

November 3, 2000

SPACE CENTER Roundup

VOL. 39, NO. 22 LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEXAS

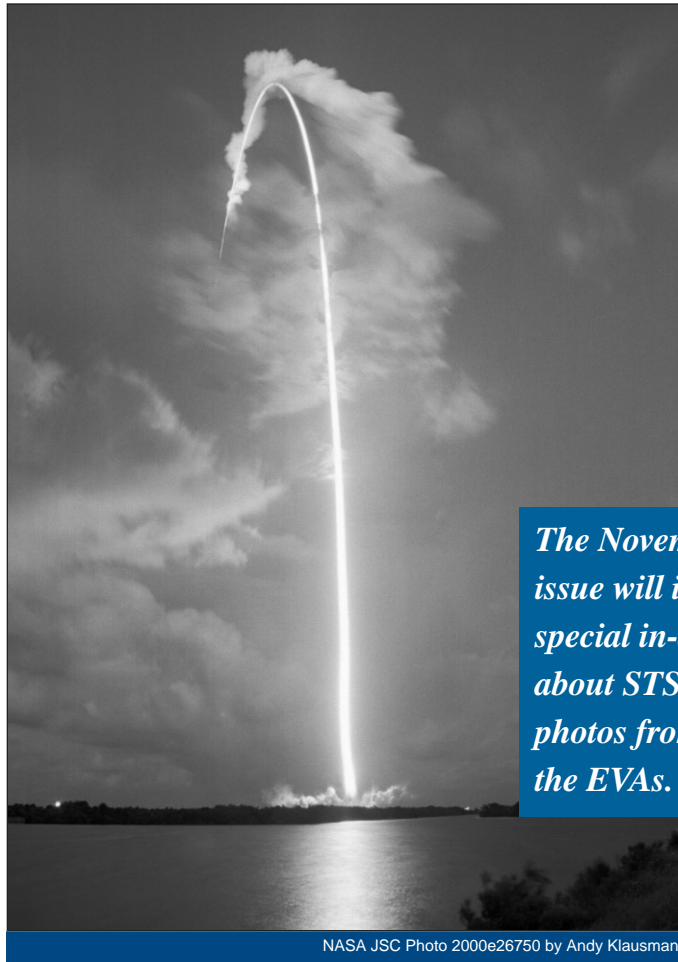
100th shuttle mission marked by EVA success

STS-92 delivers heart of station

Discovery and its seven-member American and Japanese crew lifted off Wednesday, October 11, at 6:17 p.m. Central time from Kennedy Space Center on the 100th mission in space shuttle history. The mission was earmarked not only as a milestone in shuttle success, but also representing a key flight for construction of the world's largest engineering endeavor – the International Space Station.

The STS-92 crew, including Commander Brian Duffy, Pilot Pam Melroy and Mission Specialists Leroy Chiao, Bill McArthur, Jeff Wisoff, Mike Lopez-Alegria and Koichi Wakata, were tasked to deliver the Z-1 truss, an external framework structure, and a new docking port, referred to as Pressurized Mating Adapter 3 (PMA-3) to the ISS, now orbiting at about 240 statute miles over the Earth.

The mission was highlighted by four back-to-back space walks. The bulk of EVA activity centered around ISS assembly work, including connecting umbilicals and electrical wiring to and from the new modules. But on the final EVA, the space walkers were able to take part in a special demonstration of the crew rescue backpack, Simplified Aid for EVA Rescue (SAFER).



NASA JSC Photo 2000e26750 by Andy Klausman

The November 17 issue will include a special in-depth story about STS-92 and photos from the EVAs.

The SAFER uses compressed nitrogen gas to propel the astronauts back to the vehicle should they ever stray. Attached to the shuttle via a long, slack tether, each astronaut took a turn using the SAFER to execute a controlled, 50-foot flight from the Z1 to the fore section of the orbiter's payload bay. Each time, the other astronaut followed along the flight path at the end of Discovery's robotic arm.

At the conclusion of the final EVA, the four crewmembers had logged 27 hours and 19 minutes of space walking during the mission, bringing the total for the ISS assembly to 69 hours and 34 minutes.

"We went four-for-four as far as these mission EVAs were concerned," said STS-92 EVA Lead Daryl Schuck. "We got everything done that we set out to do in regard to station assembly.... This is just an example of what we have ahead. We got the job done, but we are continuing to learn lessons and get smarter about how to do these things."

According to STS-92 Lead Flight Director Chuck Shaw, missions such as this provide the stepping-stones toward a permanent human presence in space. "STS-92/ISS Mission 3A opens the next chapter in the construction of the International Space Station," said Shaw. "This mission has built upon the foundation laid by previous missions, and was a glimpse into future missions. The future is building and growing right before our very eyes!" ■

Four flight crews assigned for 2001 missions

A cadre of 20 astronauts and one Russian cosmonaut has been assigned to four space shuttle missions targeted for launches in 2001.

Two of the missions, STS-100 and STS-104, will continue the on-orbit construction of the International Space Station (ISS). The third, STS-107, will be dedicated to scientific research for the U.S. and its international partners, while the fourth flight, STS-109, will conduct the fourth scheduled servicing visit to the Hubble Space Telescope.

Kent V. Rominger will lead the STS-100 mission to install the Canadian-built Space Station Remote Manipulator System (SSRMS) and attach the Raffaello Multi-Purpose Logistics Module 2 (MPLM 2) to the space station during three scheduled space walks. Also named to the crew are Pilot Jeffrey S. Ashby, Mission Specialist John L. Phillips, and Russian cosmonaut Yuri Lonchakov. Mission Specialists Scott E. Parazynski, Canadian astronaut Chris A. Hadfield, and Italian astronaut Umberto Guidoni of

the European Space Agency (ESA) were previously named to the crew.

Rominger, on his fifth trip to space, will serve as commander for a second time. He flew on STS-73 in 1995, STS-80 in 1996, STS-85 in 1997, and STS-96 in 1999. Ashby will be serving as pilot for the second time following his first flight on STS-93 in 1999. Parazynski will be making his fourth flight, having flown on STS-66 in 1994, STS-86 in 1997, and STS-95 in 1998. Hadfield flew previously on STS-74 in 1995, and Guidoni will be returning to space, having flown as a payload specialist on STS-75 in 1996. Phillips, a member of the 1996 astronaut class, will be making his first space flight on STS-100. Cosmonaut Lonchakov also will be making his first flight into space.

The STS-104 mission will feature three space walks to continue ISS assembly and will deliver and install the space station's airlock. First-time Commander Steven W. Lindsey and Pilot Charles O. Hobaugh will be joined by mission specialists Janet L. Kavandi,

Michael L. Gernhardt, and James F. Reilly.

Lindsey previously flew as pilot on STS-87 in 1997 and STS-95 in 1998. Hobaugh, selected as an astronaut candidate in 1996, will be making his first flight into space. STS-104 will mark Kavandi's third journey into space, after STS-91 in 1998 and STS-99 earlier this year. Gernhardt is a veteran of three previous space shuttle missions, having flown on STS-69 in 1995, and STS-83 and STS-94 in 1997, while Reilly has one previous space flight, STS-89 in 1998, to his credit.

Four mission specialists and one payload specialist have been assigned to the STS-107 mission, undertaking a series of U.S., international and commercial experiments. Michael P. Anderson and Kalpana Chawla will be joined by Mission Specialists David M. Brown and Laurel B. Clark, both members of the astronaut class of 1996 and first-time fliers. Payload Specialist Ilan Ramon will round out the crew. Anderson and Chawla both have one

previous space flight to their credit, STS-89 in 1998 and STS-87 in 1997, respectively. A commander and pilot will be named at a later date.

Four astronauts will begin training for five scheduled space walks to upgrade and service the Hubble Space Telescope during the STS-109 mission in late 2001. Three veteran astronauts, John M. Grunsfeld, James H. Newman, and Richard M. Linnehan, will be joined by Michael J. Massimino, who will be making his first space flight.

Grunsfeld has flown three times, STS-67 in 1995, STS-81 in 1997, and STS-103 in 1999 when he performed two space walks to service the Hubble Space Telescope. Newman, veteran of three space flights, STS-51 in 1993, STS-69 in 1995, and STS-88 in 1998, has conducted four previous space walks. Linnehan flew on STS-78 in 1996 and STS-90 in 1998. Massimino is a member of the 1996 astronaut class. A commander, pilot and flight engineer will be named at a later date. ■



Drills prepare teams for real emergencies.

Page 2



Scientists discuss psychology of lengthy space flight.

Pages 4-5



'Texas Twister' blows into JSC from Magnolia.

Page 6

Tree planting ceremony scheduled for Astronaut Conrad

JSC will commemorate the life of Astronaut Charles P. (Pete) Conrad by planting a Live Oak tree in his honor. The ceremony is planned for November 9.

JSC civil service and contractor employees are invited to attend the ceremony, which begins at 11 a.m. in the Memorial Grove adjacent to Bldg. 111. Employees are encouraged to ride the JSC shuttle bus (route A) to the site as there is no nearby parking.

Conrad became the third person to step on the Moon during the Apollo 12 mission November 19, 1969. Conrad also flew on two Gemini missions, Gemini 5 and 11, and commanded the first crew to live and work on America's first space station, Skylab.

Conrad died July 8, 1999, at age 69. ■



Contract renewed for federal workers

Officials from the American Federation of Government Employees (AFGE) and Center Director George Abbey recently approved and signed a major update to the center's contract with AFGE.

According to Bob Hall, JSC's Labor and Employee Relations Officer, the AFGE Local 2284 has represented JSC's non-supervisory civil service employees in Houston since the early 1970s.

"The current agreement, a three-year auto-renewable contract, was last negotiated in 1988 and has been serving the parties well," said Hall. "The current

updating was accomplished primarily to incorporate a number of significant changes in laws, regulations, and policies that have occurred over the past 12 years."

AFGE Executive Vice-President Bridget Broussard-Guidry, JSC Deputy Director Bill Parsons, JSC Director of Human Resources Greg Hayes and Hall were also on hand for the contract signing ceremony.

The updated Agreement will be available electronically on JSC's Human Resources Web site at <http://jscpeople.jsc.nasa.gov>.



NASA JSC 2000e26623Photo by James Blair

Mary McLain, president, American Federation of Government Employees (Local 2284), signs her name to the newly updated JSC/AFGE contract in a ceremony October 13 as Center Director George Abbey looks on.

Safety Viewpoint...

Staged tram accident helps emergency team prepare

By Mary Peterson

"To the unaware person, things did look bad," said Jim Ruskowski, manager of the JSC Emergency Operations Center. "But, what they were seeing actually had its roots in employee and visitor safety," he explained. "Each year, the JSC Emergency Operations Center Office conducts a training exercise with Space Center Houston to make sure that first and emergency responders from JSC and personnel from SCH are prepared to work together as a team and respond quickly to an emergency. This year's 'event' was a simulated tram accident."

Last year's staged chaos was a pretend-fire in Bldg. 30S from which trapped visitors were rescued.

Now, with four years of similar training, the EOC feels better prepared than ever to meet the demands of a crisis.

Much to their credit as well, the managers at Space Center Houston are very proactive in making sure their employees are trained to handle emergencies and are prepared to integrate into the JSC emergency response process. Shared training, such as the tram scenario, has been key to ensuring a smooth-functioning response between both EOC and SCH teams.

Will we see more scary incidents such as the tram scene? Very possibly. This is just one of several exercises that employees could happen upon as they go about their work, whether at JSC, the Sonny Carter Training Facility, or Ellington Field, as emergency response personnel are being trained. And, the very sight of it should make us all feel better.



NASA JSC Photo from video taken by Jim Hansen

J.B. Williamson, left, a fire protection specialist with SAIC, and Paramedic Melodie Stahl, right, Kelsey-Seybold, go all out for a mock tram accident, and practice their emergency response procedures on an SCH visitor volunteer. The drills are a valuable tool in responding to on-site emergencies.

works as intended if something happens in their area," said Ruskowski, "and a planned exercise is the best way to learn. More important, being prepared will mitigate fear and panic when the real thing happens, and those emotions, if uncontrolled, can defeat the best-intentioned rescue effort." ■

For more information about the JSC emergency response training program or to request that an exercise be scheduled in your area, contact Ruskowski at x38133.

Major exercises in the past have included rescuing injured persons from a confined space, responding to chemical releases, averting bomb threats, and attending to divers with medical problems. Less complex exercises have included persons who suddenly collapse to the ground for an unknown medical condition, persons who need help but cannot speak English, and calls from people who are hearing-impaired.

Believing strongly that knowledge should be shared, the EOC office is continually looking for opportunities to test other aspects of its emergency response program. All employees and managers are encouraged to look at their areas should they have a procedure that directs people to call 33333. To make sure their organization can execute the procedure, they should contact the EOC Office for help with developing a training exercise.

"Employees may not know who responds or whether their facility emergency action plan

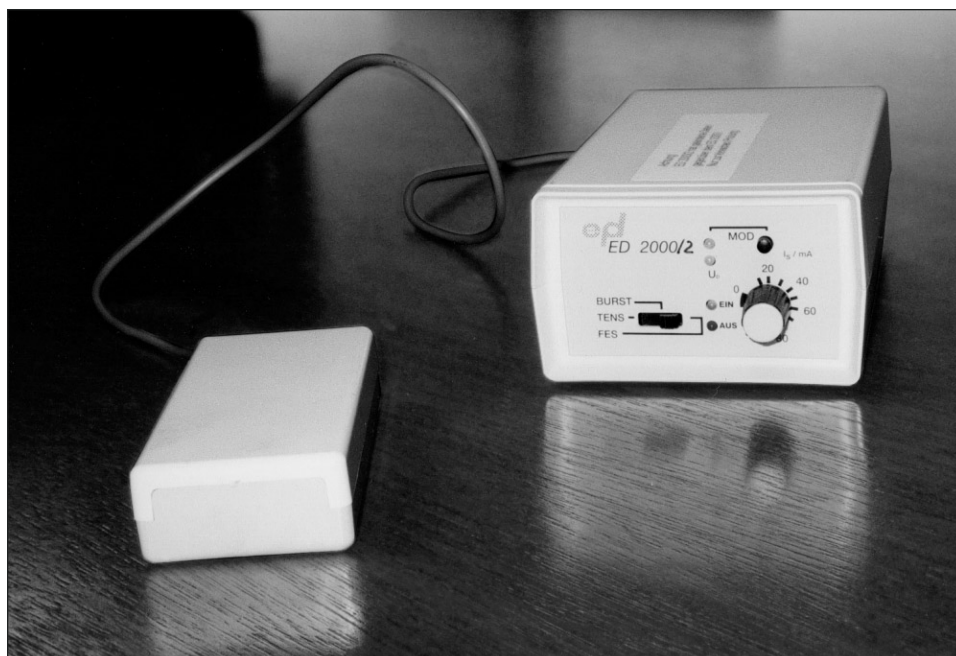
Stimulator could reduce diabetes-related amputations

Local researcher makes worldwide discovery using the Technology Outreach Program

Due to constricted blood flow, many diabetics are known to develop ulcers on their arms, hands, legs and feet, which often leads to amputations. But thanks to technology developed for the U.S. space program, a local researcher has developed a miniaturized device to help diabetics heal their ulcers and reduce the risk of amputation... all from the comfort of their own home.

"Arteriosclerosis, or a narrowing of the artery wall, is a common complication of diabetes," said Ed Krause, Ph.D., a researcher working with the University of Texas Medical Branch in Galveston. "This leads to a reduction in blood flow. If the body tissues don't receive enough blood nourishment, they begin to form ulcers that can later become infected." Krause recently patented a procedure that uses electrical stimulation tied to the patient's systolic heartbeat to widen the constricted blood vessels and enhance blood flow, specifically to the ulcerated regions, thus eliminating the need to amputate.

"If we can use this procedure to reach at least half of the diabetics who face amputations each year, we could save approximately 27,000 people from the trauma of amputation," said Krause.



Through the NASA/CLAEDF Technology Outreach Program, Russ Hays, Wyle Laboratories, helped Ed Krause, Ph.D., miniaturize a device that will help blood flow in diabetics, reducing the necessity of amputations.

With the help of electronic engineers and other industry representatives, Krause developed a large prototype of the device by slightly modifying an existing stimulator manufactured by DKI GmbH in Germany. However, since this device could only be used in a hospital setting, a patient would incur considerable medical costs. Krause envisioned miniaturizing the device so that diabetics could perform the painless treatment at home while saving substantial amounts on medical costs.

At the suggestion of a representative with the Galveston Small Business Development Center, Krause called upon the Technology Outreach Program for assistance in developing a miniaturized prototype of his device. Sponsored by the

NASA-Johnson Space Center and the Clear Lake Area Economic Development Foundation, the TOP is designed to speed the transfer of space technology to the private sector by providing free technological assistance to local small businesses.

Upon receiving Krause's request for technical assistance, TOP officials called upon one of the program's alliance partners, Wyle Laboratories Life Sciences Systems and Services, for assistance. Russ Hays, an engineering section supervisor, was assigned to the challenge.

Employing electronics technology that is used to design flight hardware for the U.S. space program, Hays created a conceptual design of the miniaturized device. He outlined what electrical components

would be required to mass-produce the stimulator, and created a list of manufacturers that specialize in small devices. He also provided details to improve the large device prototype. In all, Hays spent 10 hours on the project.

"The U.S. space program has developed a wealth of technology that is of benefit to people here on Earth," said George Abbey, JSC director. "This program is another example of an investment in the space program that is providing direct benefits to the American public. We created the Technology Outreach Program to help disseminate this technology in hopes of providing a return to the country, as well as helping small businesses overcome their challenges and bring their ideas to fruition. I am excited to see how this program has helped in the creation of a medical device that could help people and assist in eliminating suffering."

"Usually, the TOP simply provides technical assistance to small businesses," TOP Executive Director Cathy Kramer said. "But, through our partnership with Real World Inc. and Ingenium Capital Group, we were able to give Dr. Krause even a larger scope of services than before. As a result, he is well on his way to creating his miniaturized device that is going to be used on a world wide level."

Krause added, "The TOP provided me everything I needed for this project, from technical assistance to marketing and funding opportunities. There is power in this program and I would recommend it to anyone." ■

For more information on the NASA/CLAEDF Technology Outreach Program, call Kramer at (281) 486-5535.

Local schools come up winners in JSC Open House drawing Computers delivered to Cy-Creek High, Peggy Wilson Elementary

Students at Cypress Creek Senior High School and Peggy Wilson Elementary in the Cypress-Fairbanks Independent School District have new computers to use for their research. An Apple iMac and a Compaq Presario computer were delivered to the schools on October 5.

OAO Corporation and its partners, Compaq and Apple Computer, donated the computers for a drawing to benefit nonprofit schools. Visitors to this year's JSC Open House were offered a chance to register a nonprofit school of choice for the drawing.

Nilce Sibaja, a student at Cy-Creek High, won the Apple iMac for her school, and James Adiletta won the Compaq Presario for Peggy Wilson Elementary.

"The computer is going to be placed in our Resource Center," said Karen Collins, principal of Peggy Wilson Elementary, in accepting the computer for her school. "That way it will be accessible to all of our children. Our Resource Center director believes that she will post on it places that the children can write to authors, scientists and others."

Steve Rickman, NASA deputy chief, Thermal Branch, took the opportunity to speak to students at both schools.

Addressing an audience of fourth- and fifth-grade students at Peggy Wilson Elementary, Rickman said, "In a few years, a lot of you are going to be making a decision about what you want to do in life. You're in fourth and fifth grade right now, but before too long, you'll be in high school and deciding which direction you want your life to go. What I want to leave you with is this: Everybody has something that they like. I call it their passion in life. You may like mathematics, you may like music, you may like

science, you may like English—any of those is fine. Chase after your passion. Try as hard as you can to do the best that you can, and you'll find that you will have a rewarding career."

Rickman spoke to an audience of junior and senior physics students at Cy-Creek High. "If we were to build a model of every spacecraft that we were going to do and fly it, that would become a very expensive proposition," he said. "As a matter of fact, there are a lot of things that you cannot even test on the ground, so you have to rely on other means to

get the job done. We rely very heavily on mathematical modeling." To demonstrate his point, he discussed mathematical models used to design the X-38 Crew Return Vehicle.

At both schools, Rickman discussed and showed examples of several materials used to protect the space shuttle, astronauts and equipment from the searing and freezing temperatures experienced during space flight.

"We thank you not only for the computer but also for the presentation," said Sue Heineman, prin-



Attending the presentation of the Apple iMac to Cy-Creek High, from left, are: John Arnold; Nilce Sibaja, a student at Cy-Creek High School; Steve Rickman; Sue Heineman, principal of Cy-Creek High; Wanda Hobley; and Laurie Branham.



James Adiletta, front, a student at Peggy Wilson Elementary, is all smiles as he accepts delivery of a Compaq Presario he won for his school during a JSC Open House drawing. Attending the presentation at the school, from left, back, are: Wanda Hobley, NASA, ISD, assistant to the director; Laurie Branham, OAO outreach coordinator; Steve Rickman, NASA deputy chief, Thermal Branch; John Arnold, OAO JSC program manager; and Karen Collins, principal of Peggy Wilson Elementary.

incipal of Cy-Creek High. "It was very interesting."

The computer will be set up in the high school's library for students to use as a research aid.

OAO Corporation provides enterprise information technology products and services to five NASA centers including JSC, Kennedy Space Center, Marshall Space Flight Center, Stennis Space Center, and Jet Propulsion Laboratory. ■

Preparing for extended space flight: *Psychology and human behavior*

As lengthy stays aboard the International Space Station begin, and plans for potential missions to Mars begin to unfold, the need for a better understanding of the psychological issues that crewmembers will face on orbit becomes evident.

A number of psychological issues must be considered when preparing for long-duration space missions. Psychological aspects associated with crew health, well-being, productivity and teamwork become increasingly significant. And the necessity for meaningful work versus "make work," reasonable work-rest schedules, and communication capabilities all must be considered when preparing crews.

These and other psychological factors are all interrelated and all play key roles in the success of long-duration missions. Together they form the cornerstone of behavioral health and human performance.

The responsibility for defining these complex issues, preparing crews for long-duration space flight from a psychological perspective, and developing treatments for deleterious effects that they may experi-

ence belongs to the psychologists in JSC's Space and Life Science Directorate and the contractor personnel who support them. Together they make up the Behavioral Health and Performance Group.

"In general, this field is in its youth

because the U.S. hasn't done much long-duration space flight other than Skylab, the Mir series and some extended simulations," said Dr. Al Holland, NASA/JSC chief of psychology. "What we know we know from these and from analogue environments such as polar expeditions. We certainly don't have the experience the Russians have, but even they still have some outstanding issues in terms of managing behavior, well-being and performance in flight. We know how to do a two-week duration aboard the shuttle safely, and we can do three-month tours of duty in space. A six-month stay in space is probably the longest envelope that we currently understand."

Analogue Environments

The experiences of individuals who have lived and worked in polar regions and aboard the Mir space station have helped the psychologists formulate their training plans for the ISS crews.

Dr. Joanna Wood, a visiting scientist at JSC from Baylor College of Medicine, has done some work in the Australian polar stations in Antarctica. Every year since 1996, she has participated in an annual training camp held in Tasmania where future Antarctic expedition members gather together for a week at a fishing camp to train in preparation for their stays in the Antarctic.



NASA Photo STS071-E-0006

Cross-cultural training plays a key role in preparing crews for mission success. Aboard Russia's Mir Space Station, Astronaut Dr. Bonnie Dunbar, STS-71 mission specialist, shakes hands with Cosmonaut Gennadiy Strekalov, Mir-18 flight engineer. Looking on are Cosmonaut Nikolai Budarin (left), Mir-19 flight engineer, and Astronaut Robert Gibson, STS-71 commander.

Wood views these polar expeditions as insightful analogues to long-term space travel. "So far we have identified some of the major problems and issues that arise with groups living in extreme environments and some of the things that people do to deal with the problems. These can be passed off immediately to work into training flows for crews. We are going farther to look at more complex situations and look at the interplay between individual and group characteristics to help figure out who would make the best groups. How do you get a good group? Do you train it into them or does the chemistry have to be there initially?"

Research conducted thus far has shown that no two groups are the same and that no person working in a group has the same experience twice because one's experience depends upon the group one is with. "Teams in extreme environments have to live together – it's not just working," Wood says.

Another lesson learned from studying people living and working in extreme environments is the importance of selecting the right individuals to participate in the expeditions.

"These are normal people going into an abnormal set of circumstances," said Wood. "We all have only so many items in our emotional repertoire. We've got only so many emotions we can feel, and by the time we are adults, we already have our preferred coping mechanisms. We may learn about some others; we may even try them out. But when times get tough, we go back to what we know. So hopefully they will pick people who know some positive things to do – people who have demonstrated that they can cope with unusual situations."

In addition to the study of those who have lived and worked in polar regions, the

lessons learned from the Mir series have proved beneficial to the psychologists.

"Mir was a remarkable learning experience in this discipline," said Holland. "Unfortunately there are only seven people upon which to base the lessons that we've learned. And so it's not a research base – it's an anecdotal experience base. But it was very helpful in preparing for ISS because the ISS missions are no longer in duration than the Mir missions and that's a big driver for psychological issues.

"One of the major lessons that we learned from Mir was the impact of the ground organization on the psychological health, well-being and performance of the individual crewmembers. The organization can consciously improve the individual's health as well as unconsciously negatively impact that well-being through its normal operations. It is very important to make ground personnel, including management, aware of the very sizable impact that they can have on the individual crewmember's psychological well-being. That was the biggest lesson from the Mir series."

Astronaut Selection and Training

In all types of missions – space, polar, military, ground studies – many factors influence who is actually assigned to a mission, and psychological information is only one part of the overall selection process. Within that part, individuals are selected who are psychologically suited for the target mission and who work well together as a team. The determination of individual suitability and team compatibility for long-duration missions is a long, involved process that involves psychological testing, structured reference interviews, skill-based training and selection exercise, formal briefings, individual strategy sessions, and other evaluations.

The "select-out" testing and interview process addresses the clinical psychological fitness of potential candidates, and the "select-in" testing and interview process addresses the psychological suitability of each candidate for the target mission. The main areas for psychological training of

crewmembers are individual adaptation, well-being, performance and health issues. The second area would be leadership under conditions of extended, confined operations. The third major area would be team issues – team cohesion and effective team process. Finally, there are the cross-cultural issues that are embedded in individual, team and leadership areas.

Astronaut candidates, astronauts and Expedition crews get an overview of the psychological factors of long-duration space flight. They are given the psychological training that they will need to be effective in the isolated, confined environment they will face.

"There are certain phenomena that tend to occur to many people during long-duration confined operations," said Holland. "The training that the astronaut candidates receive lets them understand that, when they do fly and experience these problems, they are not experiencing something new and unusual. The training also helps them understand how people have dealt with these concerns.

"One example of individual adaptation would be what might be considered a psychological counterpart to putting blinders on a horse. Within the first six weeks of a long-duration mission, an individual makes an adaptation to the new environment of the closed vessel and comes to terms with the fact that he or she will be in this spacecraft with these same people for a long time. In general, there seems to be a need for crewmembers to limit themselves. They learn to pay less concentration and less attention to the world outside of the spacecraft. It's a necessary limitation or a coding down of the size of their world so that they can make the investment necessary to make the spacecraft a happy place. Crewmembers are usually much happier once they go through this adaptation process."

The training that Expedition crews one through four have received primarily covers psychological insight and support, team processes and cross-cultural training. It has not included a lot of the

Please see **PSYCHOLOGY**, page 5

Continued from Page 4

PSYCHOLOGY

experiential skills-practicing aspects that Expedition training now provides.

In this regard, the Behavioral Health and Performance Group has assisted Astronaut Andy Thomas, chief, ISS Expedition Corps, in developing an Expedition core training which involves seminars, outdoor leadership training in small teams and winter survival techniques. The training program exposes Expedition candidates to the issues of leadership, confinement and interpersonal contact such as crew persons can expect on ISS flights. It consists of classroom work and workshops to provide an understanding of the importance of these issues in a historical perspective. In addition, various team exercises, taking place under stressful conditions, are used to provide practical experience in recognizing the importance of teamwork and leadership and in developing enhanced interpersonal skills.

The objectives of the training program are to develop and nurture the ability of individuals to operate in a prolonged stressful environment; sensitize crew persons to interpersonal issues and how to deal with them; enhance self-management in each individual to prepare him or her to interact under stress and possible conflict; encourage individuals to become good members of expeditions; and to develop individuals to become good expedition leaders.



Regina North

isolated and confined environments.

According to North, cultural shock is not the result of any specific demand on the individual to adjust, but rather the demand for a multitude of adjustments over a defined period of time. In general, it results from mismatched expectations based on a preconceived idea of how one should respond to a particular situation. The sources of cultural shock could be climatic, geographic, political, legal, economic, religious or architectural or relate to issues such as safety, clothing, food and work. It is also very important to understand that a similar adjustment process occurs when the individual is repatriated.

that different cultures have different expectations and responses toward leadership styles, or the use of personal space. Of course, different languages and modes of expression also impact communication and productivity, especially in

schedule," said NASA Flight Surgeon Dr. Christopher Flynn. "The ground crew is charged with maintaining those schedules. But emergencies often occur on orbit that upset those schedules, keeping astronauts awake for 20 to 30 hours at a time. So their fatigue levels change. What we don't know how to do very well yet is to take an astronaut and have him or her work for 24 hours. If that astronaut sleeps for four hours, is he or she rested? Or does the person need six or more hours of sleep before he or she is really rested again and ready to go back to work? We don't know the answer to that question."

According to Flynn, the matter of how to schedule work for ISS crews on orbit is another question. "How do you schedule work for people on orbit? Is it better to manage every minute of their time from the ground controllers – which is what is done on shuttle missions? Or is it better to give them the opportunity to complete a certain number of tasks over a certain period of time and let them organize their time? Now we tell astronauts what to do every minute of the day and that can annoy them after a while – especially on a long flight. One of the challenges that we have is to understand how to schedule work for them that's not fixed."

But the schedule can't be too loose. One person doing an experiment aboard the station that requires little vibration is going to be in conflict with another crewmember who wants to exercise on the treadmill. Ground controllers now organize time to deconflict different tasks on different days.

"How do we make a new plan for the future? That's the countermeasure that's waiting to be understood," Flynn adds.

Mission Support

In-flight support involves a wide range of activities including assisting the crews in developing their own libraries of books, music and videos that will be stored aboard the ISS. The group also manages the air-to-ground communications between the crewmembers and their families as well as the on-board ham radio communications with stations at home and patching calls through to the family members wherever they may be on the ground.

The Behavioral Health and Performance Group also sends up care packages to the crews – packages from them and from family members. The packages are sent up on the Progress and the non-crew-rotational shuttle flights.

Stephen Vander Ark, supervisor of the Behavioral Performance Group for Wyle Laboratories, has worked with the first four Expedition crews. "Our interaction with the crewmembers starts shortly after they are assigned to the Expedition crews. We meet with the astronauts and their families to let them know what our role is and what types of support are available."

Astronauts and family members fill out a personal preferences questionnaire that gives the group an indication of what types of magazines and books they want to read. Working with Russian and American crewmembers, the group is putting together a general library of items including books, periodicals and CDs. At the end of their mission, the crews will add to the collection and bring some of their personal items home.

Working with family members of the U.S. astronauts who will live aboard the ISS, the group is also putting together family photo video albums on laptop computers. The family members will be able to view the albums and add captions and audio comments to the digitized photos before they are sent up to the crewmembers.

"You have to bring a piece of your home with you," said Wood. "You may want to bring pictures or mementos to remind you of your family. Some favorite books or music may help set a more pleasant tone. There has to be that thin cord that ties crewmembers back to Earth so that they have a reason to come back. When they have a reason, they have a reason to stay sane, a reason to get their job done, and a reason to come back."



Stephen Vander Ark

outside of JSC will be set up to communicate with future crews.

"We do this to make sure that the crewmembers have the opportunity to communicate with the people who have typically provided social support for them here on Earth," said Vander Ark. "This is equally important for the family and friends as it is for the astronauts."

Conclusion

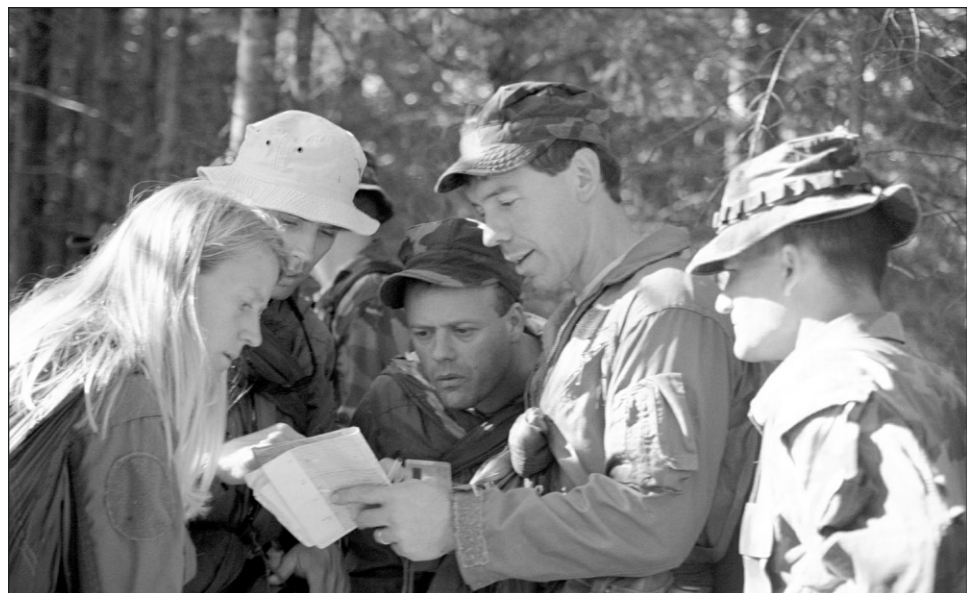
Looking to the more distant future, the preparation of crews for potential missions to Mars will entail a very different process of preparation, selection and training for two reasons. First, the duration involved is much longer – up to three years perhaps – and, secondly, the communications timeline.

"You put those two together and it mandates having a much more autonomous crew – a crew that is much less dependent on the ground for information on how to repair things," said Holland. "Real-time conversations will be next to impossible to have. Information will have to be exchanged in packets."

"We'll need a crew that will be able to maintain its own schedule. That will necessitate a change in roles for ground control members. Some very different ways of business will take place versus current operations that have a very interdependent air-to-ground team."

Holland also says that crewmembers and their families will need a lot more preparation in developing and practicing coping skills before going to Mars. Despite these hurdles, Holland finds hope in the history of past explorers.

"When I think about a mission to Mars, I think of the early explorers who, when they left sight of land for the first time on the seas in the little boats that they had, they really didn't know if the Earth was flat or not and whether or not they would drop off of the edge of the planet. It was remarkable what they did. They went out there not knowing what they were going to encounter. They were away from land without any communications capability. So I think we need to recognize that as difficult and as novel as a Mars mission would be that, from a psychological perspective, it's not novel to the human race to do this type of activity. There may not be a history of it, but it has been done and been done successfully. So I think that's a source of positive thought and inspiration." ■



NASA JSC Photo 2000-06639 by Bill Stafford

Team interaction and leadership skills in extreme environments become crucial issues when considering long-term space flight. Exercises, such as outdoor survival training shown above, help expose and educate astronauts to these situations.

The study of the historical record of various expeditions has shown that the leader of any long-duration expedition characterized by confinement, isolation and group living must fulfill a unique role. The leader's ability to fit this role is seen as being important, if not critical, to the success of the mission. The personality and leadership style of the commander sets the tone for the whole group.

As important as leadership is follower-ship or teamwork – the ability to work as a team and stay motivated. Long-duration flight, confinement and close personal contact place unique stressors on participants that are not found on short missions. This will be especially true for the crews that comprise the ISS participants since they will include members from throughout the world.

Cross-cultural training plays an important part in crew training for extended ISS missions. The crews take generic cross-cultural training classes on site. They are then given seminars in advanced cross-cultural problem-solving techniques using scenarios that have occurred in flight or on the ground.

Regina North, a behavioral scientist with United Space Alliance in the Space Flight Training Division in the Mission Operations Directorate, gives classes in cross-cultural training to JSC and Marshall Space Flight Center personnel. She says

Workload

In isolation situations, participants must have meaningful work to perform; situations in which "make work," too little work, or meaningless tasks are scheduled



Christopher Flynn

will have a demoralizing effect on the participants. U.S. experience on board the Mir station, as well as in other confined, ground-based settings, has highlighted this fact. Conversely, when someone is very interested in a task,

motivation is high to overcome any difficulties to see it through to completion.

Two concerns are interrelated: providing crewmembers with meaningful work and ensuring that they do not get fatigued. Fatigue is a major issue that could potentially compromise health and human performance.

"What we do now for long-duration flight to combat fatigue on orbit is to make sure that there is a work schedule and a rest

Ripped from the ROUNDUP

Ripped straight from the pages of old Space News Roundups, here's what happened at JSC on this date:

1 9 7 0

For the first time, astronauts will prepare their meals from an assortment of frozen as well as the conventional space foods similar to those carried on manned Gemini and Apollo missions.

Astronauts will cook their own meals on a special food tray now being developed for Skylab. Frozen foods will be stored in a freezer in the Skylab orbital workshop.

In addition to being the most palatable menu carried into space thus far, the Skylab food system is designed to meet the requirements and objectives of an important series of medical investigations.

1 9 7 5

The critical design review (CDR) for the first space shuttle orbiter, now in final assembly at Palmdale, Calif., was held at Rockwell International Space Division's Downey plant in late October, and the CDR board called the spacecraft progress "excellent."

Most of orbiter 101's major structural components have been completed and delivered to Palmdale where they are in final assembly. The wings have been mated to the mid-fuselage, and RI last week shipped the forward fuselage from Downey. Rollout will take place in the fall of 1976.

1 9 8 0

Columbia prime crew astronauts John Young and Robert Crippen, and ground-based flight controllers at JSC wrestled imaginary problems for some 55 hours last week in the fourth major simulated flight of the Space Transportation System.

The simulation was terminated 3 p.m. Thursday due to a failure in the flight simulation facility.

Purpose of the simulation is to provide space shuttle astronauts and flight controllers with realistic training, using computers and flight simulators to replicate flight conditions and evaluate actions performed by the air and ground crews. Simulated problems were introduced during the test to accustom the crews to handling a variety of potential anomalies.

'Texas Twister' joins Longhorn Project herd at JSC



NASA JSC Photo 2000e26592 by Bill Stafford

Vickie Eckhardt, a Clear Brook High School FFA sophomore, stands beside Texas Twister, the latest addition to the Longhorn Project. Eckhardt is responsible for suggesting the name of the steer, which has joined three other Texas Longhorn steers on the grounds of JSC.

A Texas Longhorn steer is now residing at the Johnson Space Center as the latest addition to a unique educational project that teaches local high school students how animal husbandry, agriculture and aquaculture relate to the future of human space flight.

Representatives from JSC, the Clear Creek Independent School District, the Houston Livestock Show and Rodeo and the Texas Longhorn Breeders Association of America accepted the six-year-old Texas Longhorn steer donated by Hal Hillman, past president and chairman of the board of the Houston Livestock Show and Rodeo, during a ceremony on October 11 at the Western Heritage Pavilion at the entrance to JSC.

The steer, named Texas Twister by CCISD students, has joined three other Texas Longhorn steers as the most visible symbols of the ambitious education project, ranging the 60-acre agriculture laboratory adjacent to Rocket Park.

"I'm so pleased that we were able to donate the bull, Texas Twister, to this famous project," said Hillman.

"On behalf of Mr. Abbey, we are proud to be a part of this community, proud to be a part of the Longhorn Project, and very thankful for all of the supporters that we have for this project, and we look forward to some really great things coming from it," said JSC Deputy Director Bill Parsons.

"On behalf of our district, we're excited about this project," said Dr. John

Wilson, CCISD superintendent, in accepting the new Texas Longhorn. "The Longhorn Project is a very special project and we're happy to accept this donation."

The CCISD Agriculture Science Center Learning Laboratory, more commonly called the Longhorn Project, was jointly developed by JSC, CCISD, the Houston Livestock Show and Rodeo and the Texas Longhorn Breeders Association of America. As students work cultivating fruit and vegetables, or grooming loaned heifers and bulls for the annual livestock show, they also learn about the sorts of alternate plant growth techniques and closed-loop life support and water and waste recycling technologies that are vital to expanding a human presence further into space. ■

DATES & DATA

November 3

Chess Club meets: The Space City Chess Club meets from 5 p.m. - 9 p.m. at the Clear Lake Park Recreation Bldg. All skill levels are welcome. For details please call James Mulberry at x39287 or James Termini at x32639.

November 6

NSS meets: The Clear Lake area chapter of the National Space Society meets at 6:30 p.m. at the Parker Williams Branch of the Harris Co. Library at 10851 Scarsdale Blvd. For more information contact Murray Clark at (281) 367-2227.

November 8

Astronomy seminar: The JSC Astronomy Seminar Club will meet at noon in Bldg. 31, Rm. 248A. For more information contact Al Jackson at x35037.

MAES meets: The Society of Mexican-American Engineers and Scientists meets at 11:30 a.m. in Bldg. 16, Rm. 111. For more information contact Laurie Carrillo at (281) 244-5203.

Spaceteam Toastmasters meet: The Spaceteam Toastmasters meet at 11:30 a.m. at United Space Alliance, 600 Gemini. For more information contact Patricia Blackwell at (281) 280-6863.

November 9

Communicators meet: The Clear Lake Communicators, a Toastmasters International club, meet Nov. 9 and 16 at 11:30 a.m. at Wyle Laboratories, 1100 Hercules, Suite 305. For more information contact Allen Prescott at (281) 282-3281 or Richard Lehman at (281) 280-6557.

November 10

Astronomers meet: The JSC Astronomical Society meets at 7:30 p.m. at Space Center Houston. For more information contact Chuck Shaw at x35416.

November 13

Aero Club meets: The Bay Area Aero Club meets at 7 p.m. at the Houston Gulf Airport clubhouse at 2750 FM 1266 in League City. For details contact Larry Hendrickson at x32050.

November 14

IAAP meets: The Clear Lake/NASA Chapter of the International Association of Administrative Professionals meets at 5:30 p.m. in the Colonial Room at Grace Community Church, 14325 Crescent Landing (Hwy 3 and Clear Lake City Blvd.). Cost is \$12.

NPMA meets: The National Property Management Association meets at 11:30 a.m. at the Gilruth Center. For more information contact Ray Whitaker at (281) 212-6030.

November 15

Scuba club meets: The Lunarfins meets at 7:30 p.m. For more information contact Mike Manering at x32618.

November 16

Airplane club meets: The Radio Control Airplane Club meets at 7 p.m. at the Clear Lake Park building. For more information contact Bill Langdoc at x35970.

Directors meet: The Space Family Education board of directors meets at 11:30 a.m. in Bldg. 45, Rm. 712D. For more information contact Lynn Buquo at x34716.

Correction

The ages of the Expedition One crew were incorrectly stated in the October 20 Roundup. International Space Station Commander and U.S. Astronaut Bill Shepherd is 51; Flight Engineer and Russian Cosmonaut Sergei Krikalev is 42; and Soyuz Commander and Russian Cosmonaut Yuri Gidzenko is 38.



Bill Yeakey: *From Mercury to Space Station*

A tribute by John McKenna

JSC recently lost Bill Yeakey, a United Space Alliance flight software engineer in Flight Design. He was a significant contributor to the Space Shuttle Program having developed more than 70 orbiter displays, many of which still fly today. Bill was one of those rare engineers driven to perfect software changes for the Space Shuttle Program. He got started in project Mercury and kept going.

Bill was a chemical engineering graduate of the University of Louisville. He left his home of Louisville, Ky., in 1958, after marrying his high school sweetheart Marilyn. Marilyn's father managed a paint and varnish company in Louisville and tried to convince Bill into working at the store. Bill had his eyes on the stars and when he told his father-in-law of his intentions to go to the Cape, his father-in-law replied, "I don't think you should be doing that Buck Rogers stuff."

The Yeakeys headed to St. Louis and Bill took a job with McDonnell Douglas. In 1960, he went to the Cape to work the Mercury Program Environmental Control System (ECS).

At a time when Americans were watching "I Dream of Jeannie" on new color TVs, Bill had become the ECS lead engineer, responsible for the checkout, servicing and operation of the Gemini ECS. Bill's career then led him to the thermodynamics team at the missile facility in Titusville, and later supporting Skylab at the

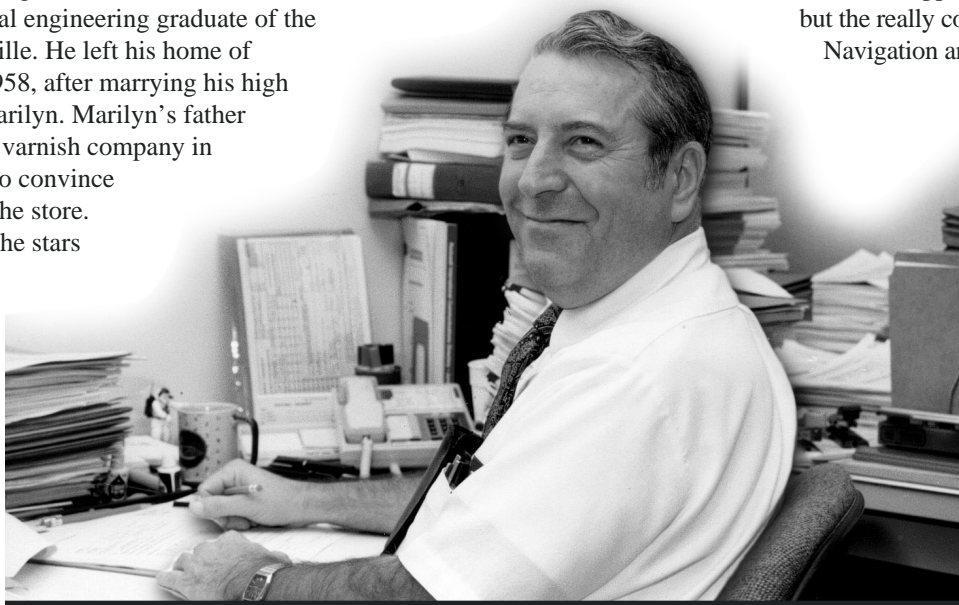
Cape and at Marshall Space Flight Center until budgets for Apollo tightened. He was out of work for a short time until he found a job at JSC with McDonnell Douglas in 1974 to aid with development of the Orbiter software and cockpit displays.

While Bob Crippen and John Young were preparing for the maiden flight of *Columbia*, enterprise drop tests validated the approach and landing software, but the really complex Orbital Guidance, Navigation and Control software still

needed to be developed. Computers were leading the way with huge consoles that each stored 20 megabytes! Acronyms kept memory size down.

Bill was a great 'bit flipper' using the tricks of the trade with the limits of the flight software. Astronauts that followed all came to know Bill Yeakey as the software expert. He knew the primary as well as backup software like the back of his hand. Hard work was his ethic and software was his life.

After nearly 100 shuttle flights and 29 Mercury, Gemini, Apollo and Skylab flights, Bill passed away on his 67th birthday, having worked two years past retirement. He leaves a tremendous void behind but will be always an inspiration for us younger bucks that wanted to go out after work, yet he got us to stay late and learn his ethic of "working hard." ■



During the STS-106 mission, the Mission Control Center flag was flown at half-staff for JSC software engineer Bill Yeakey.

'Hubble Space Telescope: New Views of the Universe' opens at Space Center Houston

At one time or another, virtually everyone has looked to the night sky and wondered where the stars came from, or questioned our universe and how long it has existed. With the launch of the Hubble Space Telescope ten years ago, our scientific knowledge of the universe has greatly expanded. Now, for the first time, a new exhibit – "Hubble Space Telescope: New Views of the Universe" – brings Hubble and its extraordinary discoveries to the public.

Sponsored by NEC Foundation of America and Rockwell Fund, Inc., "New Views of the Universe" opened Saturday, October 7, at Space Center Houston. The extraordinary exhibit is on a nationwide tour from the Smithsonian Institution Traveling Exhibition Services (SITE).

Visitors will explore the cosmos through the eye of the Hubble Space Telescope. "Through activities, video, artifacts and vivid Hubble images, they will learn about the telescope's history, design and purpose, as well as gain a greater understanding of planets, stars, galaxies and intergalactic space," said Space Center Houston President and CEO Richard E. Allen Jr.

Other exhibit areas explore Hubble's contributions to our understanding of the origins and evolutions of planets, stars,



galaxies and the universe. Visitors will discover the formation of our solar system and the kinds of planetary activities – such as a comet's impact on Jupiter or cyclones on Mars – Hubble can document.

Another section explores different types of galaxies, and investigates collisions and black holes. Guests will be able to watch galaxies collide and learn how

finding the distance to a specific galaxy can help scientists estimate the size and age of the universe.

The exhibition ends with a look at the current and future activities of Hubble. The proposed Next Generation Space Telescope is revealed, and guests will be able to tap into a database of current events and visitor questions about Hubble.

The exhibit was organized by SITE and the Space Telescope Science Institute, operated for NASA by the Association of Universities for Research in Astronomy, Inc. The exhibit and its educational programs have been made possible through NASA's Offices of Space Science and Education and Lockheed Martin.

"New Views of the Universe" will be open until January 2, 2001. Admission to the exhibit is included with the cost of admission to Space Center Houston. Ticket prices are \$13.95 for adults, \$9.95 for children 4 to 11 years of age. Children under 4 are admitted free. The price for senior citizens age 65 and over is \$12.95. JSC employees – show your civil servant badge for free admission. Contractors may obtain discount tickets at the admission windows. The Center is open 10 a.m. to 5 p.m. on weekdays and 10 a.m. to 7 p.m. on weekends. ■

Faces in the crowd

If you had an opportunity to be a part of the first crew to the International Space Station, would you do it? Why?



Albert Ruder
Washington Group, Quality Engineer

Definitely! Why not? You only live once!! You'd have to get used to weightlessness but it would be exciting.



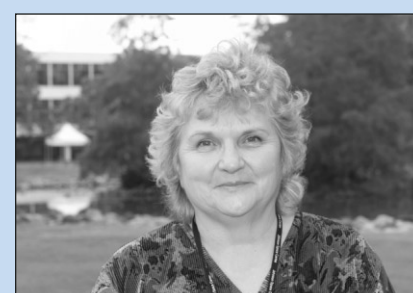
Daryl Ethington
Lockheed Martin
Documentation and Control Section Manager

I was always fascinated by space, that's why I am here. I'd take that [opportunity] in a minute! One of the neatest things about it would be that it would put a good perspective on life with regards to the universe and seeing the size of it.



Ron Lockett
United Space Alliance
ISS Flight Controller

Yes! Definitely! Because it would be a challenge. It's something that is unique and I would be one of the only people in the world who could do it. Just being the first crew of an international space station of that caliber and of that size would be an amazing experience.



Carol Hiding
Futron
Technical Editor/Graphic Designer

Absolutely, I would do it. It would be the ultimate new experience. I make it a point to do something new every year. Last year it was snorkeling. Just being in space and looking out to see the universe would be incredible – just the wonder of it.

JSC Photos by Robert Markowitz

Native American Month Observance set

Dancers from the American Indian Resource Center will perform from 11 a.m. to 1 p.m. on November 8 in the Bldg. 3 cafeteria as part of JSC's Native American Month Observance.

The dancers represent many facets of the American Indian community, from Creeks to Huastecas, from Apaches to Cherokees. The presentation is designed to demonstrate the beauty and dignity of American Indian culture, as well as to inform the audience about contemporary Native American life.

The American Indian Resource Center exists to educate the Native American and non-native communities about contemporary American Indian issues. Through lectures, cultural presentations, ceremonies, and direct action, the organization works to establish better communications between individuals and groups. Its goal is to improve the self-esteem and educational achievement of Indian youth as they interact with the larger non-Indian world. ■

PEOPLE on the **MOVE****Human Resources reports the following personnel changes:****Key Personnel Assignments**

Richard Slater was selected as chief, Imaging Science Branch, Information and Imaging Sciences Division, Information Systems Directorate.

Vincent Johnson was selected as assistant chief, Logistics Division, Center Operations Directorate.

Joe Rogers was selected as chief, Structures and Dynamics Branch, Structures and Mechanics Division, Engineering Directorate.

Rhonda Moore was named deputy chief, Manufacturing, Materials, and Process Technology Division, Engineering Directorate.

Jim LeBlanc was named manager, Biomedical Hardware Development and Engineering Office, Engineering Directorate.

James Ratliff was named deputy manager, Biomedical Hardware Development and Engineering Office, Engineering Directorate.

Additions to the Workforce

Edward Schneider joins the Flight Operations Branch, Aircraft Operations Division, Flight Crew Operations Directorate, as an aerospace engineer and pilot.

Marc Abadie joins the Ascent/Descent Dynamics Branch, Flight Design and Dynamics Division, Mission Operations Directorate, as a trajectory analyst.

Kirt Costello joins the Systems Training Branch, Space Flight Training Division, Mission Operations Directorate, as an instructor.

John McBrine joins the International Training Integration Branch, Space Flight Training Division, Mission Operations Directorate, as the deputy director of operations, Russia.

Timothy Crain joins the Advanced Mission Design Branch, Aeronautics and Flight Mechanics Division, Engineering Directorate, as an aerospace engineer.

Robert Ambrose joins the Flight Robotic Systems Branch, Automation, Robotics, and Simulation Division, Engineering Directorate, as a computer engineer.

Robert Hirsh joins the Intelligent Systems Branch, Automation, Robotics, and Simulation Division, Engineering Directorate, as an aerospace engineer.

Diana Barber joins the Flight Software Branch, Avionic Systems Division, Engineering Directorate, as a computer engineer.

Anthony Wong joins the Avionics Test and Analysis Branch, Avionic Systems Division, Engineering Directorate, as an electronics engineer.

Joshua Gibson joins the Manufacturing Integration and Technology Branch, Manufacturing, Materials, and Process Technology Division, Engineering Directorate, as a materials engineer.

Daniel Londa joins the International Elements and Operations Assurance Branch, Space Station Division, Safety,

Reliability, and Quality Assurance Office, as an aerospace engineer.

Brian Dyer joins the Sustaining Engineering Office, Vehicle Office, International Space Station Program, as a Mission Evaluation Room manager.

David Mittlefehldt joins the Planetary Science Branch, Earth Science and Solar System Exploration Division, Space and Life Sciences Directorate, as a space scientist.

David Forrest joins the Engineering Management Office, Space Operations Management Office, as a systems engineer.

Promotions

Lucy Ruiz was selected as the secretary for the center's chief engineer.

Silvia Molano was selected as a personnel staffing specialist in the Human Resources Office.

Susi Rendon was selected as the secretary for the assistant director for university research and affairs.

Kim Brennan was selected as a financial management specialist in the Cost Accounting, Reporting, and Property Branch, Financial Management Division, Office of the Chief Financial Officer.

Bridget Broussard-Guidry was selected as a financial management specialist in the Financial Services Branch, Financial Management Division, Office of the Chief Financial Officer.

T. A. Lile was selected as a financial management specialist in the Financial Services Branch, Financial Management Division, Office of the Chief Financial Officer.

Gretchen Mendez was selected as a financial management specialist in the Financial Services Branch, Financial Management Division, Office of the Chief Financial Officer.

Reassignments to Other Directorates

John Fields moves from the Safety, Reliability, and Quality Assurance Office to the Mission Operations Directorate.

Barry Boswell moves from the International Space Station Program to the Engineering Directorate.

Terry Gobert moves from the Mission Operations Directorate to the Safety, Reliability, and Quality Assurance Office.

Retirements

Thomas Krenek of the Office of Procurement.

Gerald Griffith of the Flight Crew Operations Directorate.

Paul Coan of the Information Systems Directorate.

Bob Alexander of the International Space Station Program.

Bill Bates of the International Space Station Program.

Resignations

Mae Mangieri of the Human Resources Office.

Sidney Clinton of the Office of Procurement.

Debra Bailey of the Mission Operations Directorate.

Raymond Reynaud of the Safety, Reliability, and Quality Assurance Office.

Denise Baisden of the Space and Life Sciences Directorate.

NASA BRIEFS**NOBEL LAUREATE APPOINTED SENIOR NASA ADVISOR**

NASA Administrator Daniel S. Goldin has named Dr. Baruch Blumberg, director of NASA's Astrobiology Institute and winner of the 1976 Nobel Prize for Physiology or Medicine, as senior advisor to the Administrator.

As senior advisor, Blumberg will provide guidance for NASA's newly created enterprise, the Office of Biological and Physical Research, in its efforts to develop an interdisciplinary research program focused on biology, bringing together physics, chemistry, biology and engineering. Blumberg also will continue in his role as director of the Astrobiology Institute.

"Dr. Blumberg's commitment to science is only exceeded by his commitment to excellence. NASA and the American taxpayers will greatly benefit from his contributions to the space program," said Goldin. "His many contributions to the fields of human biology, infectious disease and genomics will help lay the foundation needed to integrate biological research and technology throughout NASA. I am delighted that he has agreed to accept this position."

NASA will begin an immediate national search to fill key positions within the new enterprise as well as the Associate Administrator vacancy. NASA Chief Scientist Dr. Kathie L. Olsen, along with Blumberg, will lead the search team to fill key opportunities within the enterprise. Olsen will continue to serve as acting Associate Administrator until a replacement is named.

"The enterprise was restructured to strengthen the agency's ability to meet the challenges brought about by the growth in areas such as molecular biology, nanotechnology, information technology and genomics," said Olsen.

"NASA science is filled with discoveries of phenomena never seen before. This new enterprise will strengthen our ties with academia and other federal agencies to enlist their creative energies towards these discoveries," said Blumberg.

Blumberg received a medical degree from Columbia University and a doctorate in biochemistry from Oxford University. For more than 35 years, he has been associated with the Fox Chase Cancer Center, Philadelphia, PA, and is a professor of medicine and anthropology at the University of Pennsylvania. He was Master of Balliol College in Oxford, England, between 1989 and 1994, and has taught human biology at Stanford University. Since his discovery of the hepatitis B vaccine and its widespread availability in 1982, the number of people infected with the disease worldwide has fallen dramatically.

TENNESSEE FIRM SELECTED FOR \$300 MILLION CONTRACT

Sverdrup Technology, Inc. of Tullahoma, TN, has been selected to provide engineering, science and technical services at NASA's Marshall Space Flight Center in Huntsville, Alabama.

The contract, which became effective October 15, includes a two-year performance period plus three one-year priced options. The contract has a potential value of \$300 million over five years.

Under the contract, Sverdrup will provide engineering, scientific and technical services to Marshall's Engineering, Flight Projects, Science and Space Transportation Directorates; Systems Management Office; Space Shuttle Projects Office; and the Office of the Chief Financial Officer.

Technical services will support the space shuttle, advanced space transportation vehicles, the International Space Station, and ground and space scientific research.

Marshall is NASA's lead Center for development of space transportation and propulsion systems. Marshall is also NASA's leader in microgravity research.

TICKET WINDOW**The following discount tickets are available at the Exchange Stores**

Sony Loew's Theaters	\$5.50
AMC Theaters	\$5.00
Astroworld	1 day \$21.00
Moody Gardens (2 events) (does not include Aquarium Pyramid)	\$10.75
Moody Gardens (Aquarium only)	\$9.25
Space Center Houston	adult \$11.00 child (age 4-11) \$7.25 (JSC civil service employees free.)
Space Center Houston annual pass	\$18.75
Postage Stamps (book of 20)	\$6.60
September 30 - November 14	
Texas Renaissance Festival	adult \$16.00 child (age 5-12) \$6.50
Entertainment Books	\$20.00
Franklin Planner Refills (Classic Style)	\$25.50
Franklin Planner Refills (Seasons and Montecello)	\$30.25
Holiday Gift Wrap available November 15 to December 15	

Check out our new website on the JSC People page at: <http://hro.jsc.nasa.gov/giftshop/>

Exchange Store hours

Monday-Friday
Bldg. 3 7 a.m.-4 p.m.
Bldg. 11 9 a.m.-3 p.m.

- All tickets are nonrefundable.
- Metro tokens and value cards are available.
- Sweetwater Pecans \$6.25 per lb.
- Chocolate-covered Pecans \$8.00 per lb.

For additional information, please call x35350.

Please bring your driver's license to pay by personal check.

SPACE CENTER Roundup

The Roundup is an official publication of the National Aeronautics and Space Administration, Johnson Space Center, Houston, Texas, and is published by the Public Affairs Office for all space center employees. The Roundup office is in Bldg. 2, Rm. 181. The mail code is AP3. The main telephone number is x38648, and the fax is x32000. Electronic mail messages may be directed to:

Editor William Jeffs william.p.jeffs@jsc.nasa.gov
Assistant Editor Nicole Cloutier nicole.cloutier1@jsc.nasa.gov

**PRSR STD
U.S. POSTAGE
PAID**

WEBSTER, TX
Permit No. G27