



**Jungle smog**

JSC Earth observations experts say the smoke pall over the Amazon rain forest continues to grow. Story on Page 3.



**Officer material**

STS-37 astronaut Jerry Ross helps pin bars on a JSC quality worker promoted in the Air Force reserves. Photo on Page 4.

# Space News Roundup

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No. 9

## Atlantis to carry next great observatory

By Kari Fluegel

Exploration of the deep reaches of the universe and the nuances of working in space will continue when *Atlantis* rockets away from Earth in April, carrying with it the Gamma Ray Observatory and the first astronauts to venture outside the space shuttle in more than five years.

*Atlantis* is expected to lift off on a five-day mission from Launch Pad 39B at about 8:20 a.m. CST in early April.

STS-37, the eighth flight of *Atlantis*, will be commanded by Air Force Col. Steve Nagel, while piloting duties fall to Marine Lt. Col. Ken Cameron. Mission specialists are Dr. Linda

Godwin, Air Force Lt. Col. Jerry Ross and Dr. Jay Apt.

Nagel and Ross both will be making their third flights, while Cameron, Godwin and Apt are flying for the first time.

The Gamma Ray Observatory is an Earth orbiting platform that will study the universe's gamma ray spectrum. It is the second of the four great observatories, the first being the Hubble Space Telescope.

GRO will perform coordinated observations with Hubble during its first years in space and with the

Advanced X-Ray Astrophysics Facility and the Space Infrared Telescope Facility after those observatories are launched later this decade.

GRO, which is managed and controlled by the Goddard Space Flight Center, carries four instruments: the Burst and Transient Source

Experiment, which will detect and measure short, intense burst and other transient sources of gamma rays; the Imaging Compton Telescope, which will study gamma ray characteristics of point sources,

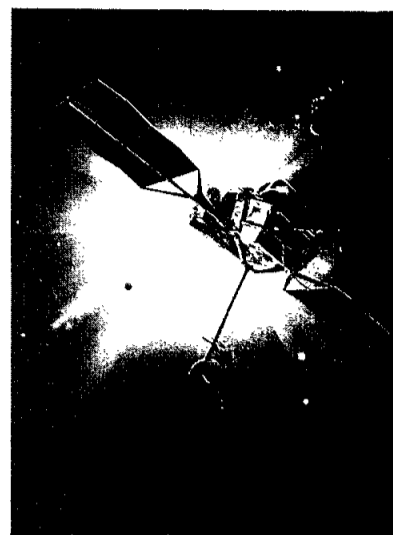
diffuse emissions from the galaxy, cosmic diffusion flux and broadened line emissions; the Energetic Gamma Ray Experiment Telescope, which will measure the highest-energy gamma rays; and the Oriented Scintillation Spectrometer Experiment, which will detect nuclear line radiation and emissions associated with low-energy gamma ray sources anywhere in the sky.

GRO will be deployed at an altitude of 243 nautical miles on the third flight day using the remote manipulator system arm controlled by Godwin.

For the initial unberthing, *Atlantis* will be positioned with its underside Please see **ATLANTIS**, Page 4



**STS-37**  
**ATLANTIS**



Gamma Ray Observatory

## Rare isotope find on LDEF is significant

Scientists from several U.S. government and university laboratories report finding the rare atmospheric isotope Beryllium-7 present on the surface of NASA's Long Duration Exposure Facility.

The isotope Beryllium-7 is radioactive and produced naturally by cosmic ray reactions in the Earth's atmosphere. Although very rare, the isotope is detectable by modern nuclear instrumentation and has been studied in the past as a means of tracing the distribution and transport of atmospheric gases in the lower atmosphere, said Dr. Gerald J. Fishman of Marshall Space Flight Center.

"The finding is thought to be significant from at least two different aspects," said Fishman. "First, it is known that the isotope is mainly produced at much lower altitudes in the atmosphere than where the LDEF was orbiting. The detection and measurements show that some, as yet undetermined, process efficiently carries it to high altitudes."

More detailed measurements may lead to a better understanding of such movement.

"Secondly, prior to this finding, there was only one atmospheric gas known to strongly interact with orbiting spacecraft. That gas, atomic oxygen, has been found to be very significant, leading to the degradation of various spacecraft surfaces. The detection of Beryllium-7 on the LDEF surface will allow scientists to study in greater detail the interaction of gases with spacecraft in low Earth orbit," Fishman said.

A team of scientists found the Please see **RARE**, Page 4



JSC Photo

Marvin LeBlanc of the Mission Operations Directorate has been named 1991 Young Engineer of the Year by the Bayou Chapter of the Texas Society of Professional Engineers.

## LeBlanc Young Engineer of Year

By Jeff Carr

Marvin L. LeBlanc, head of the Flight Planning and Pointing Section in the Mission Operations Directorate, recently was named the 1991 Young Engineer of the Year by the Bayou Chapter of the Texas Society of Professional Engineers.

The TSPE cited LeBlanc for "his multiple contributions to America's space program" as the basis for the honor. The award also serves as a nomination for the national society's Young Engineer of the Year award.

LeBlanc, who has worked as a flight controller on 14 shuttle missions, currently serves as the project design engineer and project manager for the Distributed Earth

Model and Orbiter System. DEMOS provides real-time computer graphics depicting shuttle orbital position and attitude to flight controllers.

LeBlanc also serves as project manager for the design and development of a new ground support computer system to support the shuttle teleprinter/text and graphics system. The new system is intended to consolidate and enhance current resources that produce hard-copy text and graphics messages from the ground to crews in orbit.

As a commissioned officer in the U.S. Navy Reserve, he also supports the Office of Naval Research in Washington, D.C., in aviation and space systems research.

## Discovery rolls back for repairs

By James Hartsfield

Top Space Shuttle Program managers decided early Thursday to move *Discovery* off the launch pad and to the processing hangar for repairs, delaying STS-39 until late April or early May.

*Discovery* will fly after *Atlantis* is launched on STS-37. *Columbia's* preparations for launch on STS-40 are unaffected by the move.

"We're in business to fly space shuttles, not to keep them on the ground," Associate Administrator for Space Flight Bill Lenoir said. "But we want to fly them safely."

"When we have a problem, we analyze it and see what the facts are. With the facts in hand, then we make a decision. We were not pushing to fly this mission. We just wanted to get the facts, decide whether we were comfortable and safe with the problem, and we made the decision this morning that we couldn't quite get ourselves comfortable with it."

In addition, there is no driving force such as a planetary window or urgent national defense need that requires a launch of STS-39 in March, Lenoir said.

Due to *Columbia's* and *Atlantis'* positions in Kennedy Space Center's processing hangars, there was nowhere to put *Discovery* this week if it had been rolled back earlier. "So we decided to analyze it and take our time until an opening became available," Lenoir explained.

*Atlantis* is scheduled to move from its hangar to the Vehicle Assembly Bldg. early next week as it prepares for STS-37, thus opening a spot for *Discovery*.

*Discovery's* problem was found early last week when technicians at the launch pad spotted cracks in two support areas for closing mechanisms on the fuel line doors. The cracks are not in the door hinges, but rather in metal that supports the lugs for electric mechanisms

Please see **DISCOVERY**, Page 4

**STS-39**



**DISCOVERY**

## Space station operations office opens

Lewis to head effort, report directly to program office

By Jeff Carr

JSC has established a project office for the development and implementation of Space Station *Freedom* flight operations.

The Space Station Mission Operations Project Office resides within the Mission Operations Directorate, which has overall responsibility for the development and conduct of flight planning, training, and operations for the space shuttle and space station programs.

Mission Operations Director Eugene Kranz said the new organization is "intended to provide for more direct interaction between

MOD and the work packages, institutions, and international elements in developing and defining operating concepts, requirements, and responsibilities. The change will also enhance our support of these organizations in the design of space systems and the development of operations facilities."

The new office will be headed by Charles R. Lewis who will report directly to Robert W. Moorehead, deputy director for program and

operations in the Space Station *Freedom* Program Office, on all aspects of planning, training and management of *Freedom* flight operations.

After graduating from New Mexico State University with a bachelor's in electrical engineering, Lewis worked for a year at Goddard Space Flight Center on radio frequency systems, before joining the NASA Space Task Group at the Langley Research Center in 1962. Lewis moved to Houston with

the task group in 1962 after establishment of the Manned Spacecraft Center, now JSC.

Since 1962, Lewis has held several highly responsible mission operations positions. During the Mercury and Gemini programs he was remote site spacecraft communicator. He was assistant flight director during Apollo, and flight director for Apollo 17, all Skylab flights, the Apollo Soyuz Test Project, and shuttle missions 1, 2, 4 and 9. In 1984, Lewis was named chief of flight operations integration, and then as the MOD chief of space station operations integration in 1985.



Charles Lewis

JSC

# Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Gift Store from 10 a.m. to 2 p.m. weekdays.

General Cinema (valid for one year): \$4 each.

AMC Theater (valid until May 1991): \$3.75 each.

Loews Theater (valid for one year, may be used two weeks after movie premiere): \$4 each.

Thermographed, raised lettering and logo business cards can be ordered by civil service employees; 250 cards per set. Old logos-\$21; new logos-\$18.

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# Gilruth Center News

**Sign up policy**—All classes and athletic activities are first come, first served. To enroll, you must show badge or EAA card and pay at the Gilruth Center. Classes tend to fill up four weeks in advance. For more information, call x30304.

**EAA badges**—Dependents and spouses may apply for a photo I.D. 6:30-9 p.m. Monday-Friday. Cost is \$5.

**Defensive driving**—Course is offered from 8 a.m.-5 p.m., April 20, May 18 and June 15. Cost is \$15.

**Aerobic dance**—Eight-week session meets 5:15-6:15 p.m. Tuesday and Thursday nights. Cost is \$24.

**Exercise class**—Class meets 5:15-6:15 p.m. Monday and Wednesday nights. Cost is \$24.

**Weight safety**—Required course for employees wishing to use the Gilruth weight room. The next class will be from 8-9:30 p.m. Feb. 28, March 13 and March 28. Cost is \$4.

**Country and western dance**—Intermediate class meets Monday nights for six weeks beginning March 4. Cost is \$20 per couple.

**Personal safety**—Brief lecture on personal safety awareness. Talk begins at 5 p.m. March 13 in the Gilruth Center ballroom.

**Softball tournament**—Men's Open "C", March 16-17. Cost is \$95 per team, with a 16 team limit. Entry deadline is March 14.

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# Technical Library News

These new publications are available in the JSC Technical Library, Bldg. 45, Rm. 100.

*Aerospace Capital Formation: Impact of Inflation and Depreciation.* Klaus P. Heiss, 1976. HD9711.5.U6 H45 1976.

*ASTD Buyer's Guide and Consultant Directory.* American Society for Training and Development. HF5549 .A44.

*Agenda for Progress: Examining Federal Spending.* Heritage Foundation, 1981. HJ2051 .A353 1981.

*The Pollution of Outer Space, in Particular of the Geostationary Orbit.* Gijssbertha Cornelia Maria Reijnen, 1989. JX5810 .R433 1989.

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# Swap Shop

## Property

Sale/Lease: 1 BR Egret Bay Villa, w/boat access to Clear Lake, pool, club house, pier, boat incl., \$43K or \$550/mo. Mr. Collins, 480-8190 or 996-7693.

Rent: Lake Travis cabin, private boat dock, CA/H, accom 8, wkly/dly, \$325/\$80. 474-4922.

Rent/Lease: Clear Lake condo on marina, three level, all appls, FPL, 2-2.5-2, \$950/mo plus dep., 488-3171.

Lease: Friendswood, Heritage Park, 3-2-2, good cond, FPL, all appliances, \$795 plus dep, no pets. x32571 or 280-0031.

Sale: Pipers Meadow, 3-2.5-2, formal LR/DR, FPL, loft, wet bar, fans, new paint, \$92K. Dennis, x34405 or 480-5076.

Rent: Galveston condo, Seawall Blvd and 61st St, turn, sleeps 6, wknd/dly/wkly, cable TV and pools. Magdi Yassa, x33479 or 486-0788.

Lease: CLC, Oakbrook, 4-2.5-2, golf course, formals, fenced, no pets, ref. \$1000/mo plus dep., 488-3171.

Lease: Medical center area condo, 2-2, all appliances, fans, walk in closets, security gate, alarm, \$560/mo. Steve, x31907 or 480-6859.

Sale: Bay Glen, 3-2-2, 2050 sq ft, great rm, formal DR, study w/French doors, assum loan, \$122.5K. 480-0527.

Sale: Baylor Univ condo, 1 BR, furn, close to campus, tax deductible. x36026 or 334-3896.

LC, Meadowbend, new sec, 3-2-2, ex cond, pool, deck, patio cover, 10% assum, \$75.8K. John Gillman, 280-7461 or 538-2072.

Sale: Webster, 2-1-1-CP, lg fenced yard, \$42K. Jackie, 282-4337 or 554-7305.

Sale: Private lake house on 1/2 wooded acre, 1 lg BR, 1 bath, sundeck porch, 7 mi SE of Palestine, TX. (903) 729-6885.

Rent: River Oaks, 2-1, library, FPL, hrdwds, 6650/mo plus dep; River Oaks area, 2 garage apts, miniblinds, new paint and carpet, gas stoves, all util, \$395 ea. 774-3945.

Rent: Two story townhome condo, 1-1.5-CP, CA/H, all appls, pool and full rec facil, 286-2805.

Rent: El Dorado Trace condo, 2-2-CP, FPL, \$275 dep, \$525/mo. 486-8964.

Sale: Dickinson/LC, FM 517W, 3-3-2, lg game room/guest quarters, 1 acre, alarm sys, \$79K. 534-6641.

Sale: Splendor, wooded 2 acre corner lot, \$1K dwn, owner fin \$13K bal at 8% LC, Britany Bay, 4-2.5-2, many extras, \$107K w/assum 8% loan bal of \$82K. 332-0047.

**Cars & Trucks**

'66 Mustang, 289 eng, 3-spd/standard, orig owner, 58K mi, ex cond, \$7800. 480-5090.

'87 Chevy Cavalier, white, 4-dr, auto., A/C, 38K mi, ex cond, 20 plus mpg, city, warr, \$4300 OBO. Dave, x39579 or 482-6187.

'83 Dodge Salesman coupe, rebuilt eng, have all parts, \$5000. (409) 948-0241.

'88 Mercury Sable LS wagon, 47K mi, 100K mi warr, loaded, \$9000 OBO. Terry, x36351 or 996-9164.

'90 Mazda Miata, blue, "A" pkg plus CD, ex cond. 488-1120.

'73 Chevy Nova, V8, 2-dr, A/C, runs well, needs minor work, batt, new tire, \$350 OBO. 283-1285 or 538-1078.

'88 Honda Accord LXI, white, PB/PS, A/C, AM/FM, 5-spd, pwr windows, 52K mi, warr, good cond, \$8695 OBO. Daryl, 282-4284 or 286-9218.

'85 Chevy S-10 Blazer, 5-spd stick, 4WD, A/C, good tires, V6, luggage rack, tow pkg, \$6500 OBO. Charles, 559-2331.

'85 Mustang convertible, V6, auto., A/C, all pwr, AM/FM/cass, low mi, very clean, blue/lan top, \$7300. Dean Thompson, 332-2229.

'85 Ford Tempo GL, 5-spd, A/C, 4-dr, cruise, tilt, good cond, \$2600 OBO. Darin, x39052 or 332-8771.

'81 Datsun PU, king cab, needs some work, \$750. Mar, x39309.

'84 Camaro, V6, auto., A/C, tu-tone blue, 51K mi, ex

cond, \$3750. x37108 or 486-8463.

'83 Honda Prelude, 5-spd, sunroof, ex cond, 87K mi, one owner, \$3500. B. Craig, x32338 or 1-420-2936.

'80 Dodge D50 PU, 118K mi, just tuned, A/C/ auto., runs good, incl fiberglass camper shell w/sliding windows, \$600. x37667 or 326-2864.

'72 Triumph Spitfire, approx 70K mi, not running, new top, Pirelli P-3 tires, rebuilt in '79, incl boot, \$500. x37667 or 326-2864.

'80 Pontiac Phoenix, V6, AC, 5-dr, lftbk, new auto., new batt, runs great, \$1950. x30092 or 481-3637.

'88 Ford Mustang LX, 4 cyl, 2-dr, sedan, auto., loaded, ex cond, 39K mi, rustproofing and service warr transfers to new owner w/\$25 deductible, \$5500. Brenda, x37747 or 554-7767.

'82 Toyota Celica Supra, 92K mi, new trans, brakes, exhaust, loaded, \$2000 OBO. 474-4084.

'71 Volvo 1800E, restored eng, new tires, needs paint. x30153 or 941-6575.

'86 Toyota PU, extra cab, longbed, A/C, PB, PS, AM/FM/cass, cruise, \$4700. Kurt, x38753 or 334-4937.

'86 Chevy PU, \$700; '80 Honda Accord, 2-dr, good cond, \$1200. x31883.

'87 Toyota Celica GT, white 3-dr hatch, A/C, auto., 4-sprk AM/FM stereo, 48K mi, ex cond, \$8200 OBO. 639-3455.

'89 Ford Probe GT Turbo, 5-spd, 100K mi warr, ex cond, \$11,750. Ford Probe GT Turbo 15 in. wheels, ex cond, \$250. Dan, 280-2780 or 457-2850.

'82 Jeep Eagle wagon limited, 4WD, 6 cyl auto., pwr windows/locks, 73K mi, \$3000 OBO. x34213 or 286-7149.

'77 Toyota Supra, ex cond, 47K mi, 5-spd, high perf stereo, \$12K. Tim, x34333 or 486-6143.

'78 MG Midget, 56K mi plus, cherry red, new paint and top, well maint, runs great spare parts, service manual, \$2400 OBO. 554-7524.

'80 Cutlass Supreme, 71K, vinyl top, red velour int, \$1100. Howard, x37346 or 488-2649.

'82 Ford Custom van, loaded, BO. 488-3191.

'87-rebuilt engine in '85-customized '80 Ford van, color TV, radio, CB, 4 captain's chairs, sofa bed, table, built-in bar w/icebox and running water, \$3000. David, x35048, or Mary Fae, x35143 or 482-9061.

**Cycles**

Lady's 21.5" Terry racing bike, computer, pump, helmet, light, lock, ex cond, was \$686, now \$300. Wayne, x34437 or 326-4832.

'80 Kawasaki KZ 1300 touring bike, 4K mi, new Dunlop tires/batt, buddy seat, ex cond, \$1500 OBO. Bob, 485-9084.

'81 Honda 650cc CB, new tires, new batt, windshield, backrest, good cond, \$850. Gene, x36424 or 474-4289.

'84 YZ 125 off-road motorcycle, ex cond, water cooled, \$750. x38265 or 482-1633.

'84 Kawasaki GPZ 750 motorcycle, 8K mi, clean, \$2000. Shannon, x32646 or 484-5412.

**Boats & Planes**

Boat slip on Clear Lake w/motorized hoist and roof for pwr boats, \$125/mo. 474-4922.

Sensenich 74 DM 6-0-58 aircraft propeller, overhauled and yellow tagged, fits some Beech, Piper PA-18, PA-22, PA-28 series acft. 538-2299.

'85 Alon Aircoupe, \$10.5K for full purchase or \$5250 for one-half partnership. 334-4986 or 244-4395.

'79 Renegade 1540 ski boat, 140hp Evinrude, SST prop, custom trlr, new paint, carpet, ignition sys, \$2650 OBO. 333-6868 or 486-7846.

Challenger raft, paddles, air pump and life jackets, \$80. Liz, 283-0439 or 486-3991.

Evinrude 25hp, elec start, new, \$1700. Jerry Craig, 283-5311 or 420-2936.

'83 Renken 18' sailboat, roller furling jib, 4hp aux, galv trlr, sleeps 4, good cond, \$4000. 339-3476.

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## Today

**Cafeteria menu**—Special: tuna and noodle casserole. Entrees: broiled codfish, fried shrimp, baked ham. Soup: seafood gumbo. Vegetables: corn, turnip greens, stewed tomatoes.

## Monday

**Free enterprise lectures**—The Lockheed National Management Association will give lectures on free enterprise and our economic system during brown bag lunches at 11:40 a.m. Mondays from March 4-May 6 at Lockheed, Plaza 4, Rm. 44F (fourth floor). For more information contact Charles Campbell 333-6107.

**Cafeteria menu**—Special: meatballs and spaghetti. Entrees: wieners and beans, round steak with hash browns. Soup: chicken noodle. Vegetables: okra and tomatoes, carrots, whipped potatoes.

## Tuesday

**Cafeteria menu**—Special: fried chicken. Entrees: beef stew, shrimp creole, sweet and sour pork chop with fried rice. Soup: beef and barley. Vegetables: stewed tomatoes, mixed vegetables, broccoli.

## Wednesday

**Cafeteria menu**—Special: Swiss steak. Entrees: fried perch, New England dinner. Soup: seafood gumbo. Vegetables: Italian green beans, cabbage, carrots.

## Thursday

**Cafeteria menu**—Special: stuffed bell pepper. Entrees: turkey and dressing, enchiladas with chili, wieners and baked beans. Soup: cream of chicken. Vegetables: zucchini squash, English peas, rice.

## March 8

**Cafeteria menu**—Special: Salisbury steak. Entrees: baked scrod, broiled chicken with peach half. Soup: seafood gumbo. Vegetables: cauliflower au gratin, mixed vegetables, buttered

cabbage, whipped potatoes.

## March 11

**Lockheed NMA meets**—The Lockheed National Management Association will present a brown bag luncheon at 11:40 a.m. March 11 in the Lockheed Plaza 4, Rm. 44F. "The Oil Industry as a Failure of Price Control," will be the topic. For more information contact Charles Campbell at 333-6107.

## March 18

**AIAA meets**—The American Institute of Aeronautics and Astronautics will host a Computer and Software Systems Technical Committee meeting at 11:45 a.m. March 18 at Franco's Restaurant. "Artificial Intelligence with Hypercard" will be discussed by Stephen Desrosiers of McDonnell Douglas. call Karen Lee-Taylor at 283-1961 for more information.

**Lockheed NMA meets**—The Lockheed National Management Association will present a brown bag luncheon at 11:40 a.m. March 18 in the Lockheed Plaza 4, Rm. 44F. "Inflation and Depression," will be the topic. For more information contact Charles Campbell at 333-6107.

## March 21

**NCMA seminar**—The National Contract Management Association's semi-annual conference will be March 21 at the Moody Civic Center, Galveston. The conference theme is "Managing Contracts for Peak Performance." For more information contact Lucy Yates, x31864 or Sue Garman x35998.

**Computer workshop**—JSC and University of Houston-Clear Lake will co-sponsor a workshop, exhibits, and conference March 21-22 at the University of Houston-Clear Lake. The theme is "X in Space '91: Aerospace Applications and Directions with the X Window System." For more information or registration contact SEPEC at 282-2223, or Jane Kremer at x32601.

## March 25

**Lockheed NMA meets**—The Lock-

heed National Management Association will present a brown bag luncheon at 11:40 a.m. March 25 in the Lockheed Plaza 4, Rm. 44F. "The Correlation of Economic Freedom and Living Conditions," will be the topic. For more information contact Charles Campbell at 333-6107.

## March 26

**BAPCO meets**—The Bay Area PC Organization will meet at 7:30 p.m. Mar. 26 at the League City Bank & Trust. For more information, call Earl Rubenstein, x34807, or Tom Kelly, 996-5019.

**JSC music festival**—An open-mike Spring Music Festival jam-session has been slated for 4:30 p.m. March 26 at the Gilruth pavilion. All JSC employees are invited. The Southwind Band will host. For more information contact Paul Torrance or Ernie Smith, x31883.

## April 23

**Space Congress**—The 28th annual Space Congress will be April 23-26 in Cocoa Beach, Fla. The Canaveral Council of Technical Societies will host the conference with a theme of "Space Achievement—A Global Destiny." For more information contact Stuart Shadbolt at (407) 383-2200, x2202, or John Glass Jr. at (407) 383-2200, x2207.

**LDEF seminar**—The American Institute of Aeronautics and Astronautics and Software Systems Technical Committee will host "LDEF: In Support of Requirements Analysis" presented by Mark Smith of D. Appleton Co. at 11:45 a.m. April 23 at Franco's Restaurant. For more information contact Karen Lee-Taylor at 283-1961.

## May 3

**AACE workshop**—The American Association of Cost Engineers Houston Gulf Coast Section will present its annual spring workshop May 3-4 at the Hobby Airport Hilton. Dennis Lawler of JSC's Intelligent Systems Branch, will be one of several speakers. For more information, call Ralph O'Neal at 492-3922.

## Audiovisual & Computers

Apple II C computer, monitor, printer, mouse, \$495. 996-9690.

IBM 286/12 mHz clone, 40 MB HD, 1.44 and 1.2 floppies, EGA color, over \$1200 in access, books, games and SW, \$1250. 481-4238 or 795-1034.

Brother HR-15X daisy wheel printer, \$50. x38039.

Commodore 64C computer, disk drive, color monitor, Mannesman printer, modem, Geo and all SW manuals, \$450. Cecil, 488-0719.

IBM XT 640K RAM, 30 MB, 8087 coprocessor. CGA color graphics monitor, \$675. 328-1072.

Laptop 286 Zenith Super Sport 20, 20MB HD, 720K FD, 640K RAM, VGA, serial and parallel ports, carrying case, batteries, ex cond, \$1000 OBO. Dianne, x37714 or 286-8610.

Realistic 200 channel direct entry hand-held scanner, over 18K avail freq, incl AC charger, new NiCd batt, and Texas freq book, \$250. Phil, x30257 or 554-7377.

IBM XT computer 640K RAM, 30 MB HD, 2 FD, color Taxan monitor, \$975. x30092 or 481-3637.

Mitsubishi MGA stereo sys, incl integrated 50W amp, tuner, turntable and pair of speakers, \$350. x33572 or 996-1382.

Pair of Advent Prodigy tower speakers, \$275; Baby Advent speakers, \$175, x33572 or 996-1382.

Mitsubishi 19" portable TV, good color, VHF/UHF antenna, \$85. 286-5316.

## Pets & Livestock

Female Persian cat, 2.5 yr, silver w/amber colored eyes, regis, declawed. Henry, 283-6382.

Baby cockatiels, hand fed. Linda, 484-7834.

Regis exotic miniature Vietnamese pot bellied pigs, \$300-\$2000; exotic doves and finches, \$5 ea. James, 335-6710 or 482-6744.

AKC regis Dalmation puppies, six wks old, \$250. Patricia Clarke, 489-0214 or 787-1633.

Chinese Shar-Pei puppies, 2 males, champion bloodline, 1 white, 1 spf red, \$450. Cynthia, x37525 or 992-4617.

Minipups of New Zealand rabbits. Gail, 550-6200.

Chinese Shar-Pei puppies, wrinkles, pedigree, born 12-8-90, off-blk/chocolate, ex health, \$200-\$500. 482-3072.

AKC Doberman puppies whelped 12-23-90, red with rust markings, tails/dewclaws clipped, shots and wormed, avail Mar. 1, \$300/pup OBO. Ronnie, x31851 or 332-7501.

## Photographic

6 Kodak Carousel 140-slide trays, \$8 ea. Rich, x35137.

Canon AE-1, Canon 50mm lens, Vivitar 80-200mm lens, filters, \$250; Hanimax Motor Marine I underwater 35mm camera, flash, motor drive, close up lens, \$225. Kevin Walters, 486-6411 or 532-2181.

## Household

King sz water bed, \$100; sofa, \$200; computer w/ desk, \$600; tables, \$5 ea. x32571 or 280-0031.

Walnut table w/4 chairs and 2 leaves. 538-2299.

Bedroom suite, antique green full sz bed w/mirrored dresser, chest of drawers and 2 tables, \$675; G.E. dishwasher w/pot scrubber, almond, built-in, needs ad, \$70. Magdi Yassa, x33479 or 486-0788.

Eureka canister vacuum cleaner, 1.2hp, ex cond, was \$215, now \$125; King sz wrtd, dark oak, w/padded rails, imers, hr, pad, sheets, filler kit, ex cond, was \$260, now \$160. Gilles, x36267 or 480-7816.

Sears gas clothes dryer, \$45. 554-6200.

Sofa, 5 pc sectional, incl 2 recliners, 1 full sz fold-out bed, 1 corner pc, brown cloth, \$700. Jerry, 283-4360 or 486-5906.

White velvet swivel rocker, ex cond, needs cleaning, \$40. x31260 or 488-2941.

Secretary desk, good cond, \$130. 996-1442.

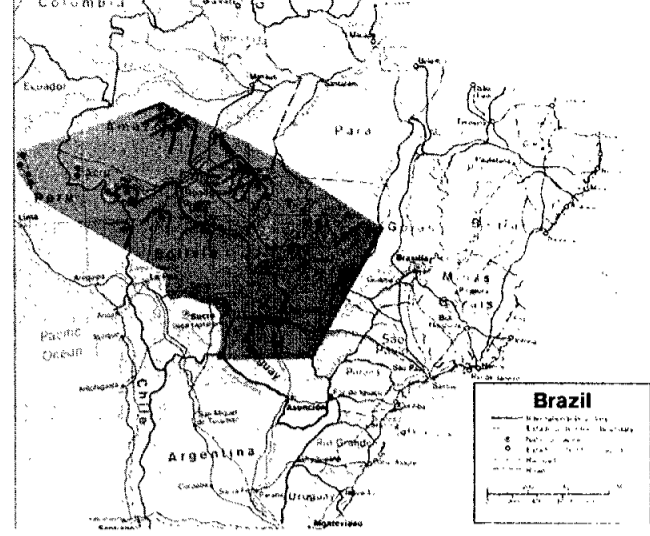
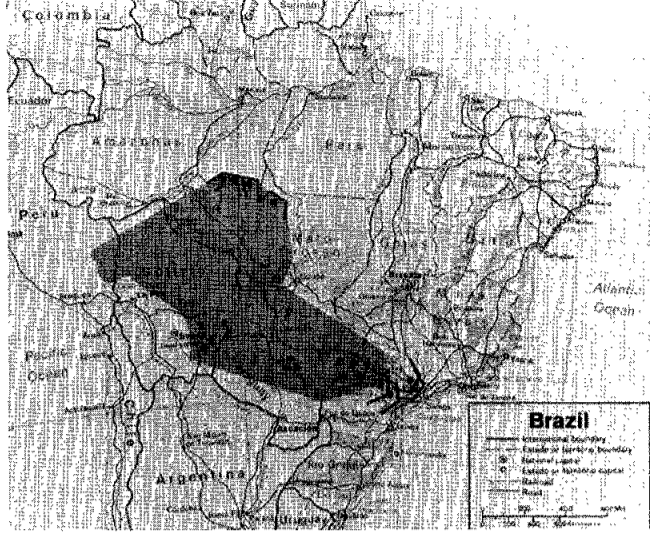
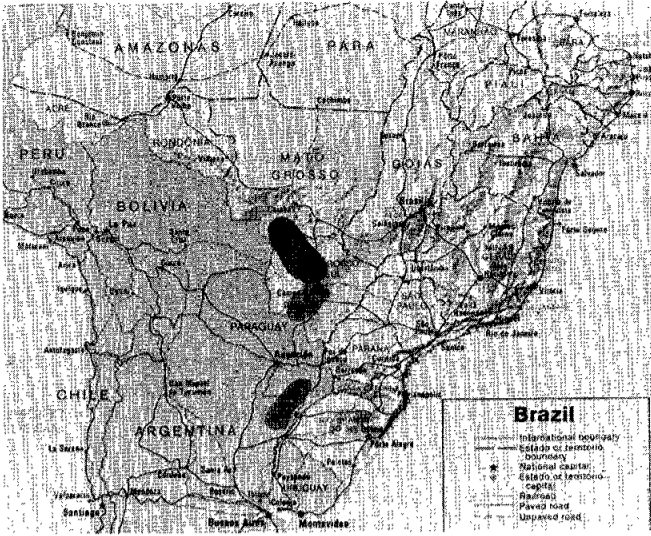
Chauncey Jerome 30 hour, antique mantel clock, c. 1840's, runs, good cond, \$425. 996-1442.

Double bed w/matt and box springs, incl headboard, \$35; sheet set, \$20. Judy, 538-18

1973

1984

1988



A study by JSC scientists shows annual smoke concentrations in the Amazon River basin have increased tenfold since the early 1970s. Growth of the smoke pall is depicted on the above maps showing, from left, areas photographed by astronauts on Skylab 3 in 1973 and the space shuttle in 1984 and 1988.

# Global Science

## Astronaut photography tracks growing Amazon smoke palls



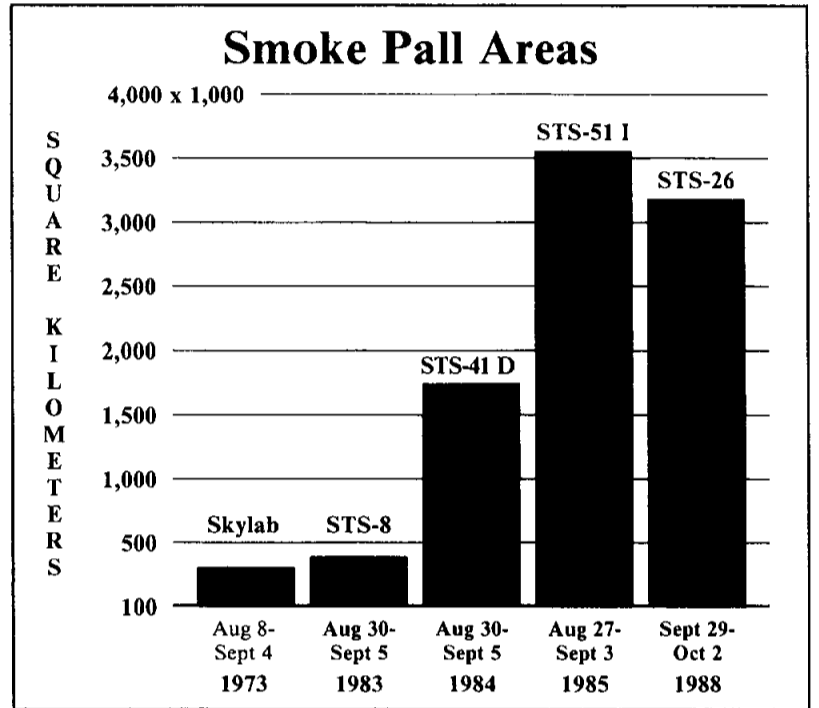
*'People who first see the study and photos are a little shocked.'*

—Dr. Mike Helfert



*'Astronaut photography can be a strong contributor to NASA's Mission to Planet Earth.'*

—Dr. Kam Lulla



By James Hartsfield

**JSC** Earth Observations scientists have pored over more than 4,000 photographs taken by astronauts since the start of U.S. space flight to assemble a history of annual smoke accumulations in South America's Amazon River basin.

What they have found is startling. The photographs show a smoke cloud that has grown from an area that would cover all of Texas in 1973 to a current yearly cloud that could cover a majority of the continental U.S.

The Amazon smoke palls have increased tenfold in size from an area encompassing 300,000 square kilometers in 1973, as documented by photography from Skylab 3, to a 3 million square kilometer smoke pall documented by photos from shuttle mission STS-26. A smoke pall study was co-authored by Space Shuttle Earth Observations Office scientists Dr. Kam Lulla and Dr. Mike Helfert.

In addition to astronaut photography, Lulla and Helfert reviewed photography from NOAA weather satellites to complement and fill in a gap in astronaut photos of the Amazon from 1988 to the present. Smoke palls are present in the Amazon only during the region's dry season, when burning of agricultural areas and land clearing occurs. The dry season normally lasts from late June through early November, so if no shuttle missions are flown during those months, no astronaut photography can be acquired.

"With this year's schedule, we may get a chance for more photographs of the smoke," Lulla said. "We have three flights that may see it."

The study is the first and only historical documentation of the increasing smoke over the Amazon and has been presented at several scientific meetings, including the Global Environmental Monitoring Symposium last fall, Lulla said. The results also have been published in various scientific journals, and were

seen and heard by the chief of the Brazilian space agency, who is attempting to track the rate of deforestation in Brazil.

"He was very impressed with the work and requested copies of the study," Lulla said. "He congratulated us on it and was very interested in seeing it continue. He was very supportive."

The size of the smoke concentrations and scale of its annual growth is difficult to grasp, said Helfert.

"People who first see the study and photos are a little shocked," Helfert said. "They're not surprised by the smoke — everyone knows they burn the forest — but they're surprised by the size, degree and persistence of it. They're surprised by the magnitude and they're surprised by how long it stays in place."

Out of the more than 4,000 photos that were reviewed, 800 were used in the final study. The photos were first visually interpreted, then charts were made and selected photos were digitized and pro-

cessed to better define the smoke from other elements, Helfert said.

Both authors agree that the global scale of the study required a shift in their normal scientific thinking.

"One of the toughest things to do is to switch the scale on which you think," Helfert said. "You go from a regional scale to continental to possibly global. It is difficult to realize the intensity of a process that large."

JSC's Earth observations scientists have studied smaller areas of change through space photography, such as declining lake levels, volcanoes and regional deforestation or drought. But many other large-scale studies are possible, they said.

"You name the phenomenon and if change is involved, it can be tracked over time," Helfert said. "Other examples can be pollution over many areas or large dust storms over Africa and China."

One of many unique perspectives of astronaut photography is that the database for some areas is the longest record for space photos

available. Manned photography was available earlier than satellite photos.

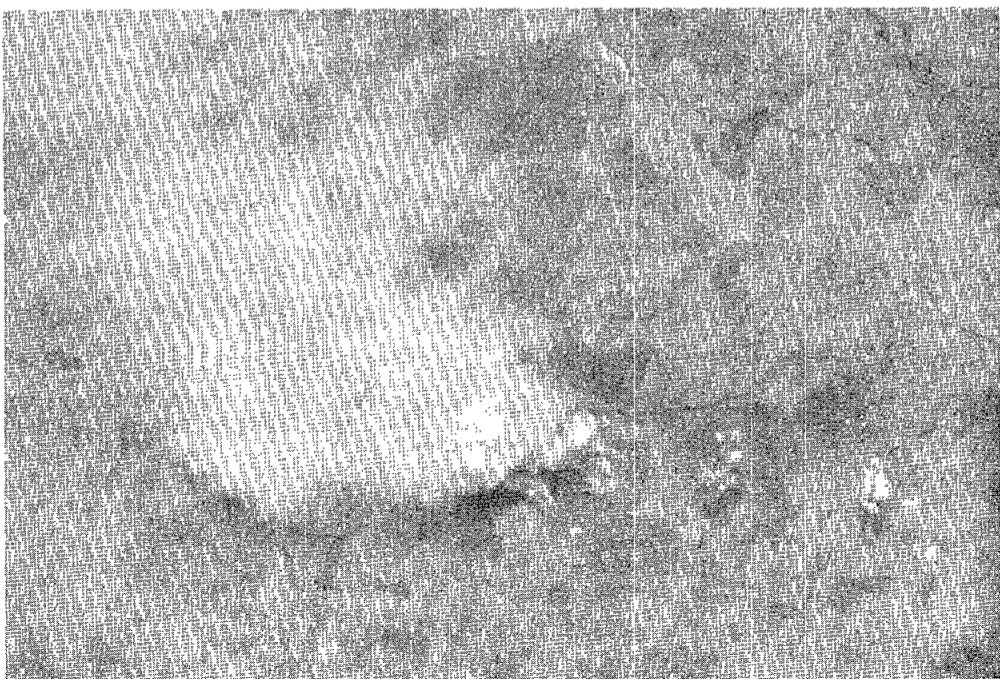
But astronaut photography can be even more useful when it is coupled with information provided by unmanned satellites. The two information sources can fill in time gaps in one another's data, as well as provide two different perspectives, Lulla said.

"Astronaut photography can be a strong contributor to NASA's Mission to Planet Earth," Lulla said.

The two scientists are anxious for astronauts to photograph the Amazon region again.

"If we get a chance to see it this year, we don't necessarily expect to see it larger than it has been," Lulla said. "Probably, it would be about the same as from the 1988 shuttle photos. We don't expect a big change that quickly. But we do expect to see it consistent."

Monitoring of the smoke areas by the office also is expected to persist. "As long as it's observable, we'll be watching it," Helfert said.



Smoke from a single fire fans out over an area of deforestation in the Amazon jungle in one photo from STS-41D in 1984.



Smoke from hundreds of Amazon forest fires spreads to the horizon, blocked by the Andes Mountains on the western South American coast, in this photograph from STS-26 in 1988.

# Antarctic ozone hole in 1990 equals earlier low

Continuing observations by the Total Ozone Mapping Spectrometer have confirmed that ozone depletion over Antarctica in 1990 matched the levels observed in 1987 and 1989, the lowest yearly ozone totals recorded.

TOMS, an instrument aboard NASA's NIMBUS-7 satellite, has monitored stratospheric Antarctic ozone concentrations since 1979.

Research by NASA scientists at Goddard Space Flight Center indicates that the 1990 Antarctic "ozone hole" matched the record 1987 ozone depletion in depth, duration and area. During the formation of the hole in August, the total ozone values were the lowest yet recorded.

The "ozone hole" is a large area

of intense ozone depletion over the Antarctic continent that typically occurs between late August and early October and breaks up in mid-November. Ozone, a molecule made up of three atoms of oxygen, comprises a thin layer of the upper atmosphere that absorbs harmful ultraviolet radiation from the Sun. In the presence of sunlight, atoms of chlorine and other chemicals can strip an oxygen atom from an ozone molecule, leaving behind an oxygen molecule that does not absorb the radiation.

Because of the catalytic nature of the reactions, each chlorine atom can destroy thousands of ozone molecules. In meteorological conditions that are regularly monitored in the

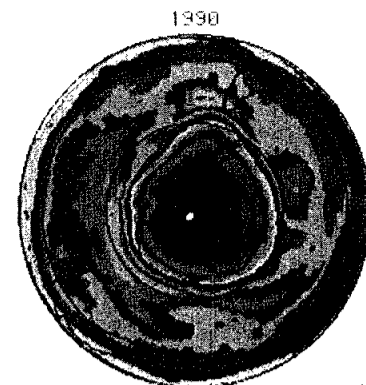
Southern Hemisphere, this process creates the annual ozone hole over Antarctica.

TOMS data is one part of a larger NASA effort to study ozone depletion. Its data is calibrated by the Shuttle Solar Backscatter Ultraviolet instrument, a Space Shuttle payload next scheduled for flight aboard STS-43 in July. The Upper Atmosphere Research Satellite, scheduled for launch in November, will investigate the chemistry, dynamics and energy flows of the upper atmosphere, particularly in regard to ozone depletion.

The ATLAS-1 space shuttle mission in April 1992 will carry several instruments that will complement TOMS measurements of global total

ozone by studying the distribution of ozone at various altitudes. In addition, NASA plans to launch three more TOMS instruments in the next few years: aboard a Soviet Meteor satellite in August, aboard a U.S. expendable rocket in late 1993 and aboard the Japanese Advanced Earth Observing Satellite in 1995.

These complementary missions are important to understanding the dynamic processes that can lead to ozone depletion. Though the specific chemical interactions and meteorological conditions associated with ozone depletion are relatively well understood, general atmospheric chemistry and physics need further investigation before predictions can be made about ozone depletion.



This computer-enhanced image from the Total Ozone Mapping Spectrometer on Nimbus-7 shows the size of the Antarctic ozone hole in October 1990. The lowest ozone values occur in the three shading levels at the center.



JSC Photo by Benny Benavides

**BEARING BARS**—Pedro Rivera of JSC's Quality Assurance Engineering Division gets his second lieutenant's bars from his wife, Elsie, and Astronaut Jerry Ross in JSC's Bldg. 226. Ross, an Air Force lieutenant colonel, swore in Rivera on Feb. 22. Rivera received his commission in the Air Force reserves after serving as a staff sergeant. He works with the Quality Assurance Mission Manager's Group, monitoring and aiding quality assurance activities on certain shuttle missions.

## IMU expert earns partnership award

James M. Lecher, a senior staff engineer for Lockheed Engineering and Sciences Co., will receive the JSC Quality Partnership Award next week.

JSC Director Aaron Cohen is scheduled to present the award, which recognizes Lecher's contributions to the Space Shuttle Program, on Tuesday.

Lecher is the leader of the LESC inertial measurement unit support team for JSC's Navigation, Control and Aeronautics Division. IMUs are flight-critical hardware, providing velocity and attitude data by which the space shuttle's general purpose computers steer.

Lecher's Inertial Systems Laboratory calibrates, verifies and assesses the suitability of each IMU before it is flown. Once an IMU passes assessment, it becomes a flight-ready spare and eventually is installed in a shuttle.

In selecting him as its semi-annual award winner, JSC's Safety, Reliability and Quality Assurance Office cited specific quality contributions made by Lecher: He holds daily ISL staff meetings to review milestones and the

activities of each of the ISL's 16 staff members, and chairs weekly ISL working group meetings to review the technical progress toward closing all problem and discrepancy reports on IMU test articles. He has designed extensive formal documentation for each IMU hardware anomaly that is investigated, and is responsible for an extensive inventory of test software.



Lecher

"Lecher's constant vigilance and dedication to all aspects of the ISL operation have resulted in unqualified success for both the ISL and the IMU hardware in supporting the space shuttle flight program," Kenneth Cox, chief of the Navigation, Control and Aeronautics Division, said in his nomination.

SR&QA uses the Quality Partnership Award to recognize individuals and teams outside SR&QA that play key roles in helping employees and contractors reach a common goal of excellence.

Nominations should be sent to M. Conley Perry, chief of the Quality Assurance and Engineering Division, Code ND, x34352.

# Atlantis astronauts to perform first space walk in years

(Continued from Page 1)

toward the Sun. Once GRO clears the payload bay, the two solar panels that power the observatory will be unfurled. *Atlantis* then will pitch around toward the Sun to recharge GRO's batteries before releasing the observatory from the orbiter's arm.

At 35,000 pounds, GRO is the heaviest satellite to date deployed with the mechanical arm.

"So we move that very slowly," Godwin said during the preflight news conference Monday.

Lead Flight Director Chuck Shaw said GRO does not have the orbital release criteria attached to many planetary or geosynchronous payloads. The observatory can be released in any attitude on any orbit, he said.

On the fourth day, Ross and Apt will venture outside the orbiter for a six-hour extravehicular activity that will be the first since Ross closed *Atlantis'* airlock door on Dec. 1, 1985, during STS-61B.

During their spacewalk, Apt and

Ross will test several different translation devices called the EVA Development Flight Experiment that could be the predecessors of instruments to be used on Space Station *Freedom*.

"You've got to find ways to move around on a structure like that," Shaw said. "There are different ways depending on what you're going to be doing. you can have simple ways like a rope to climb back and forth on. It's a very simple tool, but it's very labor intensive for the user. If you have something to carry it's nicer to use a more complex system like an elevator. Our version of the elevator is the RMS.

"What the EDFE is going to do is give us an entire suite of activities, varying from the very simple... to the very complex."

Apt and Ross will evaluate three carts that will carry them down a 47-foot rail mounted on the port side of the payload bay. When using the first cart, the manual version, the astronaut mounts a foot restraint and pulls with his arms to propel himself down

the track. A mechanical version resembles a railroad car mechanism with which the astronaut pumps a handle to move. The third is an electrical version with which the astronaut turns handles to create electricity to move the truck.

Apt and Ross will both evaluate all three vehicles, at times carrying each other to simulate transporting cargo to a work station.

"I look at this as a flight test type of demonstration in which we are looking at the feasibility of different types of transportation methods on board the orbiter which can be applied to space station or other large structures," said Ross, who will be wearing red stripes on his space suit. "But also we are looking to gain a lot of basic engineering data that we can use in the design process for space station or other payloads that might fly in the orbiter's payload bay."

The two space walkers also will evaluate the RMS arm speed and maneuverability and perform a loads analysis on a fixed, instrumented work station called the Crew Loads

Instruments Pallet.

While Apt and Ross are outside *Atlantis*, Cameron will monitor the EVA activities and systems from the crew cabin.

*Atlantis* also will carry six secondary payloads. The BioServe Instrumentation Technology Associates Materials Dispersion Apparatus will investigate biomedical and fluid sciences. BIMDA, as it is called, consists of four minilabs that can carry 150 samples each and six bioprocessing modules. STS-37 will be BIMDA's first flight.

BIMDA is sponsored by BioServe Space Technologies, one of NASA's 16 Centers for the Commercial Development of Space. The minilabs are built by Instrumentation Technology Associates, a small commercial space firm based in Exton, Pa.

The Center for Macromolecular Crystallography, another CCDS, is sponsoring the ninth flight of the Protein Crystal Growth experiment, but this time in a new configuration. Dr. Marianna Long, assistant director of the center, said the PCG on

*Atlantis* will use temperature, gradually lowered in four separate steps, to grow insulin crystals.

The Space Station Heat Pipe Advanced Radiator Element also will be flown in a new configuration on STS-37. SHARE I was flown in the payload bay on STS-29. SHARE II consists of two plexiglass test articles that will fit into one middeck locker. Investigators are looking at a new manifold design and bubble management.

The Shuttle Amateur Radio Experiment will make its fourth appearance on STS-37. All crew members hold amateur radio licenses and will attempt to contact earthbound operators as the shuttle zooms overhead.

The Radiation Monitoring Equipment and the Air Force Optical Site Calibration Test also are flying as secondary payloads.

*Atlantis* will perform its deorbit burn on its 77th orbit, landing at Edwards Air Force Base slightly more than five days after launch. Landing will occur about 9:32 a.m. CST, based on a 9:20 a.m. launch.

## Discovery rollback conservative move

(Continued from Page 1)

that open and close the doors. The actual hinges are separate from these mechanisms. The doors must shut tightly following jettison of the external tank to protect the spacecraft from the extreme heat of reentry.

"Our engineering analysis says that there should be no issue and that the doors most assuredly would function in zero-gravity. We performed a test on *Columbia* that simulated what would happen if the (supporting) lug cracked all the way off and became essentially free, and our conclusion was that the door

would still function and close," Lenoir said.

Although documented events are suspected of overstressing the doors and initiating the cracks on *Discovery*, no conclusive evidence could be found to pin down exactly when the cracks began. With the cause of the cracks undetermined, Lenoir said, managers decided to be conservative.

"Whenever we have to err, we are going to err on the safe side. I think most of us came to the conclusion over the last 24 hours that indeed we were walking right on that fine line,"

Lenoir said. "Given that... let's take a step on the safe side and that says let's roll back and fix it."

Very small fatigue cracks have been found on *Columbia*, but they are not comparable to *Discovery's*, Space Shuttle Program Director Bob Crippen added. The areas in question eventually will be strengthened on all the spacecraft, but the upcoming launches of *Columbia* and *Atlantis* will not be affected, Crippen added.

The delay in launching STS-39, however, will cause some changes in the flight manifest for this year, most likely causing one less shuttle flight.

## Space News Roundup

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Editor . . . . . Kelly Humphries  
Associate Editors . . . Pam Alloway  
Kari Fluegel

## Rare isotope found on LDEF significant

(Continued from Page 1)

isotope during measurements at the Kennedy Space Center shortly after LDEF's return. Researchers working with removed external spacecraft components at Marshall and the University of Alabama, Huntsville, confirmed the Beryllium-7 presence and showed that it was confined to a very thin layer — the surfaces on the leading edge of the LDEF.

LDEF was returned from space by the Space Shuttle *Columbia* in January 1990 after nearly six years in Earth orbit.