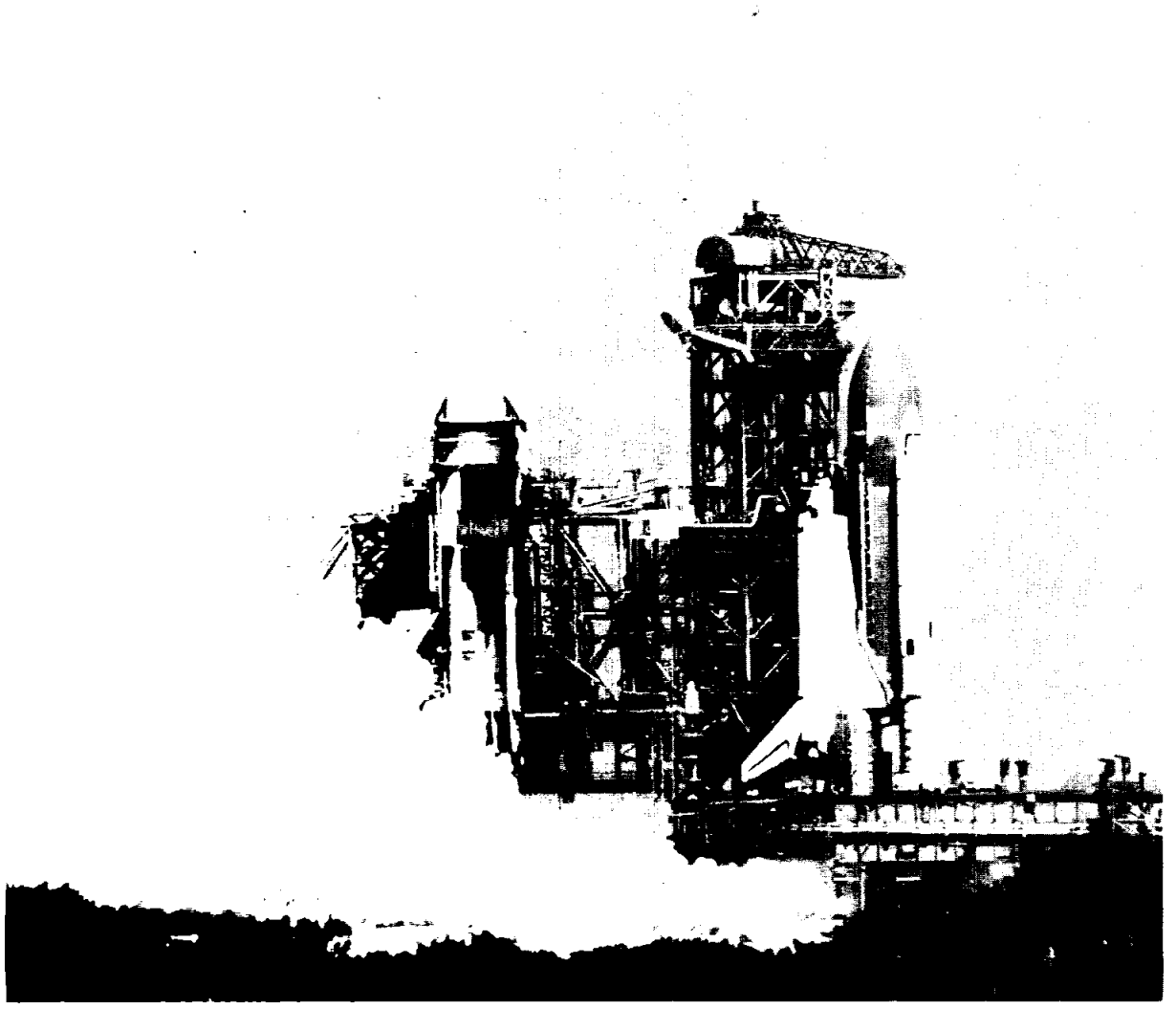
NASA
Lyndon B. Johnson Space Center

Space News Roundup

Vol. 23 No. 11 June 15, 1984 National Aeronautics and Space Administration

Discovery launch date pushed back



Steam billows from the launch pad during the June 2 test firing of *Discovery*'s three main engines. A possible debonded thermal shield liner on Main Engine No. 1 prompted at least a three-day launch delay so the engine could be replaced.

Main Engine No. 1 aboard the Shuttle Orbiter *Discovery* was replaced last week after a minor problem was detected following the Orbiter's Flight Readiness Firing June 2.

The changeout prompted NASA management to reschedule the launch of STS 41-D for no earlier than June 25.

During the inspections which followed that engine demonstration, a boroscope reading showed that a thermal shield liner may have become detached from the fuel preburner combustion chamber. This detachment, technically known as a "debonding," has occurred in previous ground tests. In each case of debond during ground tests, the engine has operated successfully for the planned duration and then been repaired.

The debond itself could have been repaired at Pad 39A, but NASA officials decided to take a conservative approach and replace the entire Engine No. 1 assembly.

Technicians last week also installed the major payloads in the *Discovery* cargo bay and performed the Interface Verification Tests with LEASAT-1 and the Large Format Camera.

Also last week, work continued on the engines, as technicians reinstalled heat shields around the three SSMEs, and conducted a helium signature test for final verification that there are no leaks in the engines or in the Orbiter's main propulsion system.

The 41-D mission will see the maiden flight of *Discovery*, a ship which is slightly lighter and more tolerant of heat loads than her sister ships *Columbia* and *Challenger*.

At the controls will be Commander Henry W. Hartsfield Jr., on his second space flight, and Pilot Michael L. Coats. Also aboard will be the first commercial payload specialist, Charles D. Walker of McDonnell Douglas, to operate the most advanced electrophoresis equipment yet flown.

Mission Specialists Dr. Judy Resnik, Dr. Steve Hawley and Richard Mullane will be charged with deploying the first of four LEASATs, as well as operating the Large Format Camera and the OAST-1 payload.

Discovery, the newest vehicle in the Shuttle fleet, weighs 147,925 pounds unfueled and without payloads aboard. By contrast, *Challenger* weighed 148,633 pounds, inert, before the 41-C Solar Max repair mission. *Columbia* weighed 155,359 pounds before the Spacelab 1 mission during STS-9, her last flight.

Discovery's 708-pound weight savings over *Challenger* results from improvements to her outer thermal protection system and some lighter airframe internal structures. Low-temperature tiles throughout most of the upper wings and fuselage have been replaced with the blanket-like Advanced Flexible Reusable Surface In-

(Continued on page 3)

JSC, UH-CL form R&D Management Center

JSC and the University of Houston-Clear Lake are joining forces to study human performance in space, computer science and the management of advanced technology programs.

A new Research and Development Management Center to be located on the 6,500-student campus next door to JSC will be the focal point of the cooperative effort.

The agreement, which could mean millions of dollars to the University in research funding, was announced last week during the University of Houston System's Board of Regents meeting at UH-Clear Lake by JSC Director Gerald D. Griffin and UH-CL Chancellor Thomas M. Stauffer.

"This agreement is a good example of what can be done when the complimentary strengths of two organizations are merged," Stauffer said.

The joint effort is the result of months of negotiation between JSC and UH-CL task forces set up to assess NASA's needs in the areas of research, development management and human performance in space, according to Dr. Charles Hardwick, UH-CL Provost and Vice Chancellor for Academic Affairs.

"This agreement opens the door for our faculty to work with NASA in the areas of science, technology and business management," he said.

JSC Director of Research and Engineering Aaron Cohen said the new relationship would revolve around mutual cooperation. "As projects come up that we need help on, we will institute studies for the University to work on," he said.

UH-CL and JSC have previously worked together in the areas of computer-assisted education courses for flight controllers, the testing of astronaut candidates and a major research program into a new computer language. UH-CL was awarded a grant in 1983 to study Ada, a proposed new computer language which would unify computer operations throughout the U.S. aerospace community, and could possibly be used in the design and operation of the Space Station.

The new program, however, is the first time the University has entered into a formal contractual agreement with NASA, Hardwick said. A contract for the creation of the new Research and Development Management Center should be signed soon, he added.

The R & D Center's management activities will focus on programs and studies dealing with research and development budgeting, program planning and control, procurement, general management practices and organizational analyses.

Responsibilities in the area of human performance in space will include autogenic training and performance, Space Station human performance and health maintenance.

"The space center," Stauffer said, "is a world-class pacesetter in the development and application of advanced technologies. The University has specific strengths in business administration and computer science, which can give us an edge in working up strategies to manage and market these emerging technologies."

Hardwick, who played a key role in working out the pact, said, "This blend of different talents is likely to be especially beneficial as we move into the age of space commercialization. We are on the brink of developing many lucrative, space-based industries involving drugs, medical research, communications, metallurgy and other ventures — all of which will require astute business management. Business interest in space is building. A survey I read about recently, for example, indicated that 84 companies are interested in carrying out 244 different experiments in space." — *Lynn Parsons*

Crews for 51-H and 61-E announced

The flight crew for Space Shuttle flight 51-H and mission specialist astronauts for mission 61-E were announced last week by NASA.

Veteran astronaut Vance D. Brand will command mission 51-H, scheduled for launch in November 1985, using the orbiter *Atlantis*. Brand was commander of STS-5, the first operational Shuttle flight in November 1982 and mission 41-B, the first use of the manned maneuvering unit in February 1984.

Other members of the 51-H crew are Michael J. Smith, pilot; Robert C. Springer, Dr. Owen K. Garriott and European Space Agency astronaut, Dr. Claude Nicollier, mission specialists; and Dr. Michael L. Lampton and Dr. Byron K. Lichtenberg, payload specialists.

Payload on Flight 51-H will be the Earth Observation Mission-1 (EOM-1), a reflight of nine Spacelab-1 experiments in the areas of space plasma physics, solar physics, atmospheric physics, astronomy and earth observations. A short Spacelab habitable module and a pallet of experiment hardware will occupy the cargo bay.

Launch of 61-E is set for March 1986, with a crew of six on the orbiter *Columbia*. Mission specialists for this mission include Dr. Robert A. R. Parker, David C. Leestma and Dr. Jeffrey A. Hoffman. The cargo will be Intelsat VI-1, a large communications satellite for Intelsat, the multinational communications satellite network, and Astro-1, an astronomy package designed to view Halley's Comet.

The 51-H commander, Brand, 53, a native of Longmont, Colo., came to NASA in 1966. His first space flight was as command module pilot on the July 1975 Apollo-Soyuz Test Project. Smith, 39, is a native of Beaufort, N. C. As a Navy pilot, he served on the aircraft carriers *USS Kitty Hawk* and *USS Saratoga*. He came to NASA in 1980 and this will be his first Shuttle mission.

The 51-H mission specialists include Springer, 42, who was born in St. Louis, Mo., and joined NASA in 1980 after serving as a pilot in the Marine Corps. Garriott, 53, is a veteran astronaut, having logged nearly 70 days in space, including the 59-day Skylab-3 mission in 1973 and the nine-day Spacelab-1 flight in 1983. Garriott has been with NASA since 1965. He was born in Enid, Okla.

Nicollier is a European astronaut flying as a mission specialist with European payloads. A native of Vevey, Switzerland, he is 39 years old. His experience prior to assignment for astronaut training was in astronomy. He is a pilot in the Swiss Air Force Reserve.

Lampton, 43, is a native of Williamsport, Pa. A physicist, he was a backup payload specialist for the Spacelab-1 mission. Lichtenberg, 36, is a biomedical engineer and pilot. A native of Stroudsburg, Pa., he was one of two payload specialists who flew on the Spacelab-1 mission.

Of the 61-E mission specialists, Parker also flew on Spacelab-1, serving as a mission specialist. A native of New York City, the 47-year-old astronomer/astronaut joined NASA in 1967. This will be his second space flight.

Leestma, 35, was born in Muskegon, Mich. A Naval Flight Officer, he was selected as an astronaut candidate in 1980. He also is a crew member on Shuttle flight 41-G, scheduled to fly in October 1984. Hoffman, 39, is a Brooklyn, N. Y., native. A member of the 1978 class of astronauts, he is scheduled to fly Shuttle mission 41-F in August. Hoffman's experience prior to coming to NASA was in high energy astrophysics. — *Steve Nesbitt*

Space News Briefs

U.S. invites Allies to join project

The United States issued a high-level invitation at the Economic Summit in London last week to the leaders of six Western nations to participate in the Space Station Project. President Reagan showed a model of the Space Station to the leaders of Great Britain, France, West Germany, Japan, Italy and Canada. The White House said other countries would have to decide in the next year if they wish to participate, before Phase B definition work on the Space Station gets underway. "Preferred access would be provided to countries making substantial investments in the development stage," a White House fact sheet said. "The benefits of a manned space station are myriad," the fact sheet said. "It will enable extensive commercial use of the space environment by providing capabilities that are not currently available to the private sector. In the longer term, the station could provide the necessary first step for a permanent lunar base, a manned mission to Mars, a manned survey of the asteroids, a manned scientific and communications facility in geosynchronous orbit, or a complex of advanced scientific and industrial facilities in low Earth orbit."

Columbia to remain at Palmdale

The Orbiter *Columbia*, now at Rockwell's Palmdale, California facility undergoing modifications, will remain there until January. The Orbiter, originally scheduled to fly during Mission 41-G this fall, will instead stay in California, where additional modifications will make it more fully operational. Those mods include removal of the ejection seats and escape system and installation of operational seats, installation of a heads up display, modification of the orbital maneuvering system pod structure and plumbing, thermal protection system updates and structural reinforcement. *Columbia's* scheduled delivery date to the Kennedy Space Center is Jan. 31, 1985.

TDRS use reduction planned

Extensive checkout and engineering evaluation of the first Tracking and Data Relay Satellite, TDRS-East, will mean a significant reduction in use of the satellite between now and December. Except in case of emergencies, TDRS will not be used during 41-D and 41-F. Stations in NASA's ground network will be used instead. Since TDRS-East was finally placed in geosynchronous orbit one year ago, traffic with Shuttle missions and other satellite operations has been heavy, and only about one third of the necessary systems checkout and performance evaluations have been conducted. With the need to complete this engineering work between now and the launch of TDRS-B in February of next year, NASA has opted for a usage reduction to get the work accomplished.

Auto technology could be aircraft aid

In something of a reverse case of technology transfer, a study out of the Lewis Research Center says a 50 percent cut in fuel consumption and other benefits for general aviation could come from use of automotive gas turbine research. A common technology transfer story in recent years has been Detroit's use of wind tunnel technology developed by the aeronautics establishment for the design of fuel efficient cars. Now, according to the Lewis study, a concept known as the Regenerative Intercooled Turbine Engine could benefit from recent advances in the development of high temperature ceramics for automotive gas turbine applications. These devices could allow general aviation aircraft engines to operate more efficiently at about half the fuel consumption with the same power rating. The next step in the research process is to upgrade the reliability of the ceramic components for use in aircraft.

Three win scholarships

The sons of three JSC employees were awarded scholarships in May by the NASA Exchange.

The NASA Exchange JSC Scholarships have been awarded each year since 1967. The three young men selected were the 42nd, 43rd and 44th scholarship recipients since that time. The scholarship provides up to $4,000 at up to $1,000 per year for study at any college or university.

The recipients are Mark Chassay, son of Charles Chassay, Payload Integration Manager, Payload Integration Office; Kevin Redding, son of Tony Redding, Project Engineer, Space Station Project Office; and Dan Glebe, son of Don Glebe, Reliability Engineer, Safety Reliability and Quality Assurance Office.

Mark Chassay, a 1984 graduate of Dobie High School, was ranked second in a class of 460 and never earned less than an "A" in any high school subject. Chassay was president of the senior class, co-captain of the football team and an officer in four different clubs. He was active in football, basketball and baseball. He plans to enroll at the University of Texas and major in biomedical engineering.

Mark Chassay

Kevin Redding

Dan Glebe

Kevin Redding, a 1983 graduate of Alvin High School and a freshman at Rice University, was ranked second in a class of 490. He was active in various clubs while at Alvin High and currently has an all-A average at Rice, where he just completed his first year. He plans to pursue a major in biochemistry.

Dan Glebe is a June 1984 graduate of Clear Lake High School. He was ranked seventh in a class of 706 with a 4.3 grade point average. He has won scholastic awards and is active in church youth activities. He plans to enroll at the University of Texas and major in engineering.

There were a total of 42 applicants for the three scholarships. The criteria for selection include academic achievement, school and community activities and financial need. The application period for the 1985 NASA Exchange JSC Scholarships will be announced in February 1985.

Mark to be Chancellor

Dr. Hans M. Mark, NASA Deputy Administrator, will become Chancellor of the University of Texas System effective Sept. 1.

Dr. Mark became Deputy Administrator of NASA in July 1981; previously was Secretary of the Air Force from July 1979 until February 1981; and Under Secretary of the Air Force since 1977.

Mark's appointment was announced during a special meeting of the University of Texas System Board of Regents in Austin.

A nuclear physicist, Mark's career has included a broad range of academic, administrative and research assignments.

In announcing the appointment, Texas Board Chairman Jon Newton said of Mark: "With his Air Force and NASA background, he has demonstrated the management ability to administer effectively a complex organizational enterprise such as the U. T. System, which involves 119,000 students, 50,000 faculty and staff, and an operational budget for Fiscal Year 1984-85 of $1.8 billion. The University of Texas system is a diverse system of universities and health-science institutions, including seven academic campuses, six health-related institutions and the Institute of Texas Cultures.

Mark was born in Mannheim, Germany, June 17, 1929. He came to the United States in 1940, and became a citizen in 1945. He received his bachelor's degree in physics from the University of California at Berkeley in 1951 and his doctorate in physics from the Massachusetts Institute of Technology in 1954.

In February 1969, Mark became director of NASA's Ames Research Center, Mountain View, Calif., where he managed the center's research and applications efforts in aeronautics, space science, life science and space technology.

Mark has served as a consultant to government, industry and business, including the Institute for Defense Analyses and the President's Advisory Group on Science and Technology.

Rockets get new paint job

JSC's Saturn V, Mercury Redstone and Little Joe rockets are steadily taking on a newer look as sandblasting and an estimated 250 gallons of paint reverse what weathering the rocket has endured since going on display here.

The painting process, which began about three months ago, was hampered by rain and cold in the first few weeks, but Paul Speer, Project Manager for the painting contract with Caspan Corp., said the Saturn V should be completely repainted this month.

The first thing done to the Saturn is to clean the surface and sandblast any loose paint away to the metal. Next comes a coat of primer similar to that used on commercial aircraft. After the surface is sanded and primed, it is painted with a polyurethane paint which should last at least eight years, even under the hot Texas sun, Speer said.

The large U.S. flag and the words "United States" which go on the first or S-IC stage will be large decals provided by a subcontractor.

Speer said visitors to the Rocket Park enjoy watching the painters at work and often stop to talk about the space program. The most frequently asked question, he said, is whether the Saturn is "real" or not. The painters tell the visitors it is the only real Saturn V in the world (the Saturns at KSC and MSFC are combinations of flight hardware and mockup equipment), and would have put more Americans on the Moon had the program been extended beyond Apollo.

Speer said this is the most unique painting assignment his company has ever attempted, and that he hopes to have the rocket completed by the start of the summer tourist season. After the Saturn is fully refurbished, the painters will complete work started last week on the Little Joe II and the Mercury Redstone at the Rocket Park.

"After you paint a Saturn, you can paint anything," Speer said.

A workman resembled an astronaut during a spacewalk as he sandblasted JSC's Saturn V recently. (Photo by Chuck Biggs)

Cookin' in the Cafeteria

Week of June 18-22, 1984

Monday: Cream of Celery Soup; Braised Beef Ribs, Chicken a la King, Enchiladas w/Chili, Italian Cutlet (Special); Navy Beans, Brussels Sprouts, Whipped Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday: Beef & Barley Soup; Turkey & Dressing, Country Style Steak, Stuffed Cabbage (Special); Corn Cobbette, Okra & Tomatoes, French Beans.

Wednesday: Seafood Gumbo; Catfish w/Hush Puppies, Roast Pork w/Dressing, Pepper Steak (Special); Broccoli, Macaroni & Cheese, Stewed Tomatoes.

Thursday: Cream of Tomato Soup; Beef Tacos, BBQ Ham Slice, Hungarian Goulash, Chicken Fried Steak (Special); Spinach, Pinto Beans, Beets.

Friday: Seafood Gumbo; Liver & Onions, Deviled Crabs, Roast Beef w/Dressing, Tuna & Noodle Casserole (Special); Whipped Potatoes, Peas, Cauliflower.

Week of June 25-29, 1984

Monday: French Onion Soup; Beef Chop Suey, Smoked Sausage w/German Potato Salad, Breaded Veal Cutlet (Special); Okra & Tomatoes, Green Peas. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday: Split Pea Soup; Salisbury Steak, Shrimp Creole, Fried Chicken (Special); Mixed Vegetables, Beets, Whipped Potatoes.

Wednesday: Seafood Gumbo; Fried Catfish w/Hush Puppies, Braised Beef Rib, BBQ Plate, Weiners & Beans, Shrimp Salad, Stuffed Bell Pepper (Special); Corn O'Brian, Rice, Italian Green Beans.

Thursday: Chicken Noodle Soup; Beef Stroganoff, Turkey & Dressing, BBQ Smoked Link (Special); Lima Beans, Buttered Squash, Spanish Rice.

Friday: Seafood Gumbo; Broiled Turbot, Liver & Onions, Fried Shrimp, Meat Sauce & Spaghetti (Special); Green Beans, Buttered Broccoli, Whipped Potatoes.

★At Building #3
On Wednesday we feature the Reuben: Corned Brisket, Swiss Cheese on a bed of Sauerkraut, Poupon Mustard on Rye and 1/4 Pickle. Delicious.
Monday & Thursday check out our French Dip Sandwich
All you can eat salad bar, only $2.60.

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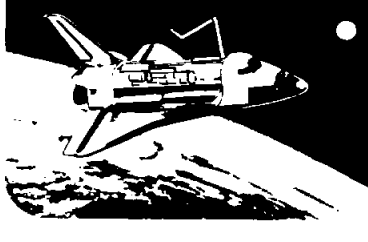

The ***Roundup*** is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for all space center employees. ***Roundup*** deadline is the first Wednesday after publication.

Editor . . . . . Brian Welch
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Reagan points to challenges of space

Editors Note: The following are excerpts from President Reagan's address to the 1984 graduating class of the U.S. Air Force Academy on May 30.

We've only seen the beginning of what a free and courageous people can do. The bold, not the naysayers, will point the way, because history has shown that progress often takes its greatest strides where brave people transform an idea, which is scoffed at by skeptics, into a tangible and important part of everyday life.

Your generation stands on the verge of greater advances than humankind has ever known. America's future will be determined by your dreams and your vision.

And nowhere is this more true than America's next frontier —the vast frontier of space. The Space Age is barely a quarter of a century old. But already we've pushed civilization forward with our advances in science and technology.

Our work on the Space Shuttle gives us routine access to the landscape above us — dropping off payloads, performing experiments and fixing satellites. And I believe we've only touched the edge of possibilities in space. It's time to quicken our pace and reach out to new opportunities. This past January, in my State of the Union Address, I challenged our nation to develop a permanently manned space station, and to do so within a decade. And now we are moving forward with a strategy that will chart the future course of the U.S. space program.

The strategy establishes priorities, provides specific direction for our future efforts, and assigns responsibilities to various government agencies. Above all, America's space strategy offers a balanced program that will best serve the down-to-Earth needs of our own people, and people everywhere.

Our goals are ambitious, yet achievable. They include a permanently manned presence in space for scientific, commercial and industrial purposes; increased international cooperation in civil space activities; expanded private investment and involvement; cost-effective access to space with the Shuttle; and strengthened security and the capability to maintain the peace.

The benefits to be reaped from our work in space literally dazzle the imagination. Together, we can produce rare, life-saving medicines, saving thousands of lives and hundreds of millions of dollars; we can manufacture superchips that improve our competitive position in the world computer market; we can rapidly and efficiently repair defective satellites; we can build space observatories enabling scientists to see out to the edge of the universe; and we can produce special alloys and biological materials that benefit greatly from a zero-gravity environment.

Let me give you one exciting glimpse that illustrates the great potential of how working in space can improve life on Earth. There is a medicine called urokinase which is used to treat victims of pulmonary embolism and heart attacks caused by blood clots. On Earth, this medicine is very difficult and expensive to produce. About 500,000 doses are needed annually, a cost of $500 million. Dr. Robert Jastrow, chairman of the first NASA Lunar-Exploration Committee, notes that tests in our Shuttle have shown that production of urokinase in zero-gravity could reduce that cost by a factor of 10 or more. We could make this medicine available to thousands of people who cannot afford it at today's prices.

Our willingness to accept the challenge of space will reflect whether America's men and women today have the same bold vision, the same courage and indomitable spirit that made us a great nation. Where would we be if the brave men and women who built the West let the unknowns and dangers overwhelm them? Where would we be if our aviation pioneers let the difficulties and uncertainties sway them?

The only limits we have are those of our own courage and imagination. And our freedom and well-being will be tied to new achievements and pushing back new frontiers. That is the challenge to the Class of '84.

Space Telescope reaches milestone

The five science instruments to fly aboard the Edwin P. Hubble Space Telescope have completed acceptance testing at NASA's Goddard Space Flight Center in Greenbelt, Md.

The acceptance represents completion of the most critical of the final check-out steps for the instruments before they are assembled aboard the observatory for launch two years from this month.

The instruments are: the High Resolution Spectrograph, the Faint Object Spectrograph, the Wide Field/Planetary Camera, the Faint Object Camera and the High Speed Photometer.

The High Resolution Spectrograph, which was designed by Goddard, was returned to its manufacturer, Ball Aerospace, in Boulder, Colo. There it will undergo final rework before being shipped to the Lockheed Corp. in Sunnyvale, Calif., in October 1984, to be integrated aboard the Space Telescope.

The Faint Object Spectrograph has gone to its manufacturer, Martin Marietta, in Denver. The instrument, developed by the University of California in San Diego, will be shipped to Sunnyvale the first week of September 1984.

The Wide Field/Planetary Camera was returned to NASA's Jet Propulsion Laboratory, Pasadena, Calif., where it was designed and manufactured. The camera is expected in Sunnyvale in mid-July 1984.

The Faint Object Camera and the High Speed Photometer remain at Goddard for instrument level rework and subsequent environment testing before shipment to Sunnyvale.

Goddard received the first of the Space Telescope's instruments and the Science Instrument Command and Data Handling (SIC & DH) Subsystem (provided by Fairchild) for testing in March 1983 under the Center's Verification and Acceptance Program (VAP). The VAP testing was successfully completed 10 days ahead of schedule, a significant accomplishment due to the complexity of each instrument and the scope of the combined instrument system testing.

The tests have verified that the instruments, both alone and all five together, will work with the Space Telescope's SIC & DH Subsystem.

The tests also verified all flight software (provided by IBM) which will be used for instruments' operations and data processes. Tapes of the testing were forwarded to the Space Telescope Operations Control Center (STOCC) at Goddard for evaluations of the Control Center's software, which will operate the Space Telescope in orbit.

Goddard engineers additionally tested each instrument's alignment with the Space Telescope's focal plane. The optical test utilized a simulation of one quarter of the Telescope's focal plane structure, provided by the Perkin-Elmer Corp., Danbury, Conn.

As a result of the tests, several problems were identified in the instruments which must be corrected by their manufacturers before assembly aboard the Space Telescope.

The High Resolution Spectrograph, Faint Object Spectrograph, and Wide Field Planetary Camera will require adjustments for science data interface. Minor misalignments also were uncovered with the High Resolution Spectrograph and the Faint Object Spectrograph instruments. All problems will be resolved during the instrument rework periods before final shipment to Sunnyvale.

Welding system aids ET production

A system designed to help improve production of the Space Shuttle External Tank has transformed the art of welding into a science, according to engineers at the Marshall Space Flight Center.

The system, called variable polarity plasma arc welding, is a computer-controlled welding operation designed to increase the quality of the welds, improve production time and reduce the cost of making the external tanks, according to William Wilson, an engineer at Marshall.

The huge external tanks are manufactured by the Martin Marietta Corporation at Marshall's Michoud Assembly Facility near New Orleans.

The welding system is being incorporated into the production process in a joint cost reduction program between Martin Marietta and NASA. By 1985, an initial investment of $20 million to improve the external tank production system is expected to produce a total program savings of an estimated $350 million.

The plasma arc technique, first tested in private industry in the mid-1960s as an alternative to more conventional welding, provides higher heat at the point of the weld. The higher heat is generated because plasma arc uses an ionized gas as a means of applying the heat for welding to the metal surface.

Variable polarity plasma arc welding refines and controls the ability of plasma arc to cut metal and employs a reverse polarity cycle to clean the metal of impurities during the welding operation.

The computer-aided system first melts a key hole through the metal, then "pushes" or continues to burn the hole along the weld line. The molten metal fills in behind the key hole forming a weld essentially free of defects.

During every 23 millisecond period of the welding operation, the polarity of the metal surface is reversed for four milliseconds, removing impurities in the path of the weld.

Marshall engineers combined the benefits of variable polarity plasma arc welding with a computer controlled system to provide a more consistent quality weld. X-rays of the plasma arc weld show an absence of porosity, impurities and internal defects in the metal.

"It is a near impossible task for individual workmen to continuously weld the huge external tank on a high production basis because of the varying shape of the tank and varying thickness of the tank walls," Wilson said. "The computer can direct a continuous input which adjusts to the various contour and structural variations of the tank."

The first computer-controlled weld stations were implemented at the Michoud facility with the thirteenth external tank. By October 1986, 16 different welding stations are planned to be equipped with the new system.

With both Marshall and Martin Marietta working jointly as the development team on the computer-aided welding system and in making other improvements in the external tank production, significant cost savings have been realized, according to Porter Bridwell, manager of Marshall's External Tank Project Office.

"In 1979, the External Tank Project Office, in conjunction with the contractor, made a commitment to reduce the cost of the first 60 external tanks by $66 million based on the one-time investment of $20 million," said Bridwell.

In addition to the enhanced welding system, the total effort to reduce costs in external tank production by the estimated $350 million covers all aspects of processing, improvements in materials and production procedures, Bridwell added.

Discovery poised for maiden voyage

(Continued from page 1)

sulation (AFRSI). The advanced insulation also is installed on the payload bay doors and *Discovery's* vertical stabilizer.

The builders at Rockwell International also used graphite epoxy composite materials to replace some aluminum spars and beams in *Discovery's* wings and payload bay doors.

LEASAT-1 (formerly SYNCOM-IV), the communications satellite to be nudged into space on Flight Day 2 during Orbit 17, will have the first "frisbee deployment." After locking pins are retracted, a pyrotechnic device will fire, releasing a spring which will flip LEASAT out of its cradle with a wrist-like motion similar to tossing a frisbee. The flip will give the satellite its spinning motion and provide separation velocity.

The 15,305-pound LEASAT will be placed in a 184 statute mile circular parking orbit. Two additional maneuvers will place the satellite in its circular geosynchronous orbit with a three degree inclination. LEASAT-1 users will include military mobile air, surface, subsurface and fixed Earth stations.

The Large Format Camera, the first of its kind to go into orbit, is essentially a high altitude aerial metric stereographic mapping camera that is bigger, more stable, more precise and more technologically advanced than its airborne predecessors.

The 900-pound space eye can produce 2,400 negatives from 70 pounds of film, including two types each of black and white and color. From 160 up, the camera can resolve scenes down to about 70 feet, the length of an average home, compared with the 270-foot resolution of the Landsat satellites. A single LFC frame can photograph an area larger than the state of Massachusetts. The camera will be used periodically to assist in global exploration for oil and mineral resources and mapping and monitoring the Earth.

The principal investigator for the camera is Bernard H. Mollberg of JSC.

On-orbit power generation from the Sun will be the major theme of the OAST-1 package, sponsored by the Office of Aeronautics and Space Technology at NASA Headquarters. The package contains three experiments on a support structure, including the 105-foot long Solar Array Experiment (SAE). During SAE ops, the array will be extended to a length of 73.5 feet (70 percent) and 105 feet (100 percent) and used for dynamic and thermal testing. During extensions, rocket motors on *Discovery* will be fired so the effect on the long array can be measured.

The presence of Payload Specialist Charlie Walker takes on added importance during this mission because it will be the first for the latest Continuous Flow Electrophoresis System (CFES) hardware, known as Block III. CFES III is designed to run 41-D continuously for 80 hours, and is the most advanced step yet toward production of pharmaceuticals in space.

Other payloads aboard Discovery will include the CINEMA 360 and IMAX camera systems, a student experiment to examine a certain type of crystal growth using a 10 inch rod of gallium, and an experiment called CLOUDS, which will document cloud cover dynamics over the Earth.

—Research by Dave Alter

STS 41-D at a glance

Crew:	Hartsfield, Coats, Resnik, Hawley, Mullane, Walker
Orbiter:	OV-103, *Discovery*
Window:	*45 minutes*
Inclination:	*28.45 degrees*
Altitude:	*173/121 nautical miles*
Duration:	*7/00:52:26 (MET), 112 full orbits*
Payloads:	*LEASAT-1, OAST-1, LFC, CFES III, CINEMA 360, IMAX, CLOUDS*

Gilruth Center News

Call x3594 for more information

Guitar classes — The beginning class will focus on learning simple songs and chords, while intermediates will work on more advanced techniques. Beginners meet from 7 to 8 p.m. beginning July 11 for six weeks. Intermediates meet from 8 to 9 p.m. beginning July 11 for six weeks. The cost is $25 per person for either class.

Defensive driving — Learn to drive safely and qualify for a 10 percent reduction in your insurance for the next three years. The class will be held from 8 a.m. to 5 p.m. July 14. The cost is $20 per person.

Tennis classes — Beginning tennis will focus on fundamentals. The intermediate class will focus on backhand, body movement, footwork and other techniques. Beginners meet from 5:15 to 6:45 p.m. beginning July 9 for eight weeks. Intermediates meet beginning July 9 also. Call the Rec Center for times. Cost for either class is $28 per person.

Fitness and weight control — This course is designed to help change the eating and thinking patterns of people who have trouble losing and maintaining weight loss due to overeating and lack of exercise. Learn about nutrition, exercise and behavioral patterns. The course will meet Mondays, Wednesdays and possibly Fridays beginning June 25. The cost is $25 per person, and you can get more details at the Rec Center.

Pest control — Learn how to do it yourself when it comes to ridding your home of roaches and other pests. Learn how to spray your home, what chemicals to buy and how to do it all safely. The class meets from 7 to 10 p.m. on July 12. The cost of this one-night class is $7.50 per person.

Lunar Rendezvous race — Sign up now to run in the Lunar Rendezvous Space Run July 23. The five-kilometer race begins at 8 a.m. Trophies will be awarded to the top male and female finishers, and medals will go to the top three places. The cost is $6 per person for early registration. T-shirts will be given to the first 500 entrants. Registration forms are available at the Rec Center.

Counted cross stitch — This class will introduce you to the basics of counted cross stitching. The four week course meets from 7 to 9 p.m. beginning June 25. The cost is $13 per person.

Weight safety — This is a required course for all persons interested in using the weight room at the Rec Center. The class will teach you how to use the machines with safety stressed. The next available class in the series meets from 8 to 9:30 a.m. beginning June 29. The cost for the one-day class is $4 per person.

The grounds in front of Bldg. 16 were filled with eclipse watchers May 29 as the Sun was almost totally obscured by the Moon in the skies over Houston. (Photo by Andrew Patnesky)

Roundup Swap Shop

Ads must be under 20 words total per person, double spaced, and typed or printed. Deadline for submitting or cancelling ads is 5 p.m. the first Wednesday after publication. Send ads to AP 3 *Roundup*, or deliver them to the Newsroom, Building 2 annex. No phone-in ads will be taken. Swap Shop is open to JSC federal and on-site contractor employees for non-commercial personal ads.

Property & Rentals

For rent: Galveston-By-The-Sea condo, 2 BR furnished, for rent by day (2 minimum), week or month. Call Clements at 474-2622.

For sale: 3 spaces, Forest Park Cemetery, League City, $1,000/lot. Call Nita at x5081 or 996-1429.

For lease: Sagemont 4-2-2, fenced backyard, large den, no indoor pets, $525/mo. plus $450 deposit. Call 331-1136.

For sale: Heritage Park, sparkling clean 3-2-2, attached garage, enclosed utility, fenced yard, $10,000 down, owner carry 2nd, assume 1st. Price $56,500 or lease at $550. Call Quinn at x4771 or 481-0289.

For sale: Green Terrace, lots of glass on the 10th fairway, open concept, private master suite, 2 BR down, 2 BR 3 baths. $157,500. Call Quinn x4771 or 481-0289.

For lease: Heritage Park 3-2-2, on quiet cul-de-sac, fans, custom storm doors and windows, fresh paint, no pets, $525/mo. plus deposit. Call Charles Partin at x5061 or 332-2295 after 5 p.m.

For lease: South Bridge near Almeda Mall, 3-2-2 split level, FPL, dining, fans, mini blinds, fenced yard, $575 plus deposit. Call 991-1584.

For sale or lease: 4-2-2 in Middlebrook II, popular floor plan, both formals, fenced yard, well maintained. Call Bartosh at x4039 or 488-7387 after 5 p.m.

For lease: 10 acres (Alvin area), fenced, on paved road, good for horses, cattle. Call Damewood at 482-5572.

For lease: Kirkmont 3-2-2, fenced yard on cul-de-sac. Available July 1, $550/mo. Call Gene at 482-3969.

For sale: 3/4 acre waterfront lot with access to excellent bass fishing in Brazoria County. Call Don at 280-4244 before 4 p.m.

For sale: Beautiful 4 BR home on one acre near Alvin, 2 1/2 baths. Roomy kitchen, dining areas, den and garage, energy efficient. Call 331-4986.

For lease: Baywind II condo, 2-2, W/D, wet bar, lots of windows, tennis courts, pool, $450/mo. Call Cullen at x4364 or 643-8944.

For lease: University Trace condo, 1 BR, 1 bath, all appliances, 2 pools, jacuzzi, sauna, exercise room, close to JSC, $375/mo. plus deposit. Call Fred at x2391 or 480-1086.

For rent: Ideal family vacation in New Braunfels, lovely 2-2-2 above Landa Park, 3, 4, or 7 days, June 1-Sept. 1, $200-$350. Call 482-2810.

Must Sell by mid-August: House in League City, flood zone "C", 15 minutes from JSC, 3-1 1/2-2 central air/heat, carpeted BR, hall, den, fans. 12% fixed VA loan, $640/mo. P & I & Tax & Insurance, $5,000 equity. Call Keith at 483-3643 or 332-8251.

For rent: 2 BR condo, Gulf Shores. Call Harold Stephenson at x4341 or 554-2420.

For rent: New Orleans condo, in French Quarter, see the World's Fair. June 15-22, sleeps 4 plus, $500. Call Faye at x2488 or 332-3386 or 488-5586.

For lease: Bayou Vista 3-2 canal front, like new, $600/mo. plus 1st, last and deposit. Adults, no pets. Call Vonda at 483-6484.

For lease: Lake front condo, 2 BR, 1 bath, 5 minutes from JSC, private tennis courts and marina, 24 hour security, $365/mo. Call x2979 or 480-5583 or 482-7156.

For rent: Galveston Gulf Front Condo, treat yourself to a relaxing 2 day to 1 mo. vacation in this completely furnished condo, low rates. Call Nussmen 488-7762.

Cars & Trucks

1976 Honda dirt bike, 100cc perfect, like new, street legal, $350. Call Allgeier at x6486 or 488-0397.

1976 Datsun B210, 4 speed, radio, AC, good work car, $1,000. Call B. Long, 538-1816 after 5:30 p.m.

1977 Triumph TR 7, 5-speed, AM/FM cassette, air, mags, 74,000 miles, $2,000. Alvin area. Call 585-5198 after 5 p.m. or weekends.

1979 Mustang Cobra, PS, PB, stereo cassette, sunroof, 40,000 miles. Asking $3,500. Call 480-7413 after 5 p.m.

1975 Pontiac Catalina, still the best-running car I ever owned. Tacky anti-rust body. Best offer. Call Cliff, x4457 or 486-8810.

1978 Buick Century Custom station wagon, 56K miles, loaded, $2,750. Call Phil, x2878 or 488-4453.

1975 Yamaha 250 Enduro, street legal, 6,700 miles, needs tune-up. Owner too old to be Hell's Angel, $300. Call Beck, x2071.

1982 Renault Le Car, 6,000 miles, AM/FM, 4DR, excellent condition, $4,999. Call Anne at x5956 or 474-7020 after 5 p.m.

1969 Fury III, mechanically very good, 73,000 miles, one family, some fixable cosmetic blemishes, $600. Call Dick Springer, x3205.

1982 Honda CB 900 F, 7,000 miles, $1,800. Call M. Conran, x2805 or 526-2783.

1980 Citation 4DR hatchback, V6 auto, AC, PS, PB, AM/FM, good condition, low price, $2,700. Call 488-4069.

1968 VW Bug, automatic stick-shift, blue, 120 K miles, running well, fair-good condition, $750. Call Fred, x3404.

1979 Honda Accord LX, 5-speed, AC, PB/PS, AM/FM stereo cassette, 7300 miles, $3650. Call Sashi Menon, x3929 or 482-9476.

1971 Dodge Coronet, auto, AC, PS, PB, engine in good condition, body needs work, reduced to $225, negotiable. Call Greg, x5949 or 476-4448 any time after 5 p.m.

1972 Datsun 240Z, clean Michelin tires, 65,000 plus miles, $2950. Call Max at x2808.

Ford E-150 van, stationary seat base with seat belt. Chevy Van rotating seat pedestal, $10 each. Call G. Bauch at x6233 or 333-3382.

1981 Toyota Tercel, AC, $4,300. Call Ralph, x4188 or 479-6668 after 3 p.m.

Sears mini-bike, 4 years old, $150. Call Nita, x5081 or 996-1429.

1979 Trans-Am, excellent paint, body, interior, and engine (61,000 miles), needs AC compressor, $4,200. Call R. Richard, x5041.

1974 Plymouth Duster, good condition, clean, AC, engine tuned, regular gas, $1,000. Call Doc Pepper, x5372 or 332-4366.

1976 Toyota SR5 Corolla Liftback, clean, excellent condition, 73,000 miles, AC, 5-speed, radio, $1,800. Call C. Huss, 488-5660, x267 or 488-6310.

1982 Ford Econoline van, action custom conversion, 1st class condition. Call Biggs, 471-6984.

Boats & Airplanes

Six-gallon portable fiber glass gas tank with gauge for under transom, $25. Call 488-1326 after 4:30 p.m.

Brand new Hummingbird Super Sixty Depth Sounder, $115. Call Don, 280-4244 before 4 p.m.

1974 Skeeter Bass boat with 50 HP Johnson motor, trolling motor, depth sounder, etc. Call Don, 280-4244 before 4 p.m.

1979 Pennyan cabin cruiser, 24', flying Bridge, 250 HP single Chrysler, low hours, depth finder, sportsman galvanized tandem trailer, $10,000. Call Don, x6596 or 554-6733.

New lower rates for Gulf Coast Aero Club: C-152, $21.85/hr.; C-172, $26.85/hr.; GA Tiger, $35.85/hr.; coming soon Cherokee-6, only $51.85/hr; $8/mo. dues. Call Mark, x4436 or 554-2538 after 5 p.m.

Aircraft for rent: Cherokee Lance-6-place, club seating, 160 knots true, $75/hr wet, 250 TT/25 RT and check ride; Cherokee 140-4 place, 120 knots, private pilot, $30/hr wet. Both A/C hangered in Friendswood. Will rent for less with commitment on hours. Call L. Damewood, 482-5572.

Audio-Visual & Computers

Want H-17 disk drives (or equivalent) and disk controller board for Heath H-8 computer. Call Jim Bates, x4614 or 944-4687 after 5:30 p.m.

For sale: TI 99/4A computer (almost new) TI tape unit, all interface cables, documentation, several tapes with software/games/music, $100. Call Gunter, x3458.

Mitsubishi 50" Video system, light wood cabinet model with shutter doors, 1 year old, $2,000 or $157/13 mo. Call Darlene, x2591 or 334-7336.

Stereo with speakers, Sony AM/FM and phone, $50. Call Williams, 333-5470 after 6:30 p.m.

Computer printer-integral data systems DMTP-6 UP, full documentation, RS-232 Serial or Parallel, $150 or best offer. Call 480-6325 after 5 p.m.

Pets

Boxer puppies, AKC, fawn, male and female, Champion Sire and Champion Dam, $250-$500. Call Linda at x4921 or 334-2294 after 6 p.m. and on weekends. Parvo shot and wormed. Ready to go home.

Pomeranian puppies for sale. Absolutely adorable. Call Annita Weldon, x3995 or 482-1461.

For sale: orange-winged Amazon parrot, young, two cages, one perch, miscellaneous toys, feed, $350. Call Bob, x5961 or 488-7340 after 5 p.m.

Want young white male poodle not over 10 lbs. Call 333-2395.

Wanted

Want trombone player for Contraband, 18-piece swing band. Call Milt, 488-5903 or Ray, 996-1966.

Want female housemate to share large house in Heritage Park w/same, own room, bath, with W/D, access to pool and tennis courts. Call 996-9412 after 5 p.m.

Want loving, responsible babysitter for 2-year-old boy, weekdays NASA area. Call Beth, x2688 or 488-0356 after 5 p.m.

Want to buy electric trains. Call Don, x2449.

Carpools

Need a ride or carpool from Bayridge subdivision or apartments in League City to JSC, 8 a.m. to 4:30 p.m. Call Rita, x3183.

Interested in joining a carpool from Meyerland area to JSC beginning July 1? Call Jerry Bell, x4401 or 280-3659.

Household

Kenmore washing machine, $100; 220 volt electric dryer, $100. Call Glenn, 943-1790 or 480-8800, x74.

Six cushion modern sofa, very sturdy, great for college apartment, earth tones, $40. Call 482-2810.

Chair, informal Brown cloth, $50. Call Williams, 333-5470 after 6:30 p.m.

Refrigerator like new, 17 ft. Sears, white, frost-free, $350. Call Bartosh, x4039 or at 488-7387 after 5 p.m.

14-inch color television, Sears, excellent condition, beautiful condition, $150. Call 488-5564.

Dining room table and four chairs, $90; "National Geographic," 50 for $25. Call 488-5564.

Two foam mattress and box spring sets, twin size, excellent condition $20/set; two 5-gallon propane tanks, $20 each, one propane regulator $10. Call McCreary, x4296 or 488-7636 after 5 p.m.

G.E. double oven, self-clean, matching copper electric stove top, $400/both; washer, 1 year, $75; Ethan Allen pediment style bed, 1 year old, queen size, $250; Tell City hardrock maple telephone bench, $125. Call Bob, x3856.

Continental riding mower, reasonable. Call McElligott, 489-1682 or 333-4150.

Aluminum frame, external windows, 4' x 6', $30; 4' x 8', $35; external doors, 8' x2' and 8' x 2'8" $15 each. Call Judy, x3470 or 334-5805.

G.E. air conditioner, portable, 115V, used only occasionally. Call 488-4069.

Miscellaneous

Two 14k white gold bands, both size 7; wedding band has 5 1/8k diamonds, engagement ring has one 1/2k diamond and 2¼ diamonds. Call Marschel, x3076 or Bldg. 13 Rm. 215.

Baseball cards to trade, sell or buy. Call Bill, x4036.

Bedroom chandelier, hand painted French leaf scroll design with 5 lights, $75. Call 488-1326 after 4:30 p.m.

For sale: 1/2 HP motor/sand filter for above ground pool, $250 or best offer. Call 538-4004 after 5:30 p.m.

Gun Cabinet for 6 guns, pine, storage, locks, needs glass, $75; stereo tape recorder, 7-inch reel-to-reel, $50. Call x4303 or 487-7413.

Carnivorous plants, pitchers, sundews, bladderworts plus growing instructions, 24 varieties. Call Jeff, x3967 or 996-0755 after 5 p.m.

Free: 400 Bricks for church or tax-exempt organization. Call Dale Nussman, 488-7762.