

Space News Roundup

Vol. 31

March 13, 1992

No. 11

JSC experiment yields water from Mars meteorites

By Kari Fluegel

A single drop of water rarely causes excitement in the scientific community, but a few milligrams of liquid extracted from a meteorite may have started to answer one of the great mysteries of planetary science.

Were the canals seen on the surface of Mars carved by once great torrents of rushing water or by some other process?

Dr. Everett Gibson of the Planetary Sciences Branch in JSC's Solar System Exploration Division; Dr. Haraldur Karlsson, formerly a

National Research Council postdoctoral fellow at JSC; and scientists at the University of Chicago have analyzed a drop of water extracted from several meteorites believed to have come from Mars and have concluded that the oxygen isotopes in the water were extraterrestrial.

"It's really a beautiful piece of scientific work to do this analysis," Gibson said.

The results of the team's findings are being published in today's issue of the journal SCIENCE.

Photographs returned to Earth

from the Mariner 9 and Viking spacecraft show features that suggest Mars once had a water-rich atmosphere and flowing water on its surface. Sometime in its history, however, most of the water disappeared leaving only minute amounts of vapor in the atmosphere.

Through the years, several meteorites have been collected on Earth that scientists have identified as Martian by comparing them to information gleaned by Viking. Six of these meteorites were used for the water extraction.

Gibson said the meteorites were heated in steps in a small vacuum system at JSC to extend trace amounts of water. The water samples were hand carried to the University of Chicago for analysis of oxygen isotopes. Although the water droplets were less than 1/64th of an inch in diameter, it was enough to do the analysis.

The analysis determined that the oxygen isotopes in the water were different from the oxygen isotopes in the silicate portion of the meteorites. In other words, the water had a differ-

ent parent source than the oxygen in the silicate minerals in the meteorites. That parent source could have been the Martian atmosphere, an ancient Martian ocean or even a comet that impacted the planet, Gibson said.

The lack of a homogeneous oxygen isotopes on Mars supports the theory that Mars does not have plate tectonics. If such a process had been active on Mars, the oxygen isotopes would have been homogenized as they are on Earth.

Please see **WATER**, Page 4

Budgets hold good and bad news for JSC

By Kelly Humphries

The "good" news is that when President Bush's proposed 1993 NASA budget shakes down to the center level, JSC stands to receive 9.9 percent more than this year.

The "bad" news is that when the numbers for fiscal 1992 got down to JSC's level, the center received only 3.1 percent more than in 1991 and barely enough to keep up with the rising costs of running the institution.

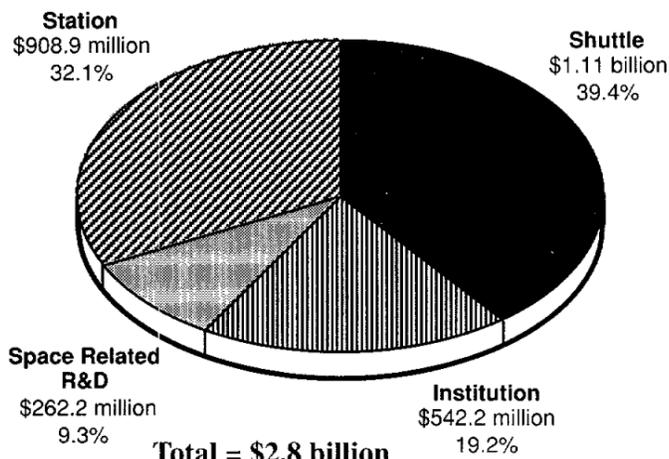
That's why employees are having to deal with inconveniences like curtailed back gate hours, fewer taxis and reduced distribution of JSC publications and announcements, said Grady McCright, deputy director of JSC's Center Operations Directorate.

JSC Comptroller Wayne Draper said JSC received a total of \$2.83 billion for fiscal 1992, or about 20 percent of NASA's total \$14.35 billion appropriation. Although that was an overall 3.1 percent increase for JSC, the institutional budget for operation of facilities took a 7.7 percent cut, from \$109.4 in 1991 to \$101 million in 1992.

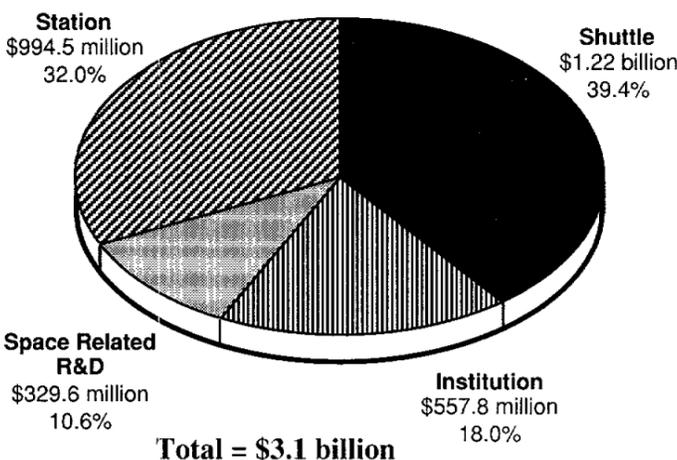
COD, which has the task of maintaining the center and providing for its institutional needs, is bearing the brunt of much of the belt-tightening because when Congress passed the '92 NASA budget it gave almost full funding to Space Station *Freedom* at the expense of other funding sources.

Please see **BUDGET**, Page 4

JSC Budget Breakdown - Fiscal 1992



JSC Budget Breakdown - Fiscal 1993



Bush chooses TRW's Goldin to head NASA

Daniel S. Goldin, vice president and general manager of TRW Space and Technology Group, was nominated Wednesday by President Bush to become NASA's new administrator.

"Dan Goldin will ensure America's leadership in space as we enter the 21st Century," Bush said in a news conference announcing his decision.

Bush praised Goldin's work with the National Space Council headed by Vice President Dan Quayle, adding that his nominee is "a leader in America's aerospace industry and a man of extraordinary energy and vitality."

Goldin, 51, has been involved in a number of NASA projects including the Tracking and Data Relay Satellite System, the Compton Gamma Ray Observatory and the Advanced Technology Satellite now under development. He also has been involved in Strategic Defense Initiative work. He joined TRW in 1967 and has held a variety of senior management posts.

NASA Administrator Richard Truly said he was pleased to learn of the

nomination and noted that Goldin has a long history of working in the space arena.

"I am pleased to learn that President Bush intends to nominate Daniel S. Goldin as the next administrator of NASA," Truly said.

"The continued achievements of NASA's space and aeronautics research programs are vitally important to the nation, and Mr. Goldin will be arriving at a time of great challenges and opportunities for the future," he continued. "I wish him every success as he comes to this elite organization."



Goldin

Truly resigned last month, effective April 1.

JSC Director Aaron Cohen was later appointed acting deputy administrator of the agency and is expected to help coordinate the transition between the outgoing and incoming administrators.

Prior to joining TRW, Goldin worked at NASA's Lewis Research Center as a research scientist exploring the use of electric propulsion for interplanetary space travel. He is a 1962 graduate in engineering from City College, New York.

Managers give thumbs-up to March 23 ATLAS launch

By James Hartsfield

Shuttle managers Tuesday gave an official nod to launch *Atlantis* at 7:01 a.m. CST March 23 on STS-45 carrying the first Atmospheric Laboratory for Applications and Science (ATLAS-1).

The flight readiness review, a final status check of all mission preparations, went smoothly and was completed by managers at Kennedy Space Center by late afternoon. At Launch Pad 39A, a final test was performed on all electrical and mechanical systems in *Atlantis*' main engines, and, by today, technicians were scheduled to begin closing out the spacecraft's engine compartment.

The STS-45 crew — Commander Charlie Bolden; Pilot Brian Duffy; Mission Specialists Kathy Sullivan, Dave Leestma and Mike Foale; and Payload Specialists Dirk Frimout and

Byron Lichtenberg — will travel to KSC on March 20 to prepare for launch.

Elsewhere at KSC, *Endeavour* was expected to move to Launch Pad 39B early today to begin preparations for a 20-second test-firing of the main engines targeted for April 6. The launch of *Endeavour*'s maiden space flight, STS-49 to retrieve and reboost the INTELSAT VI, is now targeted for May 7.

Columbia, currently in KSC's No. 3 processing hangar, is going for a June launch on STS-50, carrying the United States

Microgravity Lab. This week, the extended duration orbiter pallet, a frame holding extra hydrogen and oxygen tanks needed to stay in space for a 13-day flight, was installed in *Columbia*'s cargo bay. Work also has begun on stacking the STS-50 solid rocket boosters.



NASA Photo

The STS-45 crew takes time out from terminal countdown demonstration test activities for an informal portrait next to *Atlantis*' main engines at Launch Pad 39A. From left are Payload Commander Kathy Sullivan, Payload Specialist Byron Lichtenberg, Mission Specialist Mike Foale, Pilot Brian Duffy, Payload Specialist Dirk Frimout, Mission Specialist Dave Leestma, Commander Charlie Bolden and backup Payload Specialist Rick Chappell.

Early treatment saves JSC from computer virus

By Brian Welch

By the time the dust settled last week, only 13 cases of the dread Michelangelo virus were detected at JSC, all before the March 6 activation date.

But if the tumult was, as JSC Computer Security Manager Lee Snapp put it, "more hype than virus," it points to a perennial problem for the estimated 15,000 or more users of IBM-based and Apple computers in the JSC community. With hundreds of virus programs out there, it is a problem that isn't going away soon.

In the meantime, the watchword for computer users should continue to be caution, officials advise.

"Michelangelo was a bust because of early warning and prevention," said John Jurgensen, a computer security official with the Information Systems Directorate. "The only way to deal with computer viruses is to Please see **MICHELANGELO**, Page 4

JSC

Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Gift Store from 10 a.m.-2 p.m. weekdays. For more information, call x35350.

EAA Walt Disney on Ice (noon March 28, Summit): \$8.
Sea World, Astroworld, Waterworld & Six Flags tickets now available.
Movie discounts: General Cinema, \$4; AMC Theater, \$3.75; Loews Theater, \$4.
The following discount tickets will be available soon:
EAA Easter Egg Hunt, April 11.
EAA Country Western Dance, April 18
EAA Astroworld Night, April 28
EAA JSC Picnic, May 2.

JSC

Gilruth Center News

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

EAA badges — Dependents and spouses may apply for photo identification badges from 6:30-9 p.m. Monday through Friday. Dependents must be between 16 and 23 years old.

Weight Safety — Required course for employees wishing to use the Gilruth weight room. The next class will be from 8-9:30 p.m. March 31. Cost is \$5.

Defensive driving — Course is offered from 8 a.m.-5 p.m. and April 18. Cost is \$19.

Aerobic dance — High/low-impact classes meet from 5:15-6:15 p.m. Tuesdays and Thursdays. Cost is \$32.

Aikido — Martial arts class meets Tuesdays and Fridays. Cost is \$35 per month.

Sign language — Six weeks of instruction in the third most used language in the United States. Course meet from 6:30-8:30 p.m. Mondays beginning March 23. Cost is \$55.

Scuba — Scuba classes will meet at 6:30 p.m. Tuesdays and Thursdays beginning April 9. Cost is \$190 plus \$20 for the open water dive trip. Personal equipment costs about \$90.

Volleyball workshop — Eight-week program will meet Saturdays beginning March 21. Open beginner classes will meet from noon-2 p.m. Mixed advanced classes will meet from 2-4 p.m. Enrollment is limited to 24 students. Cost is \$25.

Self-defense workshop — The basics of self defense will be taught from 5:30-6:30 p.m. March 25. Workshop is free.

Intercenter run — Runners in the 10-kilometer or 2-mile races may turn in their times for the annual Intercenter Run at the Rec Center throughout April.

Fitness program — Health Related Fitness Program includes medical examination screening, 12-week individually prescribed exercise program. Call Larry Wier, x30301.

JSC

Swap Shop

Property

Lease: University Place townhouse, 2-2.5, \$850/mo. Dave, x38156 or Eric, x38420.

Lease: Webster/Ellington condo, lg 2 BR, \$475/mo. Dave, x38156 or Herb, x38161.

Sale: Meadowgreen, new section, 5-2.5-2, 2 story, 2 LRs, FPL, 8.5 percent FHA, will exchange for smaller house. 488-3191.

Rent: Galveston condo, furn, sleeps 6, Seawall Blvd/61st St, pools, cable TV, wknd/wkly/dly. Magdi Yassa, 333-4760 or 486-0788.

Rent: Galveston beach house, C/AH, furn, dly/wkly/mo. Ed Shumilak, x37866.

Sale: Friendswood, 2 lots, 0.95 acre, all util, \$25K/\$29K or \$39K/both. Ron, 996-9724.

Lease: El Lago, 3-2.5-2D, corner lot near water, RV and boat pad, \$1K/mo. x38068 or 532-1949.

Lease: Pipers Meadow, 2-2-2A, vaulted ceiling, blinds, fan, refrig, fenced yard, avail 4/1, \$700/mo plus dep. 486-0315.

Sale: CLC, 3-2.5-2A, formals, den, game room, vinyl siding, built-ins, storm doors, low util, \$107.9K. Tom, x30681 or 480-5309.

Sale: Townhouse, 3-2.5-2CP, patio, FPL, new C/AH, convenient to JSC, \$65.5K. Ed, x36969 or 332-0442.

Sale: University Green townhouse, 2-2.5, detached garage, 2 story, corner unit, custom drapes/blinds, fans, FPL, assum w/app. 283-5894 or 480-9620.

Sale: Friendswood, 3-2-2, brick California contemp, high ceilings, fans, fresh paint in/out, green-house, \$65K. Jeff, x31177.

Lease: Sycamore Valley, near Ellington, 4-2-2, 2000 sq ft on cul-de-sac, hot tub, \$950/mo. 992-1338.

Sale: Countryside, 3-2.5-2A, 2 story, corner lot, cov deck, all BR's up, int util rm, \$66.9K. 554-7623.

Sale: Friendswood, 3-2-2, 2 living areas, dining, lg master BR, parquet entry, wood deck, \$63.5K. 482-6651.

Sale: Pipers Meadow, 3-2-2, new carpet/paint, FPL, custom blinds, 1650 sq ft, \$76.5K. Mike, 282-3156 or 286-6254.

Sale: Bay Glen, 3-2.5-2, 1-1/2 story, vaulted LR, DR, master, masterbath, cul-de-sac, sec sys, whirlpool bath, FPL, ceramic entry, Velissa, 621-7201.

Rent: Nassau Bay townhouse, 2-2.5, FPL, pool, pty, x36665 or 333-9733.

Sale: Pipers Meadow, 3-2-2, 1400 sq ft, \$67K. x34794.

Cars & Trucks

'78 Porsche 924, 4 spd, red, blk int, 62K mi, ex cond, \$4195. x35180 or 326-3706.

'83 Mazda RX7 GSL, beige maroon, leather, new paint, loaded, ex cond, \$3K. 790-4671 or 472-7059.

'84 Nissan 300 ZX, 2+2, auto, A/C, stereo, cass, cruise, elec mirrors, \$4350. 481-3637.

'91 GMC Jimmy S-15, SLE pkg, 2 dr, custom mags, alarm, loaded, ex cond, \$14K OBO. Chris, 280-1932 or 337-5410.

'82 Volkswagon PU, AM/FM, 56K mi, ex cond, \$1150. Jeff, 532-1991.

'90 Ford Bronco II, red, 5 spd, A/C, AM/FM/cass, sport wheels, tinted windows, \$9950. Tom x35457 or 488-1191.

'79 Explorer mini rec veh, Dodge 360 eng, self contained w/stove, refrig, bath, A/C, good cond, \$6.5K. 333-3499.

'67 Chevy II Nova SS, auto, 2 dr, new 6 cyl 250 eng, \$2K OBO. Geno, 280-1505 or 992-2156.

'90 Lemans LE, new car warr, A/C, auto, 12.5K mi, ex cond, \$6K. x31354 or 946-3809.

'85 Nissan Stanza, 4 dr, all pwr, AM/FM/cass, A/C, sunroof, std, needs trans work, 150K mi, \$1.8K OBO. Rudy, 283-9320.

'82 Ford Escort station wagon, rebuilt motor, auto trans, good cond, \$950 OBO. 485-5694.

'85 BMW 524 TD, auto, A/C, all pwr, sunroof, tinted windows, new tires, good cond, \$7.2K. Phan, x31618 or 644-6442.

'88 Chevy Silverado PU, new tires, bedliner, tinted windows, custom int/ext, low mi, loaded, good cond, \$9K OBO; '74 CJ5 Oklahoma jeep, no salt damage, good cond, \$4K OBO. 489-7286.

'79 Oldsmobile Cutlass custom cruiser station wagon, new A/C compressor, loaded, 105K mi, \$900; '76 Fiat X19 convert hardtop, 55K mi, \$750. x33335 or 326-2582.

'84 Corvette, blk w/tan leather int, auto, California sunroof, tinted windows, new tires, loaded, good cond, \$10K. Marion, x31622 or 482-9381.

'87 Volvo 760 turbo, blk leather int, new turbo, sunroof, auto, A/C, all pwr, loaded, \$11K OBO. Steve or Mary, 480-7127.

'85 Chevy Cavalier, 4 dr, 4 cyl 2.0L, auto, new tires and brakes, 75K mi, ex cond, \$2.4K. 488-5522.

'90 Dodge Dakota convert, all pwr, alarm sys, rust protection, svc contract, 13K mi, ex cond, \$13.5K OBO. x49744 or 333-9742.

'78 Volvo 264GL, 6 cyl, sunroof, FM, no rust, 84K mi, good cond. Gary, 283-5781 or 480-9716.

'90 Lemans LE, factory warr, 11.5K mi, ex cond, \$6K. 946-3809.

'78 Porsche 928, brown w/leather int, auto, 75K mi, ex cond, \$8.9K. Bill, x39980.

'90 300ZX, 5 spd, T-top, tinted windows, 22K mi, ex cond, \$20.9K OBO. Rick, 282-3733.

'53 Chevy PU, \$1.9K OBO. 534-6750.

'84 Ford Crown Victoria, good cond, \$1495. 482-8820.

'90 300ZX, twin turbo, 300hp, 155mph, 12K mi, 4 wheel steer, antilock brakes, limited slip diff, Bose stereo, ex cond, \$2K. x38165 or 486-4141.

'78 Pontiac Bonneville, burgundy w/matching int, ex cond, \$2K. Lawrence Moton, 541-5846.

'19 Air Flow travel trlr, rebuilt, new tires, tandem axle, A/C, self-contained, ex cond, \$3.2K. Frank D., x33838 or 581-2846.

'75 Oachita 16' fiberglass bass boat w/85hp Johnson, Holsclair tilt trlr, depth finder, ex cond, \$1650. x34784 or 482-5190.

'86 Bass Buggy 20' pontoon boat w/trlr, 35hp Mercury, less than 70 hrs, elec start, Hummingbird LCR-2000 depth recorder, 2-6 gal tanks, new batt, deluxe pkg, \$4.5K OBO. 282-4231 or 992-3351.

'91 O'Brian Elite Windsurfer, 11', 2 sails. John, x35514 or 332-0134.

'19' boat trlr, 2.5K lbs, \$450. 534-2179.

'18' Prindle, double trapeze, new sails, ex cond, \$1.8K; 224" Gulf Coast sailboat, main jib and spinnaker, new uphols, ex cond, \$2.5K. Greg, x32259 or 474-7634.

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JSC

Dates & Data

Today

Cafeteria menu — Special: fried chicken. Entrees: fried shrimp, baked fish, beef stroganoff. Soup: seafood gumbo. Vegetables: okra and tomatoes, buttered broccoli, carrots in cream sauce.

Monday

Cafeteria menu — Special: meat sauce and spaghetti. Entrees: franks and sauerkraut, sweet and sour pork chop with fried rice, potato baked chicken. Soup: cream of potato. Vegetables: French beans, buttered squash, lima beans.

Tuesday

Aerobike workshop — Langley Research Center is sponsoring an Aerobike Technology Workshop March 17-19 at the Omni Hotel in Newport News, Va. For more information, call Bionetics Meeting Support Division, 804-722-0330.

Cafeteria menu — Special: smothered steak with dressing. Entrees: beef stew, liver and onions, shrimp Creole. Soup: navy bean. Vegetables: buttered corn, rice, cabbage, peas.

Wednesday

Cafeteria menu — Special: salmon croquette. Entrees: roast beef, baked perch, chicken pan pie. Soup: seafood gumbo. Vegetables: mustard greens, Italian green beans, sliced beets.

Thursday

JAIPCC '92 — The fourth annual JAIPCC (Joint Applications in Instrumentation, Process and Computer Control) '92 Symposium will

be held March 19 at the University of Houston-Clear Lake. The theme of the symposium, sponsored by the University of Houston-Clear Lake, the Institute of Electrical and Electronics Engineers and the Instrument Society of America, is "Technologies for New Exploration." Dr. David Criswell of the University of Houston-university Park will discuss "Lunar-based Power System to Supply Earth with 20,000 GW of Electric Power" at the luncheon. For more information, call Liwen Shih, 283-3866.

Cafeteria menu — Special: stuffed cabbage. Entrees: beef tacos, ham and lima beans. Soup: beef and barley. Vegetables: ranch beans, Brussels sprouts, cream style corn.

March 20

UNIX meeting — The JSC UNIX Systems Administration Group will meet at 2 p.m. March 20 in Bldg. 12, Rm. 256. Michael Heidt will discuss "Setting Up USENET News-feeds." For more information, call Mark Hutchison, x31141.

Abstracts due — The deadline for abstracts for the 17th annual Technical Symposium co-hosted by the Houston Section of the American Institute of Aeronautics and Astronautics and the University of Houston-Clear Lake's High Technologies Laboratory is March 20. Abstracts of 250 words or less should be submitted with a completed NASA Form FF427 to Bill Best, AIAA vice-chair, technical, RSOC/R12A-130, 600 Gemini, Houston, 77058. For more information, call Best at 283-0261.

Cafeteria menu — Special:

Salisbury steak. Entrees: fried shrimp, deviled crabs, ham steak. Soup: seafood gumbo. Vegetables: buttered carrots, green beans, June peas.

March 24

Picnic committee meets — The 1992 JSC Picnic Committee will meet at 4:30 p.m. March 24 at the Gilruth Center. For more information, call Ginger Gibson, x30596.

March 25

BANN meets — The Bay Area NAFE (National Association of Female Executives) Network will meet at 11:30 a.m. March 25 at South Shore Harbour Country Club. Dr. Jeffrey Ross, podiatry and sports medicine specialist, will discuss "The Highs and Lows of Hi-Heels." For more information, call Sharon Westerman, 486-8927.

March 29

Showcase '92 — The University of Houston-Clear Lake will host its fifth annual spring open house, Showcase '92, from 1-4 p.m. March 29 in Atrium II of the Bayou Bldg. representatives from academic areas, admissions, financial aid and student organizations will be available. For more information, call 283-2500.

HSS meets — The Houston Space Society will meet at 7:30 p.m. March 20 in Rice University's Space Sciences Bldg., Rm. 106. Shannon Walker, a doctoral candidate in space sciences at Rice, will discuss "Lightning on Venus." For more information, call Clifford Carley, 923-7221.

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Cars & Trucks

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'83 Mazda RX7 GSL, beige maroon, leather, new paint, loaded, ex cond, \$3K. 790-4671 or 472-7059.

'84 Nissan 300 ZX, 2+2, auto, A/C, stereo, cass, cruise, elec mirrors, \$4350. 481-3637.

'91 GMC Jimmy S-15, SLE pkg, 2 dr, custom mags, alarm, loaded, ex cond, \$14K OBO. Chris, 280-1932 or 337-5410.

'82 Volkswagon PU, AM/FM, 56K mi, ex cond, \$1150. Jeff, 532-1991.

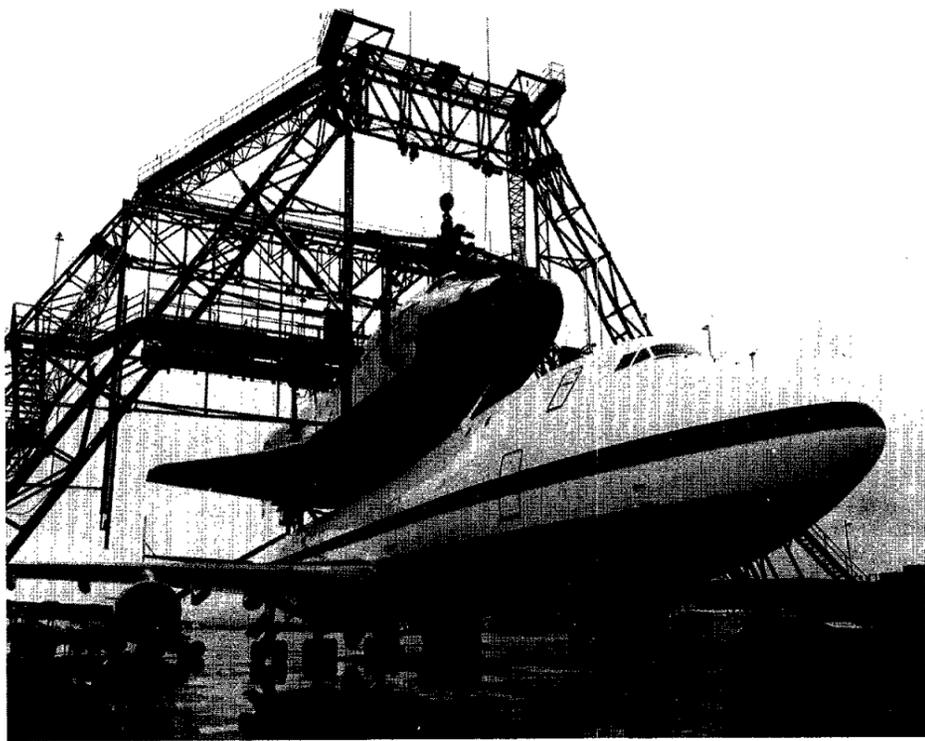
'90 Ford Bronco II, red, 5 spd, A/C, AM/FM/cass, sport wheels, tinted windows, \$9950. Tom x35457 or 488-1191.

'79 Explorer mini rec veh, Dodge 360 eng, self contained w/stove, refrig, bath, A/C, good cond, \$6.5K. 333-3499.

'67 Chevy II Nova SS, auto, 2 dr, new 6 cyl 250 eng, \$2K OBO. Geno, 280-1505 or 992-2156.

'90 Lemans LE, new car warr, A/C, auto, 12.5K mi, ex cond, \$6K. x31354 or 946-3809.

'85 Nissan Stanza, 4 dr, all pwr, AM/FM/cass, A/C



When Patience Is More Than Just a Virtue

Teamwork, ability to adapt to forecast are what make shuttle ferry flights happen

By James Hartsfield

It never rains in Southern California. But it has — for two days. And *Columbia* has been sitting piggyback aboard a 747 beside the runway at the factory where it and its descendants were built, Rockwell's Palmdale, Calif., plant, quietly pointed toward Florida, waiting.

In a trailer near the runway, an impatient group gathers for the umpteenth time. With satellite photos and nationwide maps, the weatherman explains in great detail that more waiting will be required.

"Unfortunately, this low pressure system is moving slower than expected. El Paso looks like it won't clear out before dark."

The forecast falls on a silent audience.

"Somebody get a rope." The comment from the crowd breaks the frustration. Another weather briefing is set for 4 a.m. tomorrow.

Ferrying a space shuttle across the country is a weatherman's nightmare. But teamwork and the ability to quickly adapt plans to fit the forecast make it happen.

There's a team of about 30 people that travels with the shuttle as it crosses, or tries to cross, the nation. And the lone weatherman is the man of every hour.

"Sometimes, even, I've had to explain to my boss why I like doing ferry flights," said KSC Staff Meteorologist Mike Adams, the Air Force captain deployed with the *Columbia* ferry team. Adams has 13 ferry flights to his credit.

"It's just that this job gives me a chance to practice my trade on a gut level," Adams said. "I get to eat, sleep and breathe meteorology on a ferry flight."

True to that honor, the most sleep Adams has had in one stretch during *Columbia's* trip is about three hours. The weather restrictions for ferrying an orbiter are difficult: daylight operations only, the aircraft must be on the ground by sunset and can't depart before sunrise; no flying through moisture, whether it's rain or even damp-looking clouds; no flying above 15,000 feet because the spacecraft can't be exposed to temperatures below 15 degrees Fahrenheit or air pressure below 8 pounds per square inch; any thunderstorm must be avoided by at least 25 nautical miles; and it can fly through no turbulence ranked higher than "light."

Ferry flight weather forecasting is even more difficult than forecasting for a shuttle launch, Adams said. "On a ferry, we're traveling hundreds of miles and we have just as stringent of rules to deal with as we do for launch," he said. Adams has the support of the KSC weather office and weather offices at individual landing bases along the route, but sometimes it comes down to the oldest weather forecasting tool in existence — eyes.

An aircraft called the Pathfinder flies about 20 minutes ahead of the SCA and shuttle as a weather scout. At times, the convoy must pick its way through the skies. "Sometimes, we can't find a clear route in advance, and we go in knowing the weather en route is marginal, but we feel we can find enough breaks to make it," Adams said. "Those are the situations where we're sitting with white knuckles evaluating what we see with our eyes or on the Pathfinder's onboard weather radar, making real-time judgment calls and radioing back to the SCA."

Although the weatherman is most prone to gain either glory or hanging during a ferry flight — "After a two-day delay on the ground, everyone gets a little antsy," Adams said — all those on the ferry team are on the spot at one time or another.

Rod Loe, manager of the Shuttle Operations Integration Office at JSC, holds the final responsibility for getting an orbiter across the country as quickly as possible and as safely as possible. Loe, along with JSC's Dick Tuntland, who serves as project manager for ferry flight operations, oversee a final review of the readiness of the spacecraft and all aircraft the day before the ferry flight begins. Loe and Tuntland then travel with the orbiter, on the flight deck of the Pathfinder, and have since STS-33.

"It's a very good team and a very close team. We're all striving to get to one clear-cut goal. There's a great satisfaction in getting it there and in getting it there all right," Loe said. "I always get a real high from it."

"Our role is to bring all the different elements together," Tuntland added.

For every ferry flight, those elements include a weatherman; a Pathfinder — usually an Air Force C-141 cargo plane — and six-man crew; an Air Force liaison, normally a landing support officer from JSC; a ground

operations manager from KSC and seven-member team who care for the orbiter; the Shuttle Carrier Aircraft pilots, flight engineers and a six-man maintenance crew; a KSC security officer, and a public affairs officer.

For *Columbia's* crossing, KSC's Steve Bullock is ground operations manager and heads the team that cares for the spacecraft. Among them are quality control representatives from Lockheed and NASA, safety personnel from Lockheed and NASA, a thermal tile technician and a security officer. Most, like Bullock, volunteer for the duty and wait to get assigned to a flight.

"We have a number of people that

the spacecraft. "If you let them stay loose, you'd get a zipper effect, pulling other ones off downstream during the flight," Bullock said.

To those who haven't seen it, the flight looks like something that shouldn't be. Though a shuttle atop a 747 looks impressive, it doesn't look like it should fly.

"It does the job and it flies fairly well," said Ace Beall, one of six SCA pilots. "You can tell you have a lot of drag and you have a sense of top-heaviness. But it is a nice airplane to fly."

All six SCA pilots — four from JSC, including Beall, A.J. Roy, Frank Marlow and Dave Mumme, and two from Dryden Flight Research Facility, Tom McMurtry and Gordon Fullerton — normally will fly during a ferry flight. A pilot and copilot will fly about halfway across the country, switching with another set for the final half to KSC. A third team will take the SCA back to California. In addition, one SCA pilot is stationed on the flight deck of the Pathfinder during flight, radioing weather back to his peers in the SCA.

"The challenge of flying the SCA is mainly in fuel planning and in keeping a good eye on the weather," Beall said. "If the weather is doubtful, we usually just don't go. You can find yourself between a rock and a hard place very easily when you have to change your route in flight because the fuel consumption really limits your options."

The SCA flies well, but having the orbiter on top means the engines are always at a high power level, he explained. On average, the plane burns 40,000 pounds of fuel per hour — two quarts per second per engine. The average take-off weight is about 340 tons, and the maximum allowable weight is 355 tons. With a maximum fuel supply and an average load, the SCA's range is about 1,000 miles.

"To fly the SCA, you have to exhibit a certain amount of patience. There is a lot of waiting out the weather and you have to make sure you don't come down with 'get-there-itis,'" Beall said.

Beall has flown the SCA for almost 10 years.

"It makes you feel very close to the shuttle program and you know that you're making a significant contribution. It is a very concrete result when you get a shuttle back to the cape," he said.

Columbia's trip home was made in one day, with only a two-hour stop in San Antonio, the most common stop-over base. But even though it is the most common and notice of *Columbia's* arrival was very short, news media and the public are still highly interested.

"That gives you a feeling of pride in the whole program. People are interested and they will come out for hours ahead to wait and watch us come in. It's like that almost everywhere," Beall said. "I wish everyone could see it."

Members of the ferry team barely have the chance to grab a quick sandwich before the SCA is again airborne.

Aboard the Pathfinder, ferry flight personnel, except three who sit on the flight deck, see little during the trip. There are only two windows. Ear plugs are a necessity. It is always either too hot or too cold. Sleep is the most common pastime, and there is really no way to tell where you are in the United States — there are only the two small, obscure portholes. You are simply in a cargo hold, and all you know is how long you've been there.

"When the operation is going smooth, you don't need many people," Loe said. "But when there is a problem, you need every single one."

Near one of the portholes, one member of the ground team has been watching for a long time.

"What is it?" a coworker finally asks. "It's home." No one is asleep anymore.

"There is really no feeling like the one you get when you've made it back and done it right," Loe said. But it is a fleeting feeling.

"You feel good about getting it home," Bullock explained. "But for us, it is the start of another very long journey to the launch pad. We consider it the first day of a new flow."

Columbia will be off the SCA within hours. And the 747 is set for a 9 a.m. departure back to California and Edwards, where *Discovery* is waiting its turn. The ground ops team will stay with *Columbia* at KSC and a new team will go with *Discovery*. Many other members of the ferry operations group will remain the same, however.

But everyone will get a good night's sleep first.

"Even if you planned to land every orbiter at KSC, history shows that the weather will prevent it from 30-40 percent of the time," Loe said. "Ferry flights will be around for a long time to come." □



constantly make the ferry flights. They like being with the vehicle and they like being in the field," Bullock said. "It's a small team and you can really see that you're making a contribution and that it counts."

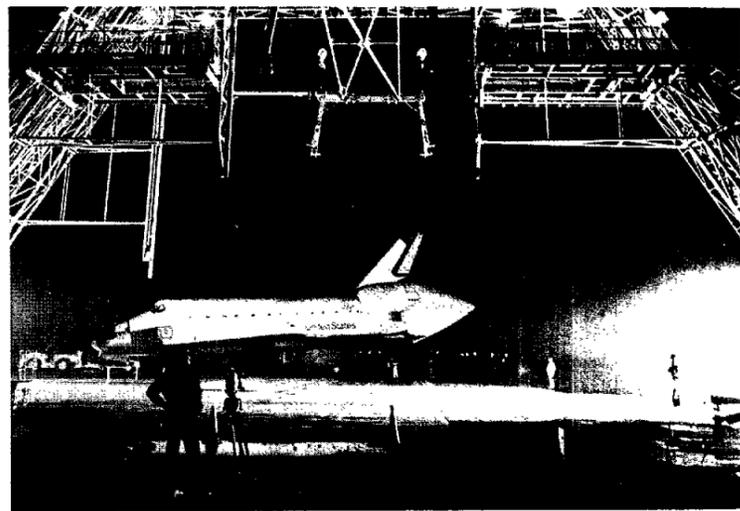
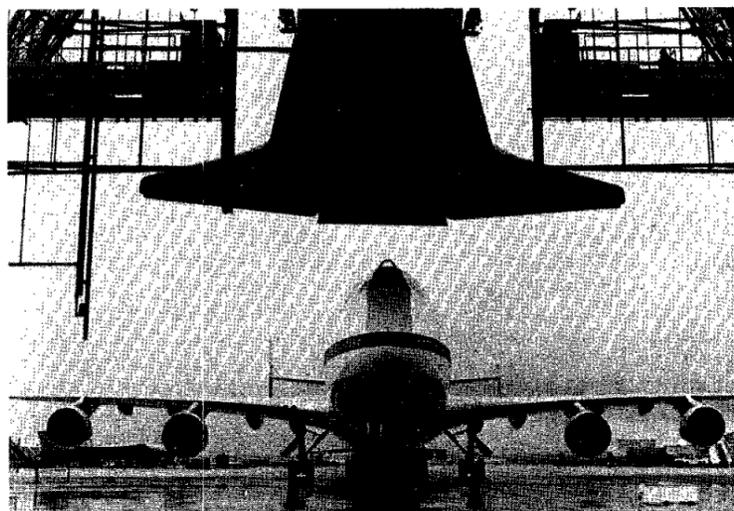
When the SCA and orbiter stop en route, the team is the first to approach. Visual inspections cover the exterior of the vehicle, checking the thermal blankets, tiles and various plugs. For a normal trip back to KSC following a landing at Edwards, the team checks the area for toxic fumes before giving permission for the SCA personnel to deplane.

"It has always amazed me how well the ground ops team can spot things, things that if you were just looking at, you wouldn't even notice," Loe said.

"If you've done enough walk-arounds, anything that's out of place just really sticks out," explained Bullock. But all members of the team assigned to ferry flights must have a high level of experience in their tasks, he added.

Problems with loose blankets or tiles are the most common trouble encountered. To fix them, arrangements are made for a hoist that can raise a technician to within reach of any surface on

Top: On a recent rainy day in Palmdale, Calif., *Columbia* is attached to the Boeing 747 Shuttle Carrier Aircraft for a trip back to KSC following six months of modifications and structural inspections at Rockwell's Palmdale facility. *Columbia* was ready before Mother Nature; rain kept the SCA grounded for two days after the mating operations were complete. Center: Headed for Florida, *Columbia* and the SCA depart Palmdale. About 100 miles ahead, an Air Force C-141 cargo aircraft checks the SCA's planned flight path for any adverse weather conditions. Right: *Columbia* is lowered toward the SCA from an orbiter lifting frame. More than a hundred KSC people traveled to California to prepare *Columbia* for the trip, but only six accompanied the orbiter aboard the Pathfinder cargo plane. Far right: *Columbia* awaits the SCA and the trip back to KSC.



Researchers gather for 23rd annual science conference

By Kari Fluegel

Scientists from around the globe will converge at the Gilruth Center next week to discuss research covering the universe during the 23rd annual Lunar and Planetary Science Conference.

More than 700 researchers are expected to attend the conference, co-sponsored by the Lunar and Planetary Institute and JSC, for five days of presentations regarding a variety of subjects with much of the focus on Venus and findings from NASA's Magellan probe.

Magellan, deployed from the Space Shuttle *Atlantis* in May 1989, has mapped about 97 percent of the Venusian surface with its radar mapping instruments and an overview of the Magellan program called "Magellan at Venus: The Global Perspective Emerges" will start the conference Monday at 8:30 a.m. Other papers

focusing on Venus will be presented throughout the event.

The public is invited to a special discussion of Magellan results and of a global view of planetary cratering Monday at 8 p.m. in Teague Auditorium at JSC. Participants will be Dr. Ellen Stofan, deputy project scientist for the Magellan Program at Jet Propulsion Laboratory, and Dr. Eugene Shoemaker of the U.S. Geological Survey.

Registration will begin during an open house Sunday at the new Lunar and Planetary Institute, 3600 Bay Area Blvd.

Conference presentations will begin Monday at 8:30 a.m. Besides the Magellan overview, other sessions at that time will be Meteorite Parent Bodies; Mare Basalts, KREEP and Copernican Ejecta. Sessions will continue Monday at 1:30 p.m. with Venus Geophysics;

Assorted Achondrites; Origin and Evolution of Planetary Systems.

Tuesday's activities start at 8:30 a.m. with Venus: Tectonism and Volcanic Associations; Reduced Meteorites; Evolution of the Lunar Crust and Mantle; Outer Solar Systems/Remote Sensing; Laboratory; and 1:30 p.m. with Venus Volcanism, Chondrules; Impact Cratering: Theory and Experimentation.

Wednesday sessions will be at 8:30 a.m. with Dynamics of Impacts and Resurfacing on Venus; Nebular Processes and CAIs; A Field Trip to the Moon; Martian Spectral and Laboratory Data; and 1:30 p.m. with Tectonism and Volcanism: Moon and Mars; Educational Outreach and Career Opportunities; Antarctic Micrometeorites and LDEF; Solar Wind and Cosmic Ray Irradiation.

Thursday sessions will be at 8:30 a.m. with

Mars Surface and Atmosphere Through Time: Atmosphere and Surface-Surface Properties and Processes; Cosmic Dust and Comets; Planetary Geochemistry; and 1:30 p.m. with Mars Surface and Atmosphere Through Time: Atmosphere and Surface—Atmosphere Interactions; Stardust; Terrestrial Impacts and the KT Boundary.

The conference concludes March 20 with sessions at 8:30 a.m. covering Offerings from the Moon; Acapulcoites and Stony-Iron Meteorites, Meteorite Organics; Galileo: Gaspra Encounter/ Asteroids.

Poster sessions will be held Tuesday and Thursday from 7 to 9 p.m. in the Great Room of LPI. Poster authors will be present to discuss more than 237 presentations.

All activities are at the Gilruth Center unless otherwise noted.

Safety Learning Center sets March, April classes

JSC's Test Operations and Institutional Safety Branch is offering a slate of safety classes in March and April that will be available to civil servants and contractors.

Instructors will teach the classes in the JSC Safety Learning Center, Bldg. 226N, unless otherwise specified. Civil service tuition is paid by the Human Resources Office.

System Safety, 8:30 a.m.-4 p.m., April 9, no tuition.

Pressure Systems Familiarization, 1-3 p.m. April 9, no tuition.

Fundamentals of Occupational Safety, 8 a.m.-4:30 p.m., April 16, no tuition.

Overhead Crane Certification, April 22, tuition required. Refresher course, 8 a.m.-noon; full certification course, 8 a.m.-4 p.m.

Orbiter Fuel Cell Course, 8 a.m.-4:30 p.m. April 27-29, South Shore Harbour. Contractor tuition is \$500.

System Safety Workshop, 8:30 a.m.-4:30 p.m., April 27-29.

For more information, call x36369.

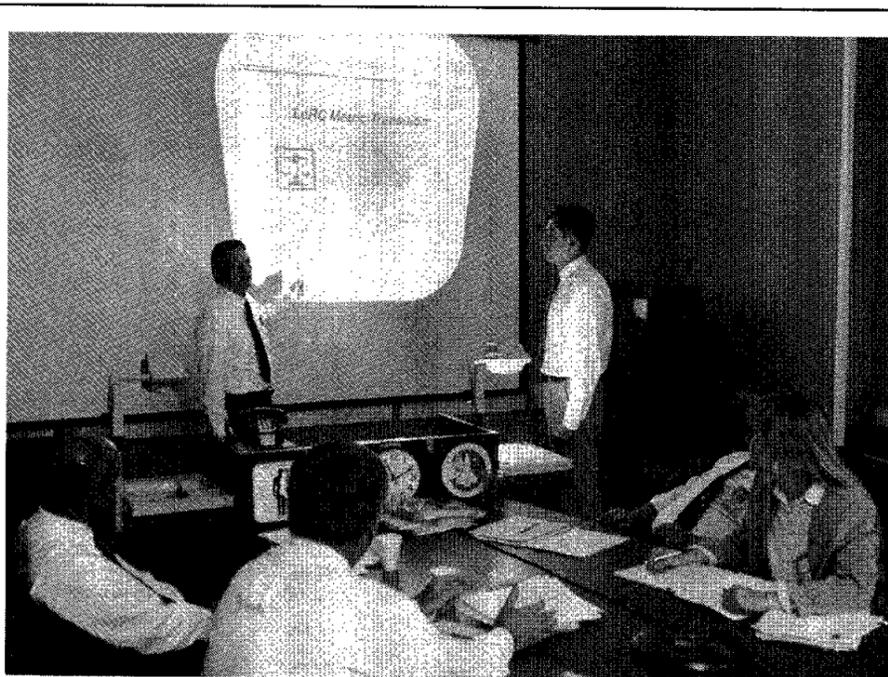
Water drop may hold clues to Mars mystery

(Continued from Page 1)

Besides Gibson and Karlsson, who is now in the Department of Geosciences at Texas Tech University, team members were Robert N. Clayton and Toshiko K. Mayeda of the Department of Geophysical Sciences and the Enrico Fermi Institute at the University of Chicago.

Findings such as the work completed by the team may answer some questions about the processes operating in the solar system, but it raises others—What happened to the water on Mars? and Does Earth have the same destiny?

"These are large and difficult questions to comprehend," Gibson said, "but perhaps if we can trace the origins and alterations of planetary atmospheres and oceans, the evolution of our solar system may be better understood."



JSC Photo by Jack Jacob

CONVERTS ALL—Phil Kramer of Lewis Research Center and Dick Weinstein, NASA metrication coordinator, discuss plans for switching to the metric system of measurement in the first Agencywide Metrication Committee meeting. JSC hosted representatives from all NASA centers last Thursday. Seated, from left, are JSC Metrication Coordinator Joe Maloy, Brian Keegan of Goddard Space Flight Center and Linda Robek of NASA's Jet Propulsion Laboratory.

Michelangelo virus a bust at JSC because of prevention

(Continued from Page 1)

treat them as analogous to a biological hazard. That means being aware and taking steps to protect yourself."

Overall, 25 cases of computer virus were detected at JSC last week. Half of those were Michelangelo, the rest were identified as comprising four other viruses that had been lurking in employees' computers, according to Judy Meier of Computer Sciences Corp.

"I think the fact that 50 percent of what we found was not Michelangelo should increase everybody's awareness of the problem," she said. There are more than 7,500 IBM-based personal computers and about 1,300 Apple computers in JSC-operated facilities alone, she added.

For the agency as a whole, the effect was virtually nil because of attention and prevention, Snapp said.

JSC relies on a variety of sources for the latest information on computer viruses, according to Jim Molini of CSC. Among them is the Virus Test Center at the University of Hamburg in Germany, and Internet Virus-L News Forum in the U.S. "There are 50 to 100 viruses that you really have to worry about," he said.

The notion of computer viruses has been around since as early as the 1970s, Jurgensen said. But it wasn't until the mid-1980s that users began to experience sometimes widespread and often crippling infections with names like "Devil's Dance," "Friday the 13th" and "Cascade."

"You have to understand what a virus is to get a realistic sense of the threat," Snapp said. "By definition, a virus must replicate and spread from system to system."

Viruses spread through the use of shared programs (raising serious concerns for network-based operating systems), through demonstration software disks, and through disk swapping. "If you have had an infection in the past, then you have an extremely good chance—something like 70 percent—of getting re-infected in the next few months," Jurgensen said. "You have an infection path. If you don't change your ways, it can happen again."

Officials offered these safe computing tips for users:

- Back up your data regularly. It is the one sure counter to a catastrophic event.

- Scan for viruses periodically. Your organization's computer security official, the Help Desk or ISD's Products Center are starting points for those seeking the latest ISD-supported virus sniffing software.

- If you want to download software, you can safely do so by accessing the JSC software bulletin board, which is scanned for malicious code.

- Scan all software you bring in from off-site before installing it on any computer you use at work.

- Report any virus you discover to your directorate computer security official.

Budget squeeze means JSC must pull together, pool resources

(Continued from Page 1)

According to McCright, the R&PM budget, which comprises over two-thirds of COD's budget, has been basically "flat-lined" since 1988. This fiscal year, COD will receive \$4.1 million less than what it actually cost to run the center in fiscal '91.

On top of that, he said, by the end of fiscal '92, JSC will have added about 525,000 square feet of on-site facilities and 25,000 square feet of off-site leased facilities since 1988, all of which must be operated and maintained under a "fixed income" COD budget.

"It's going to take all of us pulling together and pooling our resources to get through this tough year," McCright said.

Some of the cuts that already have been implemented are reduced hours at the west Space Center Blvd. gate during normal and mission periods, a virtual elimination of minor construction projects for the balance of the fiscal year, curtailed administrative printing, graphics and photography and a cut in the number

of JSC taxis.

One bright spot is that the ban on taxi service to off-site contractor facilities has been lifted, McCright said. A week after the cut was announced, the Center Transportation Section found that its demand had dropped so far that some cabs were sitting idle. Managers have decided to resume off-site taxi service, but with 10 instead of 12 cabs the response time probably will be 5 to 10 minutes longer.

The outlook for fiscal '93 isn't much better, McCright said. Although the President's '93 request asks for a 6.3 percent restoration in the JSC institutional budget for operation of facilities to \$107.4 million, JSC employees probably will continue to experience some inconveniences in another flat-line year for the institution, taking inflation into account.

Human Resources Director Harv Hartman said a limited salary budget, compounded by a turnover rate that's been about half of normal, have led to some belt tightening in

the personnel arena. The summer intern program has been eliminated this year, other summer programs have been curtailed and what little hiring will be done will be shifted primarily to the last quarter of the fiscal year.

"But if we do all those things, we believe we have a plan to get us through this year without seriously hurting the organizations or compromising program support," Hartman said.

Looking at the rest of the '92 numbers, new construction of facilities projects tapered off this year by about 40 percent from \$54 million in '91 to \$31 million in '92, and the Space Shuttle Program budget declined slightly, from \$1.16 billion in '91 to \$1.11 billion in '92.

Funding for space sciences and technology increased 36 percent, from \$107.5 million in '91 to \$146.5 million in '92, but that piece of the budget pie is only 5 percent of JSC's total budget.

The "don't-count-on-it-being-that-good" news is that the President's

\$15 billion NASA budget proposal for '93 includes a 9.9 percent increase for JSC but faces a tough battle in Congress due to the fact that the President has requested a 4.5 percent increase for NASA while keeping all domestic discretionary spending 1.6 percent under the budget agreement cap for 1993.

JSC representatives attending a recent Headquarters-sponsored Legislative Outlook Conference heard speakers from both the administration and Congress warn that the uncertainties of an election year and a strong focus on domestic issues affecting the economy will boost the degree of difficulty for NASA as it enters the '93 budget battle.

To secure adequate funding, the speakers said, NASA will need links to jobs, health, education, the environment and other domestic issues that can be seen as an investment in a strong economic future. Merit alone will no longer justify a project, and cost will be a prime factor.

The trend in JSC's budget is

toward gradual growth in the space station program and maintaining a strong shuttle capability with operations and efficiency cost reductions of 3 percent a year for the next five years—without sacrificing program safety. Program employment at JSC should remain stable, with increases in space station jobs offsetting losses and movement to Kennedy Space Center in the shuttle program.

If the fiscal '93 NASA budget were to be passed as proposed, JSC would receive \$1.22 billion for the space shuttle, a 10 percent increase primarily for enhanced orbiter reliability; \$1 billion for space station, a 7.6 percent increase over 1992; \$172.5 million for space sciences and technology, an 18 percent increase over 1992, and \$16 million for construction of facilities, another 50 percent reduction.

JSC has yet to receive program appropriations for the Space Exploration Initiative, but \$15 million is requested for JSC in exploration studies and precursor lunar and Mars missions.