



Doubly durable

Engineering's EVA Branch shows the shuttle space suit can handle double the projected use for space station. Story on Page 3.



SOAR '92

JSC hosts the sixth annual Space Operations, Applications and Research Symposium. Story on Page 4.

Space News Roundup

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Latest SLS-1 findings show dramatic changes to body

Spacelab Life Sciences-1 investigators are reporting dramatic changes from space travel in some of the body's systems, with a resiliency in others—all of which affect long stays in space and medical research on Earth.

The latest findings from SLS-1 investigations that flew aboard the Space Shuttle *Columbia* in June 1991 were made public late last week.

"Taken together, these results show the need for a laboratory in space to complement the traditional laboratory on Earth. This is vital in

understanding how the human body works, whether it is in space or on Earth," said Dr. Ronald White, chief scientist of Headquarters' Life Sciences Division.

Four principal investigators from the SLS-1 mission report key findings in the areas of cardiovascular (heart and lungs), musculoskeletal (muscles and bones) and neurovestibular (inner ear/brain) physiology.

Space travel presents a drastic change in working conditions to the heart and lungs, according to Dr. C. Gunnar Blomqvist, a cardiologist from the University of Texas Health

Science Center in Dallas.

Astronauts just returning from space often have difficulty maintaining normal blood pressure and blood flow when standing. One SLS-1 experiment using a catheter inserted preflight into an arm vein of Payload Specialist Drew Gaffney and later moved nearer to the heart shows he experienced a much more rapid fall in central blood pressure than was predicted.

In another area of cardiovascular research, it was found that exposure to space impairs an astronaut's pressure regulating reflexes, called

baroreflexes, according to Dr. Dwain L. Eckberg of the Hunter Holmes McGurie Department of Veterans Affairs Medical Center and the medical College of Virginia.

A close-fitting neck collar that looks like a whip-lash collar was used by SLS-1 crew members to record two blood pressure sensing areas located in the neck. By the eighth flight day, astronauts had significantly faster resting heart rates, less maximum change of heart rate per unit of neck pressure change and a smaller range of heart rate responses. These changes occurred

in all astronauts studied. The changes that developed were large and statistically significant.

These results validated findings obtained on Earth. They were based on predictions Eckberg made by studying subjects after prolonged bed rest. This validation could lead to important studies in clinical medicine because studying astronauts before and after flight or studying healthy people before and after bed rest may provide insights into medical problems encountered here on Earth.

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Freedom wins vote in House

The House of Representatives voted 237-181 Wednesday to continue funding for Space Station *Freedom*, but provided \$525 million less than President Bush requested.

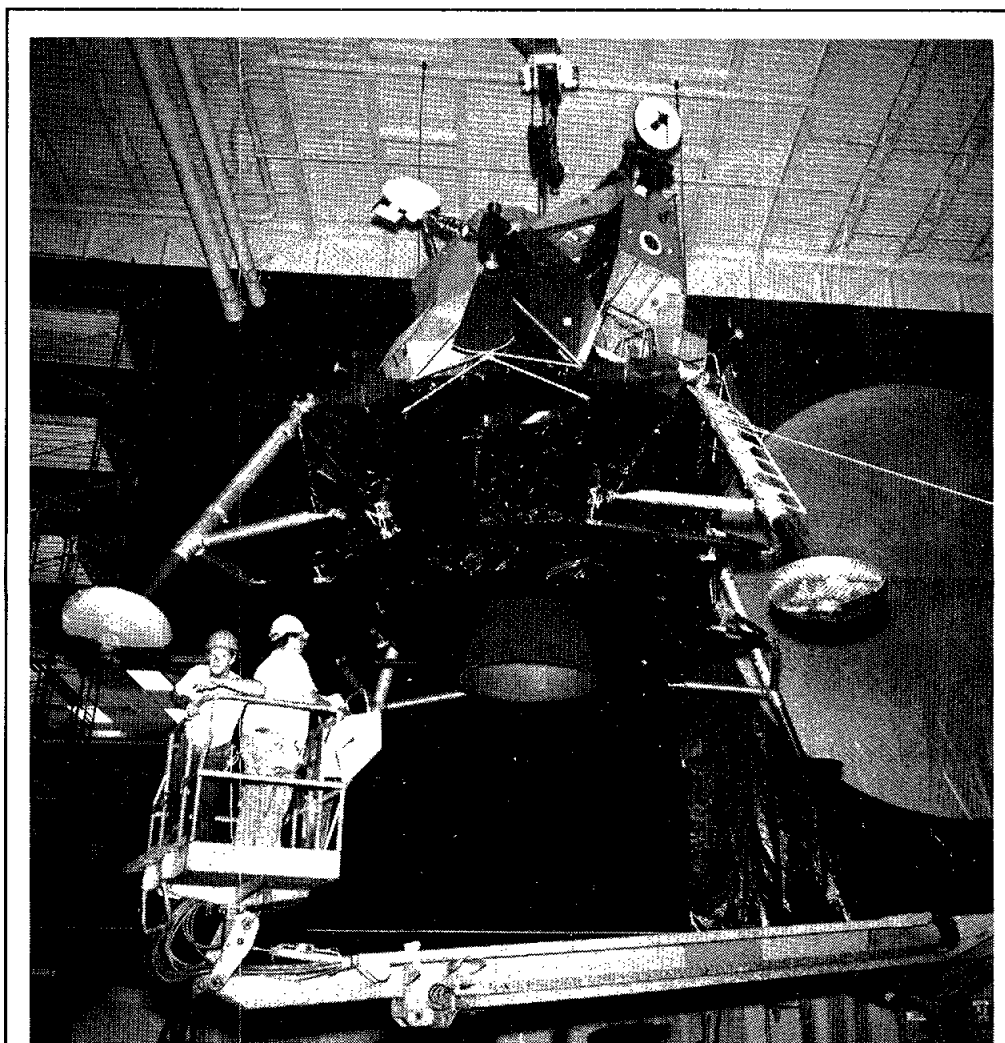
The vote struck down an amendment to an appropriations bill that would have killed the project, providing \$1.73 billion for the orbiting laboratory in fiscal 1993.

"I think this is a victory for America's future," said NASA Administrator Daniel Goldin. "I'm very proud of the Congress of the United States. In difficult economic times, the Congress stood up and did what's right for the future."

Debate centered on the economic issues such as competitiveness, jobs and budget priorities, with many opponents voicing support for the station but saying America couldn't afford it now. Proponents countered that killing the station would set back the entire civil space program for decades and forestall an important investment.

"I'm very excited," said Rep. Mike Andrews, D-Houston. "This is a terrific vote for the space station, for the space program and for the Houston area."

The House finally approved the overall appropriations bill by a vote of 314-92. The Senate, which in the past has been more supportive of *Freedom* than the House, is expected to take up the topic next week.



JSC Photo by Benny Benavides

PERFECT LANDING—Lunar Module Test Article 8 takes its place in the new Space Center Houston display on the Apollo Moon landings. The LTAs were used to train Apollo crews. LTA-8 is being suspended from the ceiling of the plaza area, poised for landing in front of a large mural of the lunar globe. Construction of the new visitor center is about 85 percent complete, and the grand opening remains on schedule for Oct. 16.

All Atlantis systems go for launch

By James Hartsfield

With a bright forecast, *Atlantis* is scheduled to launch at 8:56 a.m. CDT today carrying into orbit the European Retrievable Carrier, the Tethered Satellite System and the Evaluation of Oxygen Interaction with Materials payloads.

Atlantis' countdown started at 3 p.m. CDT Tuesday and proceeded smoothly except for a double-check of six electrical connections between *Atlantis* and the Tethered Satellite pallet on Wednesday and Thursday, but neither was deemed a threat to today's launch.

Prior to closing the cargo bay doors, technicians found dubious reports in paperwork documenting the connections. The cargo bay doors were left open slightly longer than scheduled to allow a check of the connections to verify all was well. The cargo bay doors were closed late Wednesday after the check verified the connections were good and locking pins were added to them as a safety measure, and the countdown continued without any delays to the planned launch time.

Thursday, a build-up of nitrogen pressure showed up in the catch bottle for auxiliary power unit No. 3. Technicians opened one segment of the aft compartment to vent the pressure, which was believed to have been caused by a nitrogen bubble.

Forecasters called for a 95 percent chance that

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NASA to reform procurement policies

Agency will emphasize cultural diversity through buying

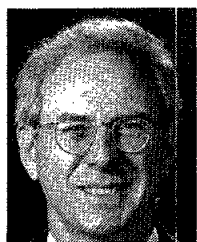
NASA will aggressively promote cultural diversity in the work place and in pursuit of contract goals for small and disadvantaged businesses, according to Administrator Daniel Goldin.

"As administrator of NASA, I have made a personal commitment to increasing cultural diversity in the workplace and to increasing the contracting opportunities for small and disadvantaged contractors," Goldin told the National Contract Management Association in Los Angeles last week.

Goldin announced a series of procurement reforms designed to make NASA a model of excellence for the federal government and to ensure that the public receives the best value for its tax dollars.

Goldin said the agency had implemented a range of initiatives to increase the number of contracts flowing to small and disadvantaged businesses, including:

- Emphasis on SDB considerations in the earliest part of procurement planning, with continuing emphasis in acquisition strategy meetings and other procurement activity.
- Establishment of firm percentages of large prime contracts to be subcontracted to SDBs, with reward of special incentive fees to prime contractors when they exceed the SDB requirement.



Goldin

"Small and disadvantaged businesses need assistance above and beyond set-asides," he said.

"In the coming months, we will be setting up a new 'minority business resource advisory committee' in NASA to help us bring more SDB contractors into the NASA family," Goldin said.

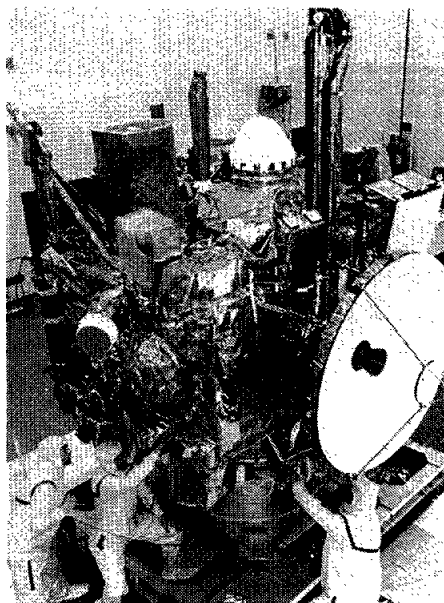
Discussing the procurement reform effort, Goldin said that NASA must continue to give the American people technical advances and the 'best' value for their tax dollars.

"In the future, NASA will not tolerate 300 percent cost overruns, defective spacecraft hardware or the failure to follow work instructions that protect government furnished hardware," Goldin said.

"Nor will we tolerate schedule slippages," he added. "We can't keep letting months turn into years and years into decades."

The major procurement changes include:

- Awarding new contracts to companies that have demonstrated they are accountable by delivering quality systems that meet cost schedules and technical requirements.
- Determining award fees by the end result.
- Giving contractors greater responsibility for success of a program, including opportunity for increased awards if they hold to schedule, keep program cost within estimates and deliver a satisfactory product.



NASA Photo

MARS OVSERVER -- GE Astro Space engineers ready the Mars Observer spacecraft for transfer to Kennedy Space Center's Hazardous Servicing Facility. The satellite, which will orbit the Red Planet and gather data for future human landings, is scheduled for launch Sept. 15 aboard Titan III rocket.

New energy policies target after-hours air-conditioning use

Four operational policies have been established to save energy at JSC by minimizing air-conditioning use and giving more authority to energy conservation managers and coordinators, JSC Acting Director Paul J. Weitz announced this week.

The four policies are designed to help JSC meet energy reduction goals mandated by Congress using 1985 as a base year.

"JSC must reduce energy usage by 10 percent by 1995 and by 20 percent before the year 2000," Weitz said. "It is clearly a significant challenge to all of us at JSC and equates to an air-conditioning reduction of 8 million tons per year."

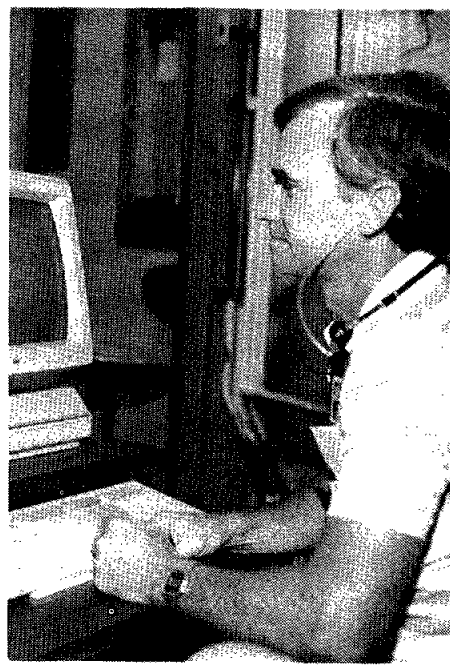
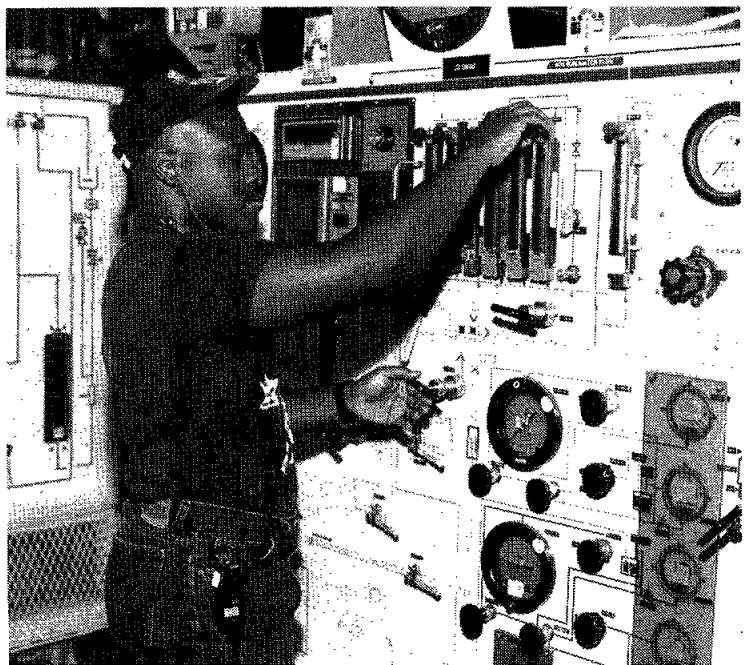
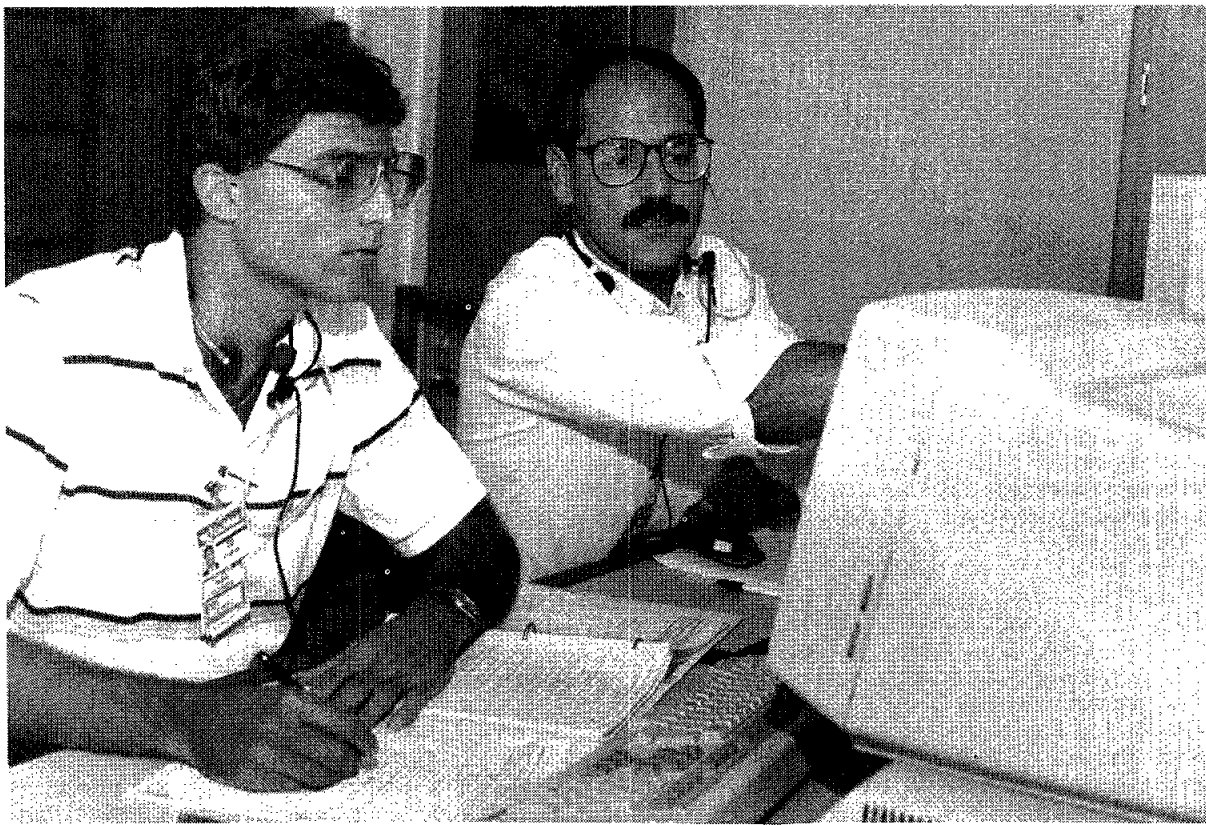
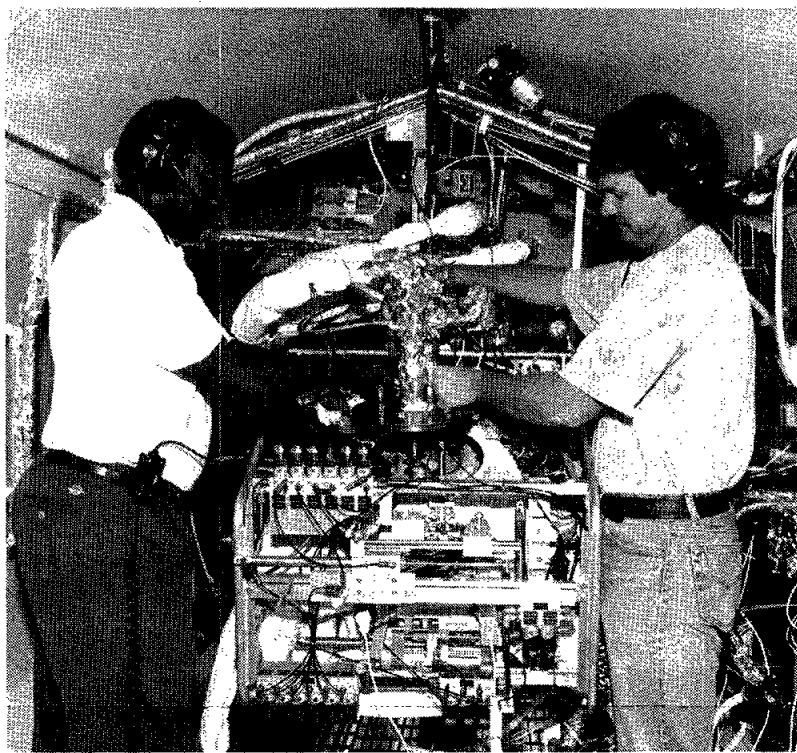
One of the new policies gives "total responsibility and authority" for the energy reduction program to the JSC energy manager, directorate and program-level energy conservation managers and division-level energy conservation coordinators.

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Top: The team that put the space shuttle space suit through its paces during two years of testing that totaled some 400 hours poses outside the Bldg. 7 eight-foot pressure chamber. **Right:** John Sanders and Ron Dickey prepare PLSS 4 to go to altitude in the chamber. **Below:** Ed Mohr, left, and Ken Bond, one of several Lockheed test directors who participated in the project, monitor data. **Bottom left:** Reggie Gay monitors the liquid cooling garment console in Bldg. 7. **Bottom right:** Lockheed's Carl Siggins monitors test data.

JSC Photos by Bill Blunck and Bob Walck



Doubly Durable

Marathon testing program shows shuttle space suit can do the job outside Space Station *Freedom*

By Kelly Humphries

When the folks in the EVA Branch of Engineering's Crew and Thermal Systems Division were given the job of qualifying the shuttle space suit for duty on — or, rather, outside — Space Station Freedom they took the best estimates and doubled them.

Glenn Lutz, subsystem manager for the extravehicular mobility unit, said current plans call for about 12 space walks to maintain Freedom before they are to be returned to Earth for servicing. If, for some reason, a cycle were missed the number could reach 25 over a 180-day period.

"We went off and said we need to go prove to ourselves we can do twice that," Lutz said.

This summer, after 50 runs in JSC's eight-foot pressure chamber, the space shuttle extravehicular mobility unit is well on its way to qualifying.

"It passed like a champ," said Lutz, who explained that when the EMU was first certified for flight it was tested for its ability to perform just three space walks before needing a complete checkout. "It was much more capable than we ever gave it credit for."

Lutz worked with a team of engineers, technicians, test directors and console operators from Hamilton Standard and Lockheed in Bldg. 7 to test the space suit's primary life support system. It took 25 people to manage the tests, which at 8 hours a session built up an impressive record of 400 hours of vacuum operation on one unit, PLSS 4. Sandwiched in between the chamber tests were two sets of laboratory tests that simulated everything but the vacuum produced in the chamber. When the second set of laboratory tests ends today, PLSS 4 will have accumulated a total of 100 test runs or 800 hours of work without an overhaul.

"I'd climb in it right now and go EVA," said Gerald Pollock, the Hamilton Standard engineer who monitored the majority of the 400 hours of the chamber tests.

Before each test series began, the PLSS (pronounced "pliss") was prepared just as it would be for flight, including all of the paperwork checks and quality inspections, said Mike Wilson, who manages Hamilton Standard's work on the subsystem. Then it was moved to the chamber, where it was attached to equipment that simulated the metabolic processes of a working human being and then some. It was taken to vacuum in two steps, then held there for 8 hours. Including the pre- and post-test work, each test day lasted about 12 hours.

Pollock's job was to monitor the EMU system and facility parameters, and defend the EMU when any problem turned up. Since the EMU was being tested, the first assumption was always that the fault was in the test article.

"We had problems along the way," Pollock said, "but in most cases it wasn't the PLSS's fault."

The key to PLSS 4's success was a change in the material that is used for the bladders in the water tank structure, Wilson said. The elastic bladder is part of the system that keeps the feed water pressurized. Recent materials developments have led to a change from neoprene to Fluorel, which leaches far fewer contaminants into the water and thus causes far fewer filter clogs and sublimator failures. The sublimator is a plate that works as a heat sink, taking the heat from the space suit and transferring it to water that condenses on the plate as ice and drifts away into space.

As the tests wound on, fewer and fewer problems occurred, Pollock said.

"After a while, it became extremely boring because nothing happened," he said. "We had no problems with the PLSS and very few problems with the facility."

John Sanders was Hamilton Standard's primary life support technician for the tests. He and his fellow technicians prepared the unit and performed all of the pre- and post-test work.

"We're really proud of the PLSS," Sanders said. "Working in this program, we all realize that we're dealing with a man's life and there's no room for error. We have to be perfect."

The tests have provided valuable engineering data on the long-term performance of the shuttle space suit PLSS, especially components that are considered consumable, such as water filters sublimator plates.

"In my eyes, it says that the EMU is much more capable than we ever thought it was," Lutz said. "We can stand up with confidence and say, hey the EMU can do the job for station."

Although the tests of the life support system were an important milestone in the work to qualify the shuttle suit for Freedom duty, more work remains. The next step is to perform similar tests on the space suit itself. Lutz said his group will take all of the suit components to ILC Inc.'s Dover, Del., assembly plant and put 25 "EVAs worth" of bending and cycles on a suit to show that it, too, can perform with same amount of margins.

Then, in 1993, 25 manned simulated space station runs will be performed — about one EVA a week for 180 days in the 11-foot chamber of Bldg. 7 — using a different PLSS. The test subjects will do all of the cleaning, maintenance and repairs required on the suits. Three of the runs will be performed in the Bldg. 32's Space Environment Simulation Laboratory Chamber B under conditions that also simulate the extreme temperatures of space — one at the beginning, one after 90 days and one after 180 days. □

Students learn by working side-by-side with JSC scientists, engineers

By Kari Fluegel

Fifteen students from nine area high schools have taken residence at JSC for eight weeks this summer to participate in an intensive science and engineering program, giving first-hand experience and insight into NASA careers.

The Summer High School Apprenticeship and Research Program was created in 1980 to give students with demonstrated aptitude for and interest in science and engineering a chance to work on a variety of technical and science projects.

During the program, students

work closely with specially assigned mentors and complete research papers on their work. They also make oral presentations to the SHARP group and their mentors at the completion of the eight-weeks.

Students and their mentors include Carmen Allen of LaMarque High School, working with Chris Culbert of the Software Technology Branch; and Yetunde Adigun of Clear Creek High School working with Dan Barta; Tarryl Churchwell of Bellaire High School working with Terry Tri; and AiQin Huang of Washington High School for Engineering Professionals working with

Don Henniger, all of the Life Support Systems Branch.

Five other Washington HSEP students are SHARP participants. The students and their mentors are Karma Lowe working with Ray Lachney of the Space Station Systems Division; Reginald Steward working with Michael Jones of the Flight Software Reconfiguration Office; Carlton Jones working with Laurie Webster of the Intelligent Systems Branch; Kane Ali working with Jim Lamoreaux of the Tracking Techniques Branch; and Tamara Adams working with Steve Siconolfi of the Space Biomedical

Research Institute.

Additional SHARP students are Omaha Williams of Mount Carmel High School teamed with David Hogg, Control Center Systems Integration Section; Curtis Moshay of Jones Vanguard High School teamed with Dick Bozeman, Thermochemical Test Branch; Twana Lee of Clear Lake High School teamed with Dave Dittmar, Quality Technology Branch; Octavious Chacon of Milby High School teamed with Craig Dinsmore, Test Operations and Institutional Safety Branch; Veronica Estrada of Austin High

School teamed with Tony Smith, Space Biomedical Research Institute; and Rebecca Williams of Jones Vanguard teamed with Vicki Kloeris, Systems Development Section.

SHARP was designed as a feeder program to build a resource pool of potential applicants for future NASA employment in science and engineering. It also was created to attract and train minorities and women who are underrepresented in the NASA scientific and engineering work force.

Eighteen former SHARP students are summer interns at JSC.

Mission Control viewing room, cafeteria hours

The Mission Control Center viewing room will be open to JSC and contractor badged employees and their families during portions of the seven-day STS-46 mission.

Based on a Friday launch, employees will be allowed to visit the MCC Saturday and Sunday, from 1-4 p.m.; Wednesday, from 11:30 a.m.-2:30 p.m. and 5-7 p.m.; and Thursday, from 11:30 a.m.-2:30 p.m.

Employees must wear their badges and escort family members through the regular public entrance on the northeast side of Bldg. 30. Children under 5 will not be permitted. No flash photography or loud talking will be permitted.

Because of the dynamic nature of shuttle missions, viewing hours may be changed or canceled without notice. For the latest schedule information, call the Employee Information Service at x36765.

Special cafeteria hours also will be in effect during the mission.

The Bldg. 3 cafeteria will be open from 7 a.m.-4:30 p.m. weekdays, except launch day, and from 11 a.m.-4:30 p.m. weekends. The Bldg. 11 cafeteria will be open from 6:30 a.m.-2 p.m. weekdays, except launch day, and 7-10 a.m. weekends and holidays.

Safety Learning Center offers August classes

JSC's test Operations and Institutional Safety Branch is offering another set of safety classes in August for civil servants and contractors.

Instructors will teach the classes in the JSC Learning Center, Bldg. 226N. Civil service tuition is paid for by the Human Resources Office. To register, fill out a registration form available by calling the learning center at x36369.

The classes include:

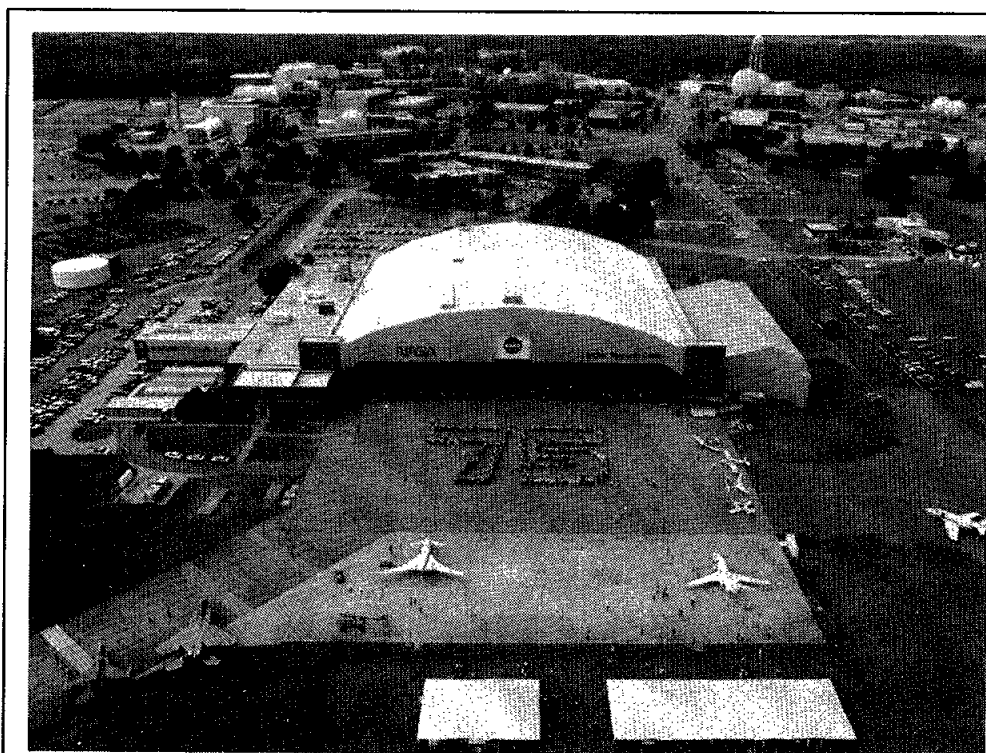
- Asbestos Level I training, 9-11 a.m. Aug. 6.
- Confined Space Entry, 8:30-11 a.m. Aug. 7.
- Hazard Communication, 1:30-3:30 p.m. Aug. 6.
- Protect Your Back, 8 a.m.-noon, Aug. 13.
- Payload Safety, 8 a.m.-4:30 p.m., Aug. 17.

Apollo astronaut Bean exhibits paintings

The Houston Museum of National Science will host an exhibit of more than 20 paintings by Apollo 12 and Skylab 2 astronaut Alan Bean through Jan. 31, 1993.

"Continue the Dream: The Art of Alan Bean" is a collection of artistic interpretations of human beings from the planet Earth at work in a strange new world. It is on display in the Welch Hall of the museum's lower level. The museum is open Monday through Saturday from 9 a.m.-6 p.m., and Sundays from noon-6 p.m. Admission is free to members; \$2.50 for non-member adults, and \$2 for non-member children under 12.

Bean was a NASA astronaut from 1963-1981. He piloted the lunar module Intrepid on Apollo 12, served as commander of Skylab 2. He began pursuing his career in art in 1981.



HAPPY BIRTHDAY LANGLEY—NASA employees form a giant '75' to celebrate the 75th anniversary of Langley Research Center in Hampton, Va. Langley, the birthplace of NASA and its precursor, the National Advisory Committee on Aeronautics, began operations July 17, 1917. Langley employees are celebrating the center's significant contributions to aerospace history—from the earliest aircraft to the latest space vehicle concepts—this month.

NASA Photo

Energy conservation starts with air conditioning

(Continued from Page 1)

"If we can really maximize our efforts at shutting off equipment and turning off air conditioning and lights after hours, we can get to the 100 percent goal without any large expenditures," JSC Energy Manager Dennis Klekar said.

The night load reduction policy

sets normal workday operation hours for air conditioning from 6 a.m. to 6 p.m. Monday through Friday. Only direct flight-support-essential equipment and systems will be operated beyond normal day shift hours. Energy conservation managers will identify such equipment and justify its operation to the

JSC energy conservation manager.

The after-hours air conditioning policy establishes that no comfort air conditioning will be provided beyond normal workday hours or on weekends except in support of flight-essential activities, emergency situations or special protocol events and designates energy conservation

managers as the only ones who may authorize exceptions.

The holiday operations policy orders that no air conditioning for personnel comfort will be provided during federal holidays, and requires contractors to work at other locations if their holidays do not coincide with the government's.

Alaskan experiment could save lives, time and money

NASA is helping a group of dedicated Alaskans begin a three-year experiment that ultimately could result in saving the lives of thousands of campers, hunters and boaters.

The Alaskans will test the use of a small emergency radio transmitter, known as a Personal Locator Beacon or PLB, to communicate with a 10-year-old search and rescue satellite system that up to now has been used primarily for aircraft and ship emergencies.

"We are confident the experiment will prove the value of these emergency devices," explained Wayne Hembree, NASA's Search and Rescue Mission manager at Goddard Space Flight Center.

"Use of the beacons by people in

remote areas undoubtedly will save lives," he continued. "Their use also will lower search times and costs and reduce the dangers to personnel conducting the rescue missions."

The experiment is being carried out with the cooperation of NASA, the National Oceanic and Atmospheric Administration, the U.S. Air Force and the U.S. Coast Guard.

The satellite system, an international program known as COSPAS-SARSAT, has been responsible for saving more than 2,300 lives since it was started in 1982. Principal partners are Canada, France, Russia and the United States.

That PLB program piggy-backs on four low-Earth-orbiting satellites — used primarily for U.S. meteorology

and Russia's merchant marine ships — to receive emergency signals and relay the information to ground stations around the world.

The PLB experiment is designed to prove the need for a lightweight beacon that can be carried and used in an emergency by individuals. Twenty beacons, which cost between \$1,200 and \$1,700, will be loaned to qualified applicants, transmitting any emergency signal and allowing search parties to "home-in" on the location.

The test is being funded by the North Slope Borough Search and Rescue Department, according to Charles Caldwell, the project coordinator for the borough. NSBSAR provides year-round assistance to over-

due hunters, boaters, whaling crews and aircraft.

The North Slope Borough is one of the most remote areas of Alaska. It covers 92,000 square miles (an area about the size of Utah). There are no roads to speak of, and travel is accomplished by amphibious vehicle in the summer and by snowmobile in the winter, Caldwell explained.

With a PLB, he said, the emergency signal would be picked up by a satellite within 55 minutes, the information sent to a rescue coordination center, and the rescue party could be at the scene shortly thereafter. In pre-experiment trials, Caldwell said, the PLB has brought searchers to within six-tenths of a mile and never more than 1.3 miles.

SLS-1 shows big changes

(Continued from Page 1)

In another SLS-1 experiment, there is clear evidence that the number of synapses, the structures used to communicate between the cells of the inner ear's gravity detecting organ and the central nervous system, increases greatly during space flight. However, size remains the same. Therefore, these systems should be able to adapt to the differing gravitational environments of space, the Moon and Mars, according to Dr. Muriel D. Ross, a neuro-anatomist at Ames Research Center.

Further research in this area should shed light on the broader topics of memory and learning in

neural tissue and on clinical inner ear diseases.

Following space flight, there is a significant and dramatic reduction in the size of all muscles needed for standing and moving, according to Dr. Kenneth M. Baldwin, an exercise and muscle physiologist from the College of Medicine at the University of California, Irvine.

"Also, there is a reduced capacity of muscles to burn fat for energy production," Baldwin said. "In addition, this experiment has verified that muscles that support the body when we walk around on Earth change their nature in space because they are not needed."

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

Atlantis on track

(Continued from Page 1)

Atlantis would have acceptable weather for this morning's liftoff.

The STS-46 crew—Commander Loren Shriver, Pilot Andy Allen, Mission Specialist Claude Nicollier, Marsha Ivins, Jeff Hoffman and Franklin Chang-Diaz, and Payload Specialist Franco Malerba — arrived at KSC shortly after 8 p.m. CDT Tuesday.

Work continues to prepare Endeavour for its second space flight, STS-47 carrying the Japanese Spacelab, set for mid-September. Three main engines have been installed on Endeavour and the connections were double-checked this week.