; there is a very real sense of anticipation that steadily increases as the EVA time approaches and peaks during the actual event. We have, though, established a certain working pattern preparing for these EVAs.

Several days in advance, Yuri and Yuri check out their spacesuits. Spacesuits are left here on Mir and used over and over; each crew person adjusts the size to fit himself. When a problem develops that can't be repaired by a crew person, the suit is replaced. The suit that Yuri is currently using has been used for more than 13 EVAs. After

the suits are checked out, any changes in wiring or telemetry are made. If Yuri and Yuri are taking a payload out, it is positioned in the airlock. Yuri and Yuri then spend some time looking over procedures and discussing, what they will be doing. Then, they gather together all the tools they'll be using and fasten them onto their tool tray.

Because of our current orbits, we don't have much communication coverage during our day, so all the EVAs have been done in the middle of the night. On the day of an EVA, we get up a little later than usual. After breakfast, Yuri and Yuri check their spacesuits again and the ground looks at telemetry to make certain that everything is in good shape. We have a quick lunch and then a rest period. And yes, we really do fall asleep; when the lights are turned off in a module, it is really dark and you just go to sleep.

After getting up, we wait until time to go out the hatch. Yuri and Yuri put on their white undergarments that have tubes sewn in the body, the head and the upper legs and arms. These tubes are for circulating water to cool the cosmonauts while they are doing the EVA. At this point in time there is very little communication capability with mission control,

so we are pretty much on our own. Just before time to enter the hatch, Yuri takes a big piece of red tape and puts it across the communication controls that I am absolutely not to touch while they are outside. He did this for the first EVA and the tape has now become a "tradition" that signals it is time to leave. I think that if I were the commander leaving a foreigner in my spacecraft all alone, I would wrap the entire place up in red tape.

The Russians have a tradition of everyone sitting quietly and collecting their thoughts before they begin a trip or start a new activity. That is what we do just before they leave for the airlock. We sit quietly together for a few minutes in the base block. Then Yuri says let's go, and both Yuris fly, literally, over my head like two white geese headed south. They exit the base block with a wave and they are off to the airlock. A few minutes later, I hear the airlock clang shut, and there I am, all alone in the space station.

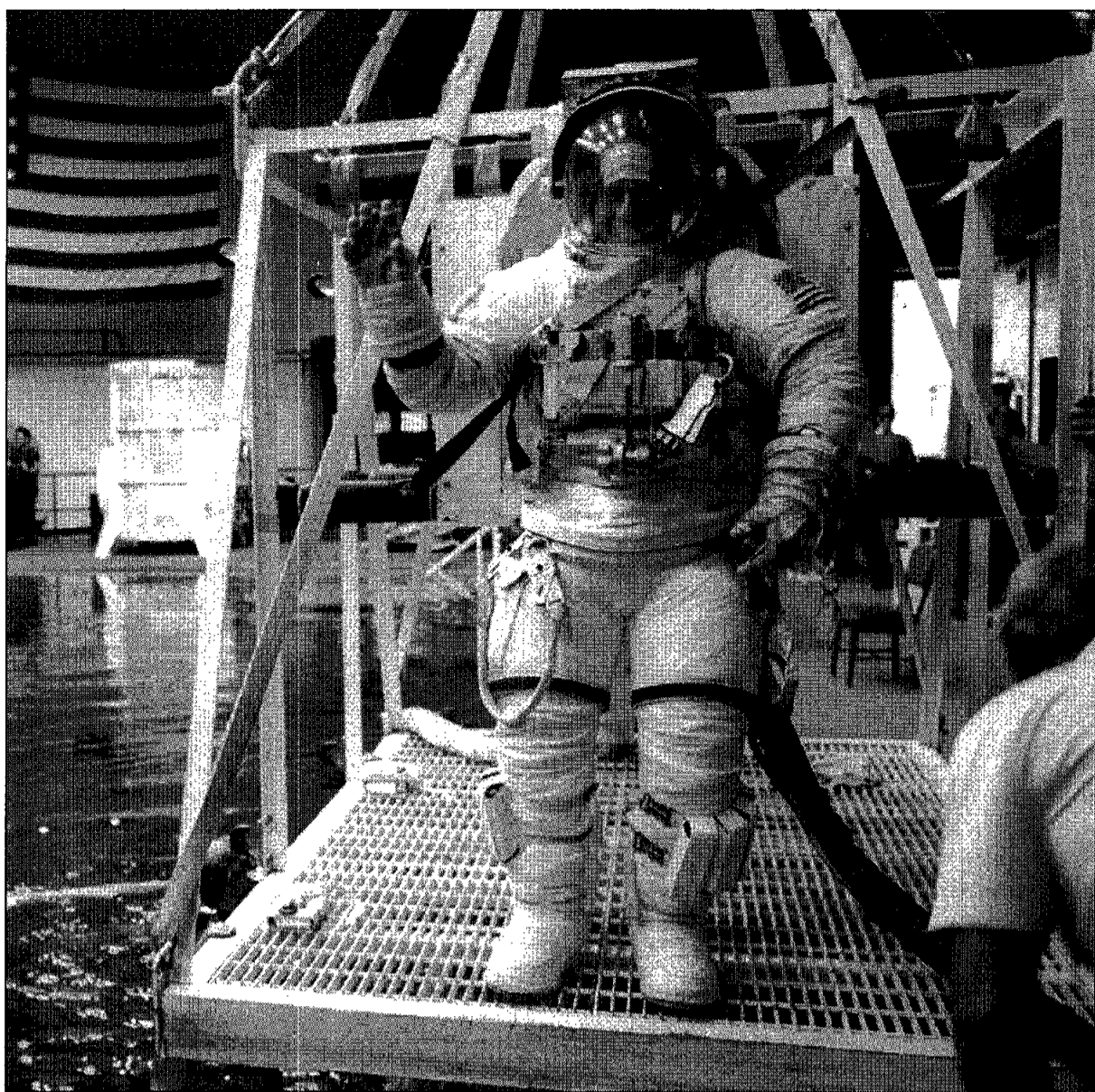
Communication is very good between the crew people here on Mir, so I hear all the preparations that are going on as they are getting the airlock ready for depressurization. Every once in a while, they will ask me what the station pressure is, what part of the world

we are flying over, what time the next communication pass will be, or what I am doing. Finally, I hear them exiting the airlock and leaving the station. I was taken totally by surprise the first time this happened because it seemed that, no sooner were they out of the airlock, than Yuri was yelling at me to look out the window and start taking pictures. I looked out and there was my commander perched on the end of a very long white pole arcing over the blue and white earth below. Because the station is so big, this pole is used to transport a crew person and payload from one segment to another. It is manually moved by the other crew person. My first thought when I saw this was, "Wow, the future is now. This is real space station work." For a number of years now, I have been seeing artist renditions of what it would be like when the International Space Station is being worked on in a routine manner by astronauts, but this was no artistic fantasy; this was real life. This was the "future" being played out in real time, and I was getting to have a small part in it. How could one person be so fortunate?

Unfortunately, Mir is big and the windows are relatively few, so I can only see bits and pieces of the EVA. After one EVA, when Yuri and Yuri were looking at the video I had taken, they asked why I only photographed

Please see **LUCID**, Page 4





Team Training

STS-79 crew spends hours preparing for link up with Mir

The STS-79 mission, set to lift-off in September, will carry an experienced crew of six that have spent the majority of its time training for the fourth shuttle docking to the Russian Mir Space Station.

Commander Bill Readdy, Pilot Terry Wilcutt and Mission Specialists Tom Akers, Jay Apt and Carl Walz, along with Cosmonaut Researcher John Blaha, trained at the JSC Weightless Environmental Training Facility and Kennedy Space Center's Payload Processing Facility to prepare for shuttle emergencies and learn the Spacehab payload systems. In addition to training in the states, Blaha spent a majority of his time in Russia preparing to become a member of Mir 22. He returned home recently to participate in another training exercise, the Terminal Countdown Demonstration Test, set for the end of August.

Training consist of a variety of activities. Crew members must learn how to space walk and repair shuttle systems even if there is no planned space walk. They must learn how to bail out of the shuttle's escape hatch and to survive in the water.

Crew members also must learn the systems they will be working with during the nine day mission. The Spacehab module will carry a variety of experiments, equipment and supplies for the Russian outpost and its occupants. Life science experiments

will study the effects of space on crew members—in particular, Cosmonaut Researcher Shannon Lucid, who will return to Earth with the STS-79 crew after a record-breaking stay on Mir.

Throughout the training, the crew took photos to share. From top to bottom left to right:

1) Apt spends time in the WETF preparing for a space walk. Although no space walk is scheduled for this mission, the crew must be prepared to venture into the cold environment of space to repair shuttle systems.

2) From left, Walz, Wilcutt, Readdy, Apt and Akers practice escaping the shuttle in their ascent entry suits.

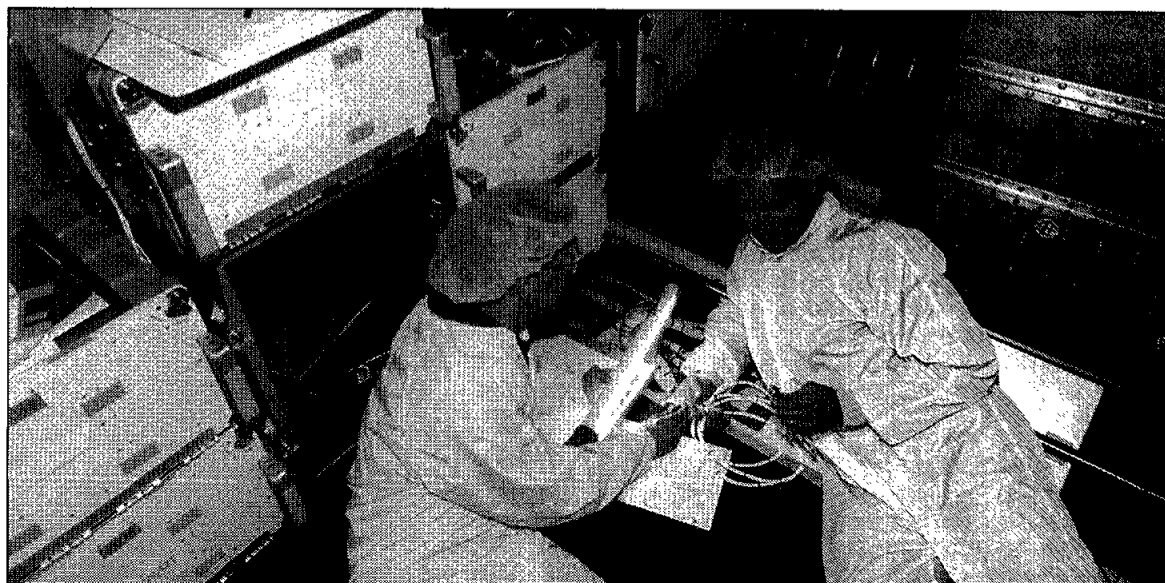
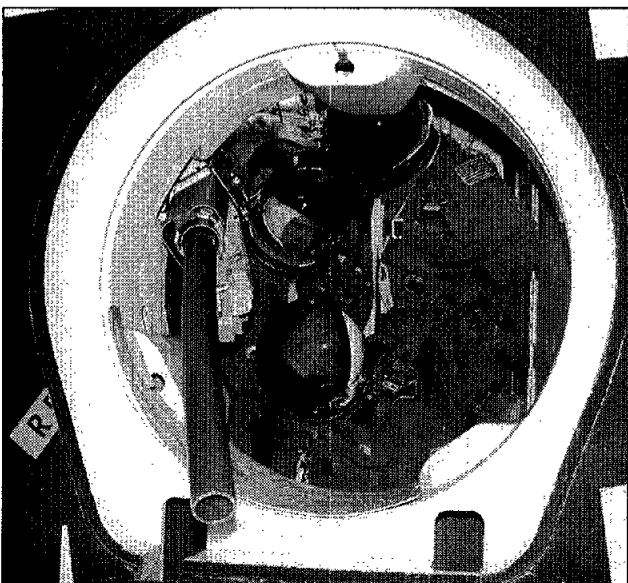
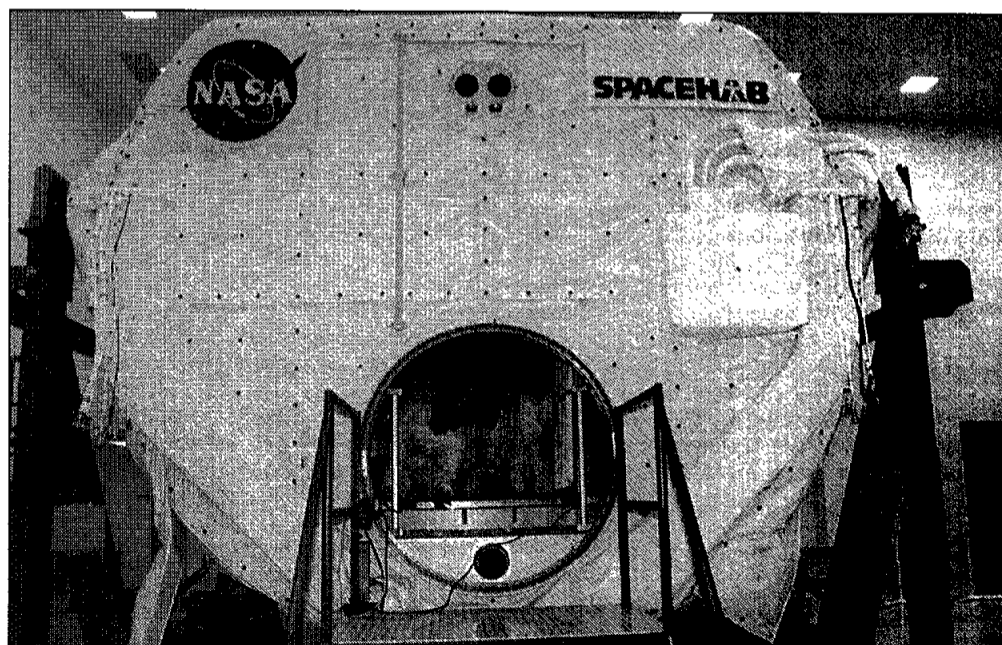
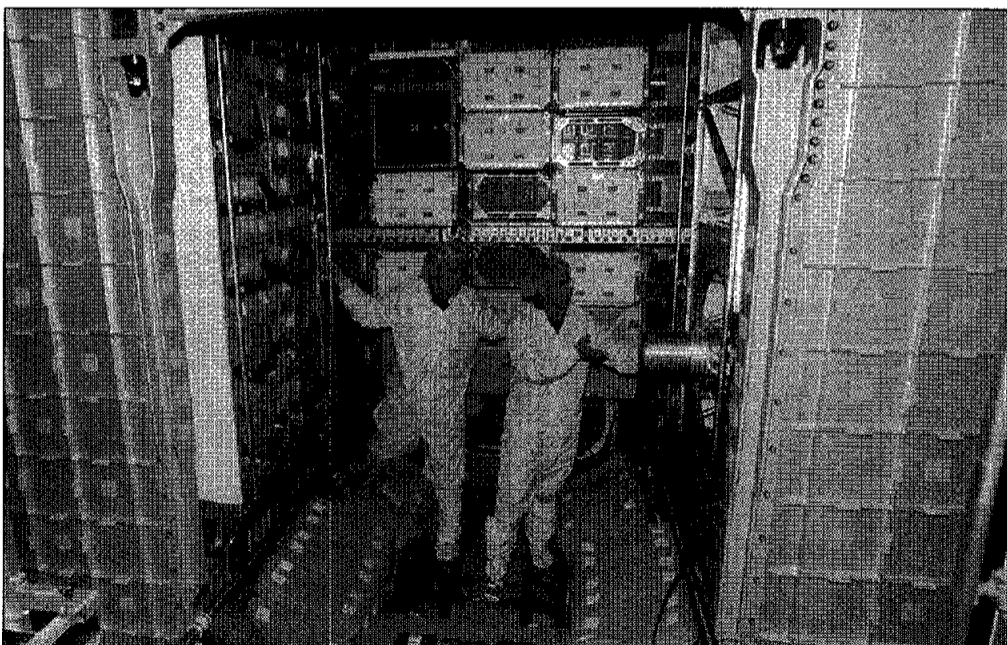
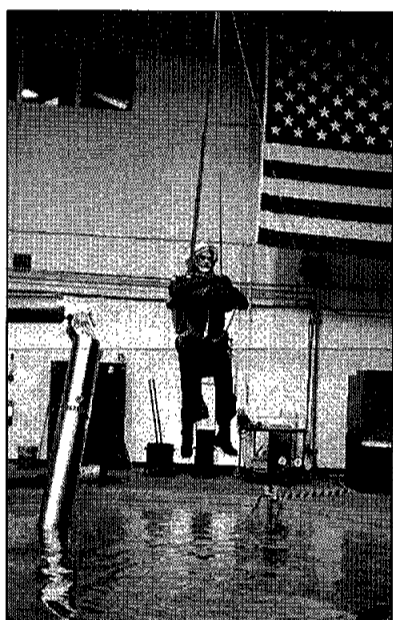
3) Readdy practices water survival training in the WETF in case the crew must abandon a mission over water.

4) At KSC, Walz, left, and Apt examine the interior of the Spacehab module. STS-79 will be the first flight of a double Spacehab and will allow more supplies and equipment to be taken to Mir while still allowing room for scientific research.

5) Chris Jaskolka of McDonnell Douglas, right, shows Walz, left, and Apt the layout of the Spacehab.

6) Walz prepares to help a team member escape the orbiter during crew escape training in Bldg. 9.

7) Apt, left, and Walz check out some of the equipment aboard the Spacehab module. □



KSC Photos
JSC Photos by
Andrew Patnesky,
Robert Markowitz

Houston science museum seeking JSC volunteers

The Houston Museum of Natural Science is seeking volunteers and will be at JSC next month to discuss available opportunities.

"The Houston Museum of Natural Science is very proud to offer one of the most rewarding and exciting volunteer programs in the Houston area," said Claudia Baltodano, recruiter for the museum's volunteer services. "Our volunteer program provides an excellent opportunity for JSC employees to become more involved in helping children and adults nourish their knowledge in science and encourage them to appreciate and love the world around them."

Baltodano will be at JSC from 2-3 p.m.

Aug. 14 in Bldg. 45, Rm. 251 to discuss the volunteer program with interested employees. Some demonstrations, including live animals, will be included in the meeting.

The museum houses the Cockrell Butterfly Center, Burke Baker Planetarium, Wortham IMAX Theatre, the world's first Challenger Learning Center and over a dozen halls of permanent natural science exhibits that the museum hosts each year.

Volunteers work in every area of the museum, from interpreting exhibits for school children and families, to essential jobs behind the scenes. There are a variety of volunteer opportunities available.

Volunteers may choose to work with the public as interpreters of the museum's permanent and temporary exhibits and assist with educational and outreach programs, or choose to be visitor services volunteers, assisting the information desk patrons. Volunteers also may choose to help with special events and fundraising activities, in all areas of planning, organizing and executing the events. Staff volunteers also are needed to work behind the scenes to maintain files, prepare mailings and help to organize and catalog museum collections. Training is provided in all areas.

Aside from the inherent personal rewards

which come from volunteering, employees also will receive museum benefits Baltodano said. Volunteers will receive free parking and two free passes for every 20 hours of volunteer service, a 10 percent discount in the Museum Gift Shop and information on upcoming events.

To learn more about the museum and its volunteer program, employees can visit the museum's web site at URL: <http://www.hmns.mus.tx.us:80/hmns/home.html>

Employees interested in becoming museum volunteers may attend the Aug. 14 meeting or call the museum volunteer office at 639-4643.

Disability act marks sixth anniversary

Today marks the sixth anniversary of the signing of the American with Disabilities Act of 1990 and the Equal Opportunity Programs Office is available to help maximize the potential of disabled workers.

This landmark legislation gives civil rights protection to individuals with disabilities, similar to those provided to individuals on the basis of race, color, sex, national origin, age and religion. Several federal statutes have been passed to enhance the opportunities of persons with disabilities to enjoy the benefits and rewards of work.

Among these statutes are two laws of interest to the work force at JSC—the Rehabilitation Act of 1973 and the ADA. The intent of the Rehabilitation Act of 1973 was for the federal government to become a model employer of individuals with disabilities. The ADA was patterned after the Rehabilitation Act of 1973. Both laws provide employees and employers with guidelines to maximize job opportunities and employment potential for employees with disabilities.

The laws include requirements for employers to make reasonable accommodations to employ and retain qualified handicapped individuals. Such accommodations could involve restructuring the job, modifying work schedules, adjusting or modifying examinations, providing readers or interpreters and acquiring or modifying equipment or facilities. The employer is not required to provide reasonable accommodation if it will impose an undue hardship on operations. The ADA does not require employers to hire anyone who is not qualified. An employee or job applicant may not succeed in claiming discrimination under the ADA unless he or she meets all the requirements of the job and can perform its essential functions.

For more information employees may contact the Equal Opportunity Programs Office at x30601.

Correction

A story in the July 19 edition of the Space News Roundup incorrectly identified the In-flight Maintenance Group team members. Members were Jeff Stone, Paul Lloyd, Randy Barckholtz, Victor Badillo, Ronnie Rogers and John Shimp.



EARNED VALUE—Above: Mission Operations Director John O'Neill, right, presents Certificates of Validation to, from left, Jay Crutchfield, Ron Gantz and Leroy Hall of Lockheed Martin, formerly Lockheed Loral, following demonstrations that their performance management systems and management teams are compliant with the cost and schedules control system criteria, also known as "earned value."

Right: Hughes-Link also received validation from MOD. From left are, Charlie Floyd of Hughes-Link, O'Neill and Howard Marshall also of Hughes-Link. Earned Value Management is a proven industry best-practice process that provides for improved contract planning and control by integrating contract scope, schedule and cost objectives. Through the establishment of a baseline plan for performance, it provides a sound basis for early problem identification, impact analysis and corrective action as may be required. By emphasizing adherence to approved processes, earned value management facilitates improved communications within each company and with their JSC customers. As a result of their success, JSC now has improved cost and schedule visibility on two major MOD contracts.

JSC Photo by Mark Sowa

Discovery returns to fleet; '97 mission will service Hubble

(Continued from Page 1)

flight of the large science module. The double module provides more room for experiments and supplies for the Mir-22 crew.

Meanwhile, *Columbia* is in the Obitor Processing facility at KSC undergoing preparations for STS-80—the third flight of the Wake Shield Facility. Engineers are preparing to test *Columbia's* fuel cell voltage. The flash evaporator system was flushed this week and technicians will remove and replace an auxiliary power unit today. The impact of the solid rocket booster swap on

Columbia's launch date is continuing to be assessed.

Elsewhere, technicians are beginning work on *Discovery*, just returned recently via ferry flight from a modification period in Palmdale, Ca. *Discovery's* next mission is planned to be STS-82 in early 1997, the second Hubble Space Telescope servicing mission. Also, preparations are in work for *Endeavour* to be transported to California for its maintenance period. Upon its return from Palmdale, *Endeavour's* next flight will be the first International Space Station mission in 1997.

Lucid writes home about Mir space walking activities

(Continued from Page 1)

their backs. I told them that you can only take pictures of what you can see. We named that video "Cosmonaut Spines." Although I cannot see everything, I can hear the entire EVA. Several times during a night pass I have been watching them work in a small flat pancake of light out on the end of some module and have heard them muttering about the mamas and the papas—the Russians use these terms instead of "male" and "female" for electrical connectors—as they work on connecting a payload to station power. It all feels warm and homey.

After five hours of intensive work, it is time to think about coming back inside and Yuri rotates the handle that controls the long pole, swinging the other Yuri through space on the

end of this cosmic "fishing pole." Yuri and Yuri then enter the airlock and begin the process of repressurization. After what seems like a long time, and after many requests for me to read them the station pressure, the airlock opens and they suddenly appear in the base block looking like two excited young boys that have just completed a great adventure. They immediately watch the video I have taken and excitedly discuss each event while drinking the hot tea or the tube of juice I have waiting. Unfortunately, even the best plans sometimes go wrong. After the last EVA, I had what I thought was Yuri's favorite juice. He eagerly grabbed it with a smile of thanks, which immediately turned into a horrible grimace as a glob of catsup squirted into his mouth. Yes, I had

mistakenly gotten the wrong tube. They all look pretty much alike. My language skills are not quite at the level that I could convince him that I should at least get points for trying.

Before the first EVA that occurred while I was on Mir, Yuri and Yuri joked about what I would be doing while they were outside, saying that I would be the "commander" of Mir—commander by virtue of being the only person inside the station. They jokingly agreed with each other that I would have a large American flag hanging in the base block to greet their return. Well, no, I did not hang up the American flag. I wasn't sure how far to stretch their sense of humor, but I did make one command decision. For several weeks we had been eating what was left in the food containers and not opening

any new ones. As you might guess, the selection we had was not any of our favorites; that is why it was left. Being in command, and feeling very much like Captain Kirk, I knew that the first prerogative of a good commander is the welfare of her troops, so I decided to open a new container and have their favorite meat and potato dish warmed up and ready for them upon their return. Eating it with gusto after the EVA, neither one asked where it had been found. All they said was, "Thank you so much."

After our meal, it is off to bed. We wake up refreshed and begin talking about the next EVA later in the week. And I begin fantasizing that maybe this time the guys will invite me to go out with them. Yes, the stars are always brighter on the other side of the hatch.

JSC team receives honorable mention

JSC's Electronic Documentation Project Software Development Team took home honorable mention in the third NASA Software of the Year Award competition.

The 12 member team developed software that will provide an electronic capability to distribute, display and control changes for crew/ground controller procedures and documentation. The EDP System will include the functionality provided by the current paper based system, but in an electronic format. This system will be available in the office, control center and in training instructor facilities. In addition, the EDP System will build on the paper process with hypertext extensions. The electronic system will reduce the cost of maintaining the current paper-based method of operations. The system also will improve the efficiency and provide enhanced flexibility in document usage, supplement and ultimately replace the paper documents and provide NASA-wide access to Mission Operations documents.

The Software of the Year Award winners were Link Windows Interactive Data System, or LinkWinds, developed by the Jet Propulsion Laboratory and the Tetrahedral Unstructured Software System, or TetrUSS, developed by NASA's Langley Research Center. LinkWinds software will help scientists better examine geophysical and climatological data. TetrUSS provides solutions to aerodynamic problems in designing new aircraft.

NASA will present the awards at the Technology 2006 Conference to be held in Anaheim, Calif., in October. Recipients will receive a plaque and a substantial monetary award.

Symposium calls for technical papers

The 31st Aerospace Mechanisms Symposium, planned for May 14-16 at Marshall Space Flight Center, will focus on the problems of design, fabrication, test and operational use of aerospace mechanisms.

The program will emphasize hardware developments. Informative and thought-provoking papers pertaining to mechanisms technology are now being solicited for the symposium.

Papers should describe fully-developed, tested and/or flown space or aircraft mechanisms and should contain essential design details and also unique requirements and other factors of interest to engineers developing flight hardware. Authors are encouraged to discuss anomalies that have occurred and thus help others avoid similar problems in the future.

Papers for presentation are selected on the basis of summaries of approximately 1000 words and must include the principal results of the investigation, along with the scope and status of the work.

Summaries must be submitted by Sept. 6 to Edward Boesiger at Lockheed Martin Missiles and Space, P.O. Box 3504, Orgn. 73-15, Bldg. 150, 1111 Lockheed Way, Sunnyvale, Calif. 94088-3504. Employees also may call 408-743-2377, or email at boesiger_ed@mm.ssd.lmsc.lockheed.com

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