

Parting advice

NASA Administrator Richard Truly discusses NASA's accomplishments and the challenges ahead. Story on Page 3.



Cab cuts

JSC's taxi service won't be going to and from many of the off-site facilities it used to visit. Story on Page 4.

Space News Roundup

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No. 10

Pioneer marks two decades of exploration

Pioneer 10 marked 20 years of exploring space Monday as it continued to make new discoveries about the limits of our solar system.

When ground controllers celebrated its anniversary, the NASA spacecraft was exactly 5 billion miles from Earth and the most distant human-made object in history.

Eight of the spacecraft's 12 instruments continue to function well.

Pioneer 10 was first to pass beyond all the planets in 1983 at almost 3 billion miles from the Sun.

The 570-pound spacecraft now is characterizing the farthest-out regions yet reached, the boundaries

of the Sun's extended atmosphere, the heliosphere. The heliosphere is the magnetic bubble of ionized gas in the interstellar medium that contains the Sun and planets. The Sun is the only star we can study "close-up." Hence, scientists are closely watching current Pioneer data.

"If we're lucky," commented Pioneer high-energy particle experimenter James Van Allen, "we may break out of the heliosphere into the interstellar gas before we lose contact with Pioneer around the year 2000. This would be the first direct measurement of true interstellar space."

Van Allen discovered the Earth's radiation belts, which bear his name.

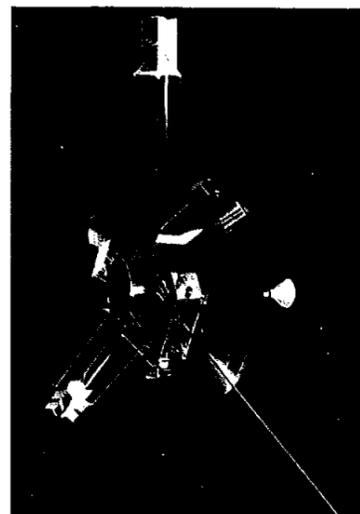
"Data may stop arriving around the year 2000 because of shrinking power from Pioneer's nuclear-electric generators plus its ever-increasing distance," said Richard Fimmel, Pioneer project manager at Ames Research Center.

Pioneer is now so distant that at the speed of light, its radio signal takes 15 hours to cover the round trip 10 billion miles from Earth to spacecraft and back. When the 8-watt radio signal (power of a night light) reaches the three incredibly sensitive, football-field-sized dish

antennas of NASA's Deep Space Network, it has the power of 4.2 billionths of a trillionth of a watt. If you collected this energy for 56 billion years it could light an 8-watt Christmas tree light for one 1,000th of one second, says Fimmel.

The spacecraft also is a unique instrument for attempting the first detection of gravity waves at the huge wavelengths possible with Pioneer distances. Gravity waves were predicted by Einstein.

Pioneer experimenters also are using planetary gravity effects on the spacecraft to seek a possible 10th planet.



Income tax withholding going down

Employees will see a few extra dollars in their paychecks starting this month, but the extra money doesn't mean lower taxes — just lower withholding.

The changes to the income tax withholding tables, which federal employees will see first in the March 17 check, reduce the income tax withholding — thus increasing take-home pay — for most low- and middle-income workers.

Over the next year, employees using the married rate may see as much as \$345 more in their annual take-home pay while those using the single rate could see up to \$172 more.

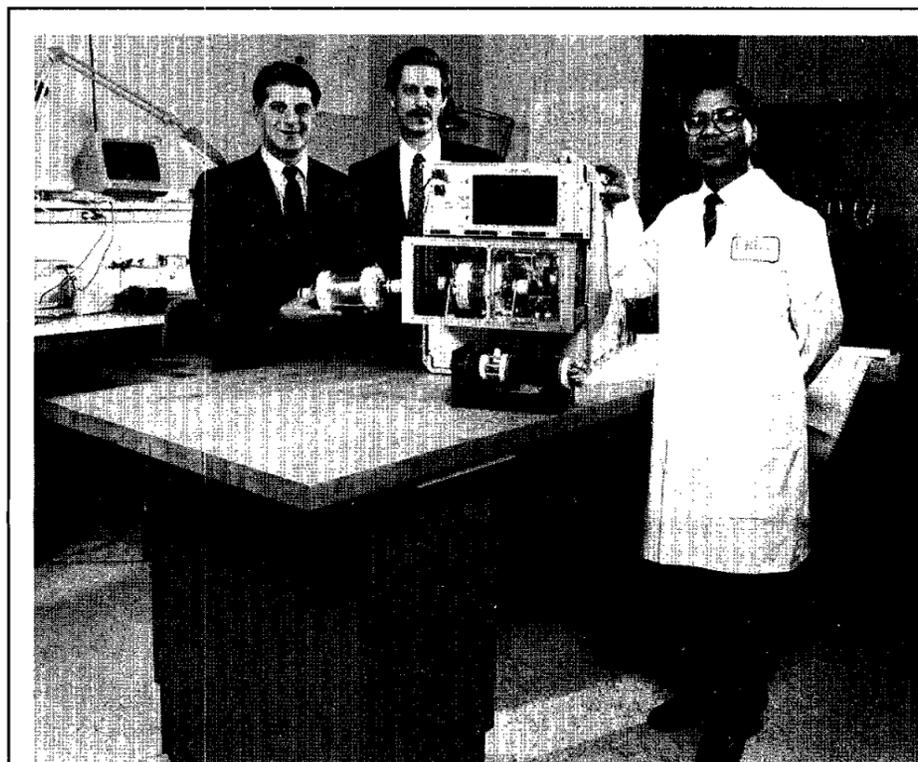
Those in the high income bracket will not be affected by the new tables. Individuals withheld at the married rate, with wages subject to withholdings of \$90,200 or more, and those withheld at the single rate, with wages subject to withholding of \$53,200 or more, will see no change.

The changes probably will affect income tax refunds in 1993. Those receiving refunds this year could see a smaller refund or could owe money next year. The Internal Revenue Service plans to notify any employee likely to owe money in 1993 because of this change to suggest adjustments in the withholding later this year.

The IRS will not penalize any individual under withheld for 1992 because of these rules.

Those who do not want their biweekly withholding to change should submit a new W-4 form claiming the same number of allowances but indicating on line 6 that an additional amount be withheld.

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JSC's David Wolf, Ray Schwarz and Tinh Trinh, from left, show off their invention — the rotating wall bioreactor — that earned them the title of NASA Inventors of the Year.

Bioreactor team Inventor of Year

By Kari Fluegel

Not many would expect an agency known for shuttle launches and Moon expeditions to make extraordinary contributions to medical research, but a biotechnology team in the Medical Sciences Division has, earning the honor of NASA Inventor of the Year.

JSC's David Wolf, Ray Schwarz and Tinh Trinh recently were selected by NASA's Office of General Counsel as 1991 Inventors of the Year for the development and design of a new class of horizontally rotating tissue culture systems, also known as the rotating wall bioreactor, that simulate microgravity.

Bioreactors are devices in which cells and tissues are grown or cultured for research

purposes.

Investigators around the country already have used the JSC bioreactor to pioneer research in lung tissue, skin growth, intestinal disease, cartilage growth and colon cancer and brain tumor growth and therapeutics.

"This is a good example of when NASA research benefits man on Earth," Wolf said.

Covered by Patent No. 4,988,623, the bioreactor cultures cells in a horizontal cylinder that slowly rotates emulating the way they could be suspended in such a mixture in space.

Prior to the development of JSC's bioreactor, three-dimensional tissue growth could

Please see **BIOREACTOR**, Page 4

Atlantis gets full tanks for maneuvers

By James Hartsfield

Technicians spent the week fueling *Atlantis'* orbital propulsion systems as preparations for STS-45 moved into the home stretch at Launch Pad 39A.

Shuttle managers plan to meet Tuesday at Kennedy Space Center for the flight readiness review. At the conclusion of that meeting, managers are expected to announce an official launch date for STS-45, now targeted for March 23. With a March 23 launch date, *Atlantis* would aim for a 7:01 a.m. CST liftoff.

The crew — Commander Charlie Bolden, Pilot Brian Duffy, Mission Specialists Kathy Sullivan, Mike Foale and Dave Leestma, and Payload Specialists Dirk Frimout and Byron Lichtenberg — participated in a long-duration simulation of the flight Tuesday and Wednesday, working with the flight control team at JSC and the payload control team at Marshall Space Flight Center.

Workers also filled the tanks of *Atlantis'* three auxiliary power units that supply the power to operate the spacecraft's hydraulic systems. Two APUs, installed in *Atlantis* last week, were test run Thursday.

The launch pad was closed to all non-essential personnel for much of the week for the various fueling operations involving hypergolic propellants, two chemicals that ignite on contact when the orbital propulsion systems are fired, and hydrazine for the APUs.

Atlantis' orbital maneuvering thrusters will get a workout on STS-45, as some 180 maneuvers are planned to point the shuttle's payload bay instrument package in the direction of the observations to be made by the Atmospheric Laboratory for Applications and Science (ATLAS-1) instruments. ATLAS-1 is the first of a series of annual missions to study the Earth, its atmosphere and their relationship with the Sun as scientists seek a better understanding of global climate changes.

Pre-mission science briefings will be broadcast live from Marshall on NASA Select television beginning at

Please see **ENDEAVOUR**, Page 4



Do your homework before choosing a product

JSC's Procurement Support Division promotes open competition in federal purchases

JSC employees who want to buy things or services for the government were urged this week to make sure they have made a thorough search of the marketplace before they commit to a particular product.

The Procurement Support Division issued a reminder Monday that JSC is required to promote and increase full and open competition in federal procurements under the Competition in Contracting Act.

"What it really says is go out and do your homework before you decide that a given vendor's product

meets your requirements," said Procurement Support Division Chief John Thiel.

"The pitfall we're trying to avoid is people reading someone's product description in a magazine and deciding that's what they need and ordering that specific product. The marketplace offers all kinds of opportunities for competition, and that's what we're after."

The development of ongoing market search techniques is being stressed, Thiel said. The Federal Acquisition Regulation requires

agencies to conduct market surveys to ascertain whether other qualified sources capable of satisfying the government's requirements exist.

Anyone who initiates a purchase request should perform some form of market survey before initiating any acquisition of \$25,000 or more, Thiel said. Such a survey may include contacts with knowledgeable experts regarding similar requirements, analyses of recent market tests or formal sources-sought synopses.

A sources-sought synopsis is

one effective method of market research and should be used for all planned noncompetitive procurements. A sources-sought synopsis is an advanced announcement published in Commerce Business Daily that describes the requirements and requests responses from potential providers. It should be used to locate additional sources and to determine if a proposed procurement is truly limited to a single source.

As soon as a new requirement is sufficiently defined, Thiel said, the

initiator should provide the appropriate procurement branch chief with draft language for a synopsis. The information that procurement will be looking for includes a description of the item or work required, the delivery or performance schedule, and identification of any parts that only one source can perform.

The contracting officer will prepare the synopsis, Thiel said, but initiators must work closely with procurement to provide the necessary information.

The Road Less Traveled

NASA's administrator shares his thoughts on the accomplishments of the agency and on the challenges that lie before it



[Editor's note: This following are excerpts from a speech delivered by NASA Administrator Richard H. Truly to the National Space Club on Feb. 24, 1992.]

By Richard H. Truly

I joined NASA on a blistering hot August day in 1969, at the Manned Spacecraft Center in Houston. I was 31 years old at the time, but I did come with some experience — almost five years as a military astronaut, test pilot training by Chuck Yeager, a Navy carrier fighter tour under my belt and, as a matter of fact, the youngest and only remaining member of the first selected manned orbiting laboratory group of astronauts.

Imagine how I felt as I joined an organization like NASA. I actually arrived between Apollo 11 and Apollo 12. Only a month before, Neil Armstrong and Buzz Aldrin had set foot on the Moon, the event that the 20th Century — probably this 1,000 years — will be remembered for. The first brilliant step of the dreams of humans, since the ancients looked up at the star canopy above, had been achieved!

It was the very epitome of opportunities in a dreary decade of an unpopular war, presidential assassinations and racial violence on the streets of our beloved land.

Yet, even then, the Apollo that I remember was not easy, was not quick, was not free of risk, and was very much criticized until the final glory was achieved. Frankly, it was like the space program of today — a tough, risky job, filled with ambitions and political realities; successes and failures; blood and kisses; and wonderful, smart gutsy people!

From the day I joined up, NASA was the toast of the nation. It turned dreams into realities. NASA symbolized quality, reliability and excellence.

And then, early in 1986 — *Challenger* — a tragedy with an impact felt throughout the world. Within NASA, it took only seconds not only to lose seven good friends, but a reputation that took 28 years to build. NASA no longer was the paragon of excellence, and the second guessers moved in.

When the call came from the White House for me to come back and supervise the repair of the shuttle program, I wanted to refuse, but I simply could not — NASA was too important. I returned Feb. 20, 1986 — six years ago last week.

I thought my job was to discover the cause, fix it, ensure future safety and reliability, and return the space shuttle to safe flight. I quickly discovered, however, that I was embroiled in politics, budgets and critical reexamination of NASA, all surrounded by a media zoo.

Two- and one-half years later, we met those technical milestones. Rick Hauck and the crew of STS-26 flew the return to flight mission in September 1988, and they were met on that desert lake bed by Vice President Bush, the late Jim Fletcher, and me. Two months later George Bush was elected president. And in July 1989, I was honored to become NASA's eighth administrator. My tour will end April 1.

These have been tough, exhausting, challenging and exhilarating years; years during which I have met and gained innumerable new friends who have given me unbelievable support; and years for which I am awfully proud. I have learned much in Washington — on the other hand, I'm not sure where I could ever apply it.

As I speak to you today, NASA has never been busier or more productive. We are, in fact, far better off than in pre-*Challenger* days. On the average, we have flown every other month since Rick Hauck landed on that lake bed.

The discoveries of the past 3 1/2 years in space astronomy and physics are revolutionizing our concept of the universe and challenging hallowed theories.

Life sciences has come to life, as it must to support human solar system exploration. We learned more about humans in space in two recent Spacelab missions than in our previous 34 years.

Having completed our initial visit throughout the solar system, we have begun the planetary phase two, to station long-duration observers at the most important places in the solar system to deepen our knowledge of origin and evolution and processes.

Space Station *Freedom* is on track and is making rapid progress. Thanks to your help, it survived in a brutal challenge last year, when the majority of members of the House voted to keep "The Dream Alive" and restore funding. The Senate followed suit. On both floors, members refused to abandon American leadership in space.

Are we out of the woods with station? No, not by a long shot! This year will be another difficult year. But after last year's budget battle, I am convinced the team is conditioned to go the distance and win the fight. It's too important for our children not to develop Space Station *Freedom*.

Fortunately, we have done our technical job well, and we are blessed with strong supporters in key places on the Hill and in the White House. Naturally, I'll be watching the fourth quarter this year from the stands, but I believe today that station is in much better shape this year.

NASA's aeronautics research program is in excellent shape. We have begun critical technology work that will lead to a high-speed civil transport devoid of pollution and noise problems, and important research on subsonic transports is under way. We are making significant strides in NASP (National AeroSpace Plane) technology despite the budget squeeze. Our continuing programs to make flight safer, improve performance and reduce cost continue unabated. Our aeronautics research tools are the best in the world.

No American industry does better in the world than our aircraft industry. NASA's work is an investment in continued leadership.

In the past few years, it has become clear that NASA must play a much expanded role to provide information if policy makers are to make sound decisions to protect the world's environment without wrecking its economy. Only space provides a global perspective of interactive Earth systems. NASA must lead this global research effort, which we call "Mission to Planet Earth."

I have tried to stimulate commercial activity in space, and technology transfer to private industry, in the past three years. Today there are 17 NASA centers for the commercial development of America's largest — are allied with these centers. They sponsor lively programs of space research in materials, pharmaceutical and other areas with high commercial potential.

We have also initiated unique programs to procure launch services, additional middeck lockers and data from commercial vendors.

That's where we stand today. Now, where are we going in the future? What are our challenges that lie ahead?

I say "we" because we are a team — the people in NASA, in other parts of the executive branch, on the Hill, in the media, in the professional organizations and think tanks, in the factories and corporate headquarters, in university halls and laboratories.

The health of America's space and aeronautics programs is not in the hands of any individual. Without teamwork, the space program is nothing.

The first challenge is to maintain the thrust of the programs in space science, aeronautics, the environment, human space flight and commercial development I have just spoken about — this is the balance that you have watched me fight Goliath for.

It is vital to remember that these programs are not just fancies of the moment. They are deeply rooted in our national fabric and codified in National Space Policies. They have been reviewed and approved by numerous Presidents and Congresses. They have been studied and reaffirmed by important commissions and advisory groups. They are bipartisan,

national and international in scope, and span a diversified range of disciplines and technical arenas.

They are the product of broad and knowledgeable consensus. They are carefully planned so new initiatives will capitalize on previous discoveries and successes.

Executing these programs, NASA knows precisely where it is headed. We put it all down on paper recently in a strategic plan we call *Vision 21*. It is not a budget document — not tactics — it is strategy. It should not become another item in a debate. We have debated long enough about goals and methods. It is time to spend our energy on action.

The next challenge is directed to NASA and its contractors. It is the challenge of continuous improvement. Common sense tells us that perfection is impossible. But if anyone has to strive for perfection, it is NASA.

Our job is maximum return for the taxpayer's investment. Therefore, continuous improvement must be part of the NASA team character and culture. We must work continuously to understand technical complexity and front-end risk, and actively seek innovation. Remember, we are a symbol of American technological competence.

But while doing this, we cannot and will not compromise safety and reliability. To unacceptably increase risk in order to save money is stupid, and the money saved is fool's gold.

The third challenge is to restore genuine public enthusiasm for the space program to make it a

national priority and, therefore, a budget priority. Here, the President must lead, as President Bush has in the past three years. And here again, the President, the Vice President, and the new Administrator must form a team with the bipartisan congressional leadership. The cheap shots must

end. Without teamwork, there is nothing.

We must push ahead, at whatever pace, on the President's goal of resumed human exploration of the solar system. Simultaneously, we must show its relevance to the pressing national concerns of today — economic competitiveness, education, health care and the environment.

It is not merely the adventure symbolized by the Moon or Mars, or the satisfying of some human imperative to explore that drives this challenge. It also is the way to an exponential leap in knowledge about the origins and evolution of our solar system and perhaps even life itself. Furthermore, it is a way to refuel our post-cold war research and technology engine to do battle in the world marketplace.

As we prepare ourselves to start a new century, and to create a new world order, such a mission would strengthen the ties with our foreign partners, stimulate our economy, enhance our competitive posture, stimulate and challenge our youth and rekindle public support and enthusiasm.

As we engage in a national debate over national priorities, I urge that the White House and Congress seriously consider a realignment of federal spending that would commit even more resources to civil research and development activities such as space exploration. The space program is not a job program, but it is about jobs — scientist, engineers and technicians — the kinds of occupations that inspire all of us, and build communities.

More than ever, on this very day, the space program needs high-level support to articulate goals, forge national support, and win resources.

As we move into the 1993 budget deliberation, our space program is in jeopardy. Attention is focusing on the economy, tax plans, defense spending, education, health care and the environment. A status quo budget would be a serious blow to the nation's space program, and it is

not helped by what passes in this town for analysis, often utterly devoid of political or fiscal reality. Increased funding is a must if we are to maintain a balanced and diversified leadership program.

So, Mr. President and Mr. Majority Leader, and Mr. Speaker, we need your good help more than ever. We need all segments to speak with a common, unified voice on behalf of America's space program. We need all parties to stop sniping, and open their minds to the value and return of our investment in space. Our space program is as American as apple pie, Jack Kennedy, Lyndon Johnson, Ronald Reagan and George Bush. We can build on that. Is this help too much to ask in an election year? No, it is exactly what needs to be asked and, as a team, we are asking it!

There is no greater repository of space experience or of space technical expertise than in NASA. NASA is not bureaucratically hidebound. NASA is filled with ambitious, creative and highly motivated people.

The last significant challenge is the most immediate. It is to provide the financial resources and support required to maintain momentum and American leadership in space. The signal that we have been receiving from the Hill is that we are not likely to get the money we are requesting for fiscal 1993 due to budget constraints and competing priorities.

To the members of Congress and their staffs who are here today, there's no doubt this is going to be a very difficult summer. There will be intense demands for resources for every manner of legitimate need — medical care, road repair, veteran's needs, housing, and tax relief.

I urge you not to let these near-term concerns overshadow your view of the dire financial position of America's long-term investment in the space program. We have pared, cut, slowed down and eliminated to the bone. Without the funds we have requested in fiscal '93, we will cut deep and into real muscle. Today, we have the world's best space program. We will be jeopardizing America's leadership of the exploration of space. We will, in fact, be undermining our children's future.

In these difficult times, I ask you to put national over regional objectives, national over personal goals. I ask you to defend the NASA budget and the NASA vision. We need you.

And for every one of you at this luncheon, after it's done, my advise is get out of your seats and get off your duff! Support the balance of this magnificent American endeavor. If you don't, you have no one to blame but yourself.

Well, now it is time to close this chapter, and I want to leave you with a couple of thoughts. First, give the new administrator your best advice and support; but don't whisper your thoughts into the ear of your favorite Washington armchair analyst — just talk to him or her directly — that's team-building, and it shows character on your part, too. And, remember my football coach friend who said, "If you've got advice for me, give it to me on Saturday afternoon, in the 25 seconds between plays. Don't give it to me Monday. On Monday, I know all the answers."

Next, and most important, remember: There is no better expression of American character than our exploration of space. People from other countries look at what we have achieved and the goals we intend to pursue there, and acknowledge that here is where you go to really understand Americans.

And what do they find when they dissect us and look for the essence? What do they find in the character that is shared by a polyglot of people of all races, colors, creeds and cultures?

What they find is this: energy, a can-do spirit, a sense of adventure, an attraction to young people, technological literacy, altruism, optimism, a compelling curiosity, and a great capacity for wonder and awe.

All of that is summed up in America's space program and in that community of people charge with carrying it out — the NASA/industry team.

To quote Robert Frost one final time:

"Two roads diverged in a wood, and I took the road less traveled, and that has made all the difference." □



'The health of America's space and aeronautics programs is not in the hands of any individual. Without teamwork, the space program is nothing.'

— NASA Administrator
Richard H. Truly

Bearingless helicopter rotor may improve safety, efficiency

NASA is conducting wind tunnel tests of a new bearingless rotor system that promises to be a significant advance in helicopter technology.

The rotor system, developed by McDonnell Douglas Helicopter Co., Mesa, Ariz., eliminates the hinges and bearings that usually connect the blades to the rotor shaft. The rotor blades and their link to the rotor shaft are the keys to the innovative system. The blades have advanced airfoils and are made of high strength composites.

The technology is expected to have

many benefits, including better maintenance and lower fuel use.

"The new rotor system would allow for faster, more agile, more cost effective and safer helicopters," said Steve Jacklin, Project Manager for the wind tunnel tests at NASA's Ames Research Center.

The tests in Ames' 40-by-80-foot wind tunnel will evaluate the rotor concept and will gather data to help develop computer programs needed to design a new generation of bearingless rotors.

Standard helicopter blades have

hinges and bearings that let the rotors flap up and down, move back and forth and twist. A helicopter needs these motions to fly, but the hinges and bearings are complex and difficult to maintain and cause aerodynamic drag that increases fuel use.

The new rotor system being tested mimics the hinges with a flexible elastic attachment that needs no bearings and can be made aerodynamically smooth. The system has far fewer moving parts, yet it allows the necessary blade motions.

"Bearingless rotor systems promise

to reduce maintenance rates, improve safety, and improve helicopter cost efficiency by having fewer moving parts and using stronger, lighter materials," Jacklin explained.

Under an agreement between NASA and McDonnell Douglas, the rotor system will be evaluated for an initial 10-week run. A second series of tunnel tests is planned for early 1993.

"This is a landmark case — a major step for us to enter with NASA and Ames Research Center to test our new advanced technology," said Dean Borgman, president of

McDonnell Douglas Helicopter Co.

Test data will remain proprietary to McDonnell Douglas for one year after the wind tunnel tests according to terms of the agreement, but NASA researchers will have access to the data for advanced rotor craft research — one of NASA's national aeronautics goals.

The rotor blade system will be installed on a test stand made by McDonnell Douglas. Ames will provide a 1,500-horsepower motor to turn the rotor and will supply the test personnel and instruments.



JSC Photo by Benny Benavides

STS-45 crew members Dirk Frimout, Charlie Bolden, Mike Foale and Kathy Sullivan, from left, inspect a bar code reader they will use to log their food and drink intake and exercise as part of Detailed Supplementary Objective 612. Krug International hardware integration engineer Lorraine Benavides points out an element of the reader to Frimout as Krug's Janie Scarlett, far right, and Boeing's Chris Fredericksen look on during the bench review of flight equipment.

Endeavour may be rolled over today

(Continued from Page 1)
8:30 a.m. today. The briefings will feature mission science managers and principal investigators who will work in Marshall's Payload Operations Control Center during the eight-day flight. Elsewhere at KSC, *Endeavour*

is to be moved to the Vehicle Assembly Bldg. today to be connected to the external fuel tank and solid rockets for STS-45. *Endeavour* will remain in the VAB for about one week, possibly moving to Launch Pad 39B late next week. *Endeavour* was powered down for

the move on Tuesday.

On *Columbia*, technicians installed the left orbital maneuvering system pod and tested the electrical generating system. *Columbia* is being readied for a June launch on the longest shuttle mission ever, STS-50.

Bioreactor team earns NASA Inventor of Year honors

(Continued from Page 1)
not be accomplished. Traditional culture devices allow only two-dimensional growth because cells become damaged by the suspension vessel or do not bond together to organize themselves into actual tissues.

Research with the rotating wall vessel over the past two years, however, has enabled the development of cell cultures that behave more like three-dimensional tissues behave in the human body. In order to behave as they do in the human body, it is necessary that cells recreate the correct three-dimensional relationships as they would in the parent tissue.

Work started on the bioreactor while the shuttle fleet was grounded following the STS-51L accident. Tissue researchers, then unable to have access to space, needed a means to simulate microgravity on Earth, and a pooling of knowledge of

biology with gravitational physics in the areas of fluid dynamics, rotational systems and life support systems was the answer to the question, Wolf said.

It was known that plants developed similarly when exposed to either horizontal rotation or actual microgravity. Coincidentally, Trinh tried rotating a syringe with microcarrier beads in an electric drill. The drill's spinning action suspended the beads in controlled positions, mirroring microgravity.

The team found that just moving the medium inside the vessel wasn't enough. The boundary layer of the medium next to a non-rotating wall added enough sheer stress to damage the culture.

"Rotating the wall takes away the fluid velocity gradients near the vessel walls," Wolf said. "That's the big difference. That's why it works."

The bioreactor also needed to compensate for the orientation changes to a shuttle middeck locker during ascent, orbit and entry.

Eventually several classes of vessels — some batch and some with continuous media perfusion — were constructed including key components of a future Space Bioreactor.

"The Space and Life Sciences Directorate Medical Sciences Division's Biomedical Research and Operations Branch was an ideal place to conduct research, and they provided all the support necessary to make it happen," Wolf said. "A mix of expertise was required including biology, mechanics and computers in order to implement the novel culture system concepts. A space center provides such multidisciplinary talent. That exactly describes the talented biotechnology team at JSC."

Since the rotating wall vessels

were developed, two patents regarding the technology have been issued and six more are pending.

"When the talented people and resources of the space center are applied to virtually any problem, we get spectacular and innovative results," Wolf said.

He added that the outstanding results seen in the Earth-based research is predicted to be enhanced by "orders of magnitude" when the Space Bioreactor vessel is operated in microgravity.

Wolf, now an astronaut scheduled to fly on STS-58 next year, was the manager of the Biotechnology Laboratory when the bioreactor was developed. Trinh is a technician with Krug International and Schwarz, who was formerly with Krug, is now chief engineer of Synthecon Inc., the company with the exclusive license to the bioreactor technology.

University of Texas; and Dr. Red Whittaker of Carnegie Mellon serving as tutors. The event begins at 8 a.m. and will conclude at 4:30 p.m. A luncheon meeting will feature an overview presentation about the exploration initiative. Luncheon cost is \$7, but the workshop is free. Reservations are due Monday.

For more information, contact Mary Stewart at x31724.

JSC's team will share this year's honor with William G. Simpson, Max H. Sharpe and William E. Hill of the Marshall Space Flight Center for "Sprayable Lightweight Ablative Coating." The coating is used on the solid rocket boosters and allows for layering not possible with the previously used material.

Both teams will be honored at NASA Headquarters this month. Wolf, Schwarz and Trinh also are the agency's nominees for the National Inventor of the Year competition conducted by the National Intellectual Property Owners Association and the U.S. Patent and Trademark Office.

"I was thrilled not just for the team but that NASA recognized the technology as important and relevant to further space research," Wolf said.

Last year, Inventor of the Year honors went to JSC's Leo Monford for his docking alignment system.

Ellington AFB plans May reunion

All those who worked at Ellington Air Force Base are invited to participate in the 1992 Ellington AFB Reunion May 29-31 at the Howard Johnson Hobby Airport Lodge.

The reunion committee is planning for the largest gathering ever in commemoration of the 50th anniversary of World War II.

All those who served at Ellington as Air Force, regular or reserves;

the Air National Guard; civilian employees; NASA; and NASA contractors during the 1940s to 1970s are invited to participate.

Events will include a golf tournament May 29, special programs, a tour of "the new Ellington" May 30 and a reunion breakfast May 31.

Cost is \$30 per person and includes a two entree buffet and entertainment.

pay periods in the year.

New W-4 forms should be sent to the Payroll Office, Mail Code LF321. Questions should be directed to the payroll clerks.

Tax withholding changes coming

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The best estimate for that additional amount would be to divide \$345 for married individuals and \$172 for singles by the number of

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

Travel christens computer bulletin board

JSC's Travel Section has created a computer bulletin board that will give government travelers easy access to rates around the world.

The bulletin board, available on the third screen of PROFS, will provide CONUS (continental United States), OCONUS (overseas) and

M&IE rates that government employees are allowed to spend on lodging, meals and incidental expenses when traveling.

Instructions regarding the use of the information are available on the first screen of the board rates. For more information, call x34842.

UHCL offering 'Survival Japanese' course

JSC employees who are looking forward to working with colleagues from Japan on the Spacelab-J shuttle mission or Space Station *Freedom* may want to check out a new offering by the University of Houston-Clear Lake.

"Survival Japanese" is being

offered by the Foreign Language Program from 5:30-7 p.m. Thursdays through April 16 in Bayou Bldg. Rm. 2-506. Classes started March 5.

Tuition is \$98, and the text, "Japanese For Busy People, Part I," is \$19.95. For more information, call 283-3033.