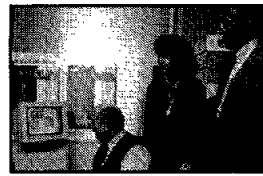




A newly developed virtual robot imitates human movements. Story on Page 3.



JSC continues to transfer technology to the private sector by issuing a new copyright license. Photo on Page 4.

Space News Roundup

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No. 2

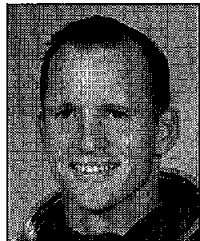
Elementary holds White space fest

By Karen Schmidt

Ed White Elementary is sponsoring a week-long space festival that will help students identify with the name-sake of their school.

Ed White was a pilot for Gemini 4, and the first astronaut to walk in space. White, Gus Grissom and Roger Chaffee died Jan. 27, 1967, at Kennedy Space Center when a flash fire consumed their Apollo 1 spacecraft during a full-scale simulation.

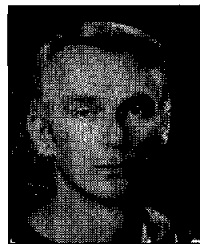
During his 62-revolution, four-day mission in June 1965, White was outside the spacecraft for 23 minutes



White

and became the first man to control himself in an extravehicular space environment with a hand-held maneuvering unit. "We wanted to do a space festival because of our ties with the space industry," said Debbie Teel, committee chairman for the week-long event. "We want to make sure we build the math and science programs for the future of our children."

The Community Affairs Team in JSC's Public Affairs Office is providing exhibits on the history of human space flight and a special Ed White display.



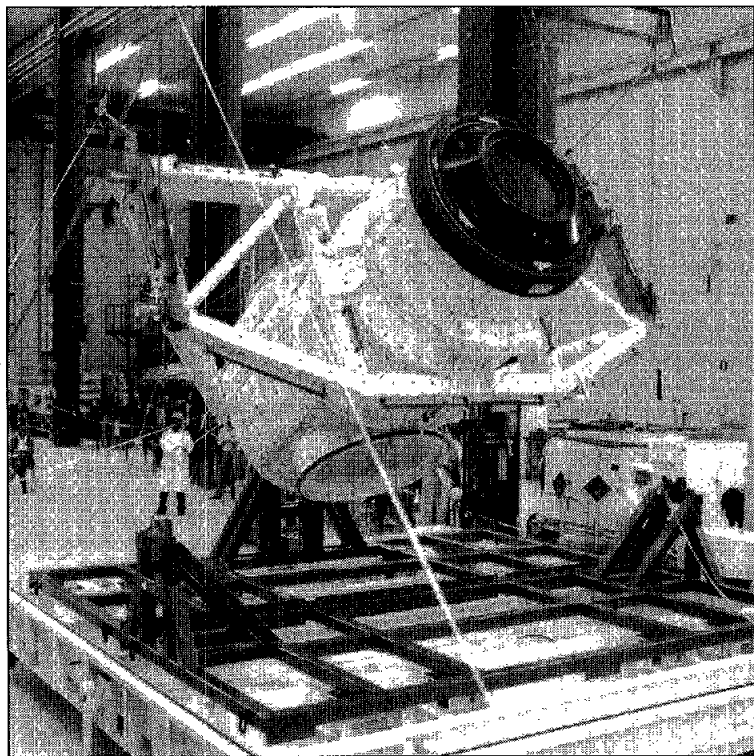
Cernan

The Lunar and Planetary Institute also is providing a display and the Space Bus, an orbiter simulator built in a converted bus, is expected at the school next week.

Each grade has been working on special projects to be completed for the celebration. First-grade students were invited to build space shuttle orbiters, while second-graders constructed a timeline. Space clothing design was a special project for third graders. The fourth grade class designed actual laboratory experiments, while fifth graders built a new space station.

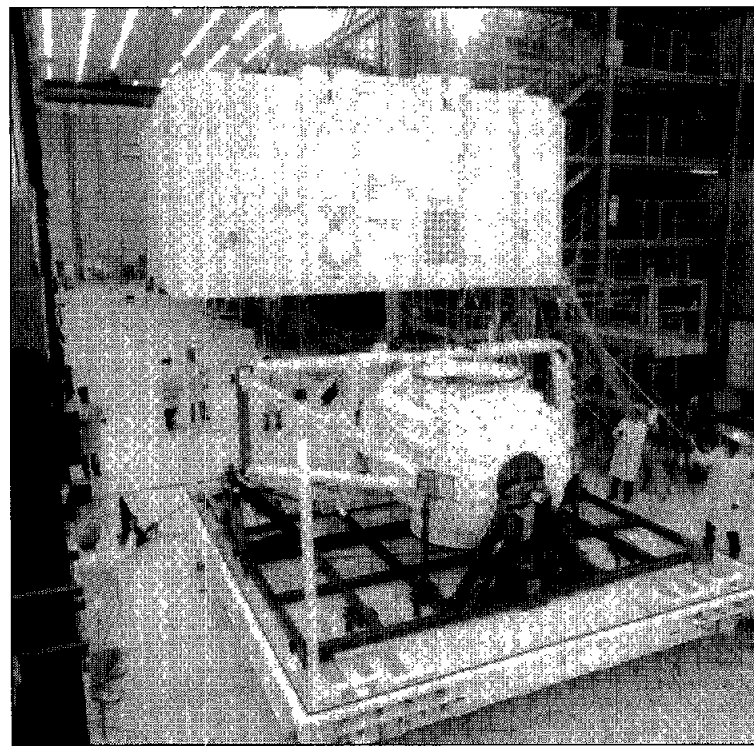
Other activities include a science demonstration on Thursday by Angelo Casaburri, and a discussion of medical issues by Astronaut Jay Bucky. Space Station Program Office Manager Randy Brinkley will talk with students Tuesday.

Friday, the children will make a special presentation to Ed White Jr. and Gene Cernan will speak.



Rockwell International Photos

WHAT'S UP DOCK?—The new orbiter docking system, jointly developed by Rockwell and RSC Energia, is now at Kennedy Space Center undergoing tests. The external airlock assembly and Mir docking system will be mounted in the cargo bay of *Atlantis* to enable the shuttle to link up to the Russian *Mir* space station. The docking system contains hooks and latches compatible with the system currently housed on the *Mir's* Krystall module, to which *Atlantis* will attach for the first time this spring. STS-71 will carry two Russian cosmonauts, who will replace a three-man crew aboard *Mir* including U.S. Astronaut Norm Thagard. The combined 10-person crew will conduct almost five days of joint life sciences investigations both aboard *Mir* and in the shuttle's Spacelab module. Thagard and his two crewmates, who will have spent three months aboard *Mir*, will return to Earth aboard the shuttle while the two cosmonauts launched on *Atlantis* will remain aboard *Mir* for about three months. Top: At Rockwell International's Downey, Calif., facility, the docking system, is hoisted. Bottom: the assembly is secured in a shipping container for its trip to Kennedy Space Center.



Key shuttle, station jobs go to veterans

Two key space shuttle and space station appointments were announced this week by JSC Director Dr. Carolyn L. Huntoon and Space Station Program Office Manager Randy Brinkley.

Senior JSC engineer Chester "Chet" Vaughan will fill the newly created post of chief engineer for the International Space Station Program, and Jay Greene is the new orbiter

been deputy director of engineering at JSC since October 1993. From December 1991 to October 1993, he was chief of the Propulsion and Power Division at JSC, and, from January to December 1991, he was chief engineer in the Office of Space Flight at NASA Headquarters.

As deputy director of engineering at JSC, Vaughan already has been serving as a technical adviser to the station program as well as a member of an independent assessment panel. Vaughan began his NASA career in 1955 at Langley Research Center.

Greene is a 30-year NASA veteran who served as a flight controller in both the Apollo and shuttle programs, then as a shuttle flight director for 10 missions, including lead flight director of STS-41C and STS-51L.

He will report directly to Lawrence Bourgeois, acting manager of the JSC Projects Office. The Orbiter Project Office is the largest such office at JSC, and as manager, Greene will be a close adviser to Huntoon in regard to orbiter processing and related activities.

"Jay is an excellent choice for orbiter project manager. His broad experience base in human space flight operations, engineering and program management will serve him well," Bourgeois said.

Greene became chief of the Safety Division at JSC in 1987 before becoming deputy manager of the shuttle program in 1989. Greene was deputy associate administrator for exploration at NASA Headquarters, then returned to JSC as Engineering Technology Office manager. He became associate director of engineering last year.

In related moves, Jack Boykin has been appointed deputy manager of the Orbiter Project Office, and Philip Glynn has been assigned as chief of the Engineering Directorate's Structures and Mechanics Division.

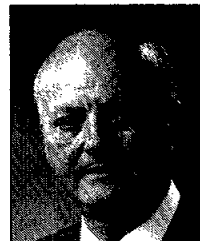
Vaughan, with technical support from engineering personnel at JSC and throughout NASA, will oversee an independent review of all technical activities for the station, ensuring that the designs are sufficient to satisfy the station's requirements and that proper testing and analysis are performed.

Greene will be responsible for the oversight of both NASA and contractor personnel at JSC involved in the preparation of space shuttles for flight and the technical management of shuttle hardware. He succeeds Dan Germany, who retired this month to go into private industry.

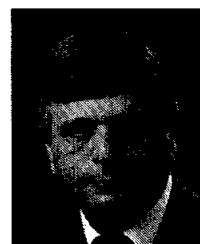
"As chief engineer, Chet will be responsible for assessing the technical adequacy of the International Space Station Program," Brinkley said. "His long-standing expertise, familiarity with the station design, forthright manner and excellent communications skills make him an excellent addition and asset for the team. Chet's assessments will serve as a constant double-check of the design approaches, and he is the type of person who will never be timid about bringing potential problems to our attention."

Vaughan is a 39-year veteran of NASA and has served the agency in a variety of engineering capacities, having just completed a three-month assignment as acting deputy director at Marshall Space Flight Center.

At the same time, Vaughan has



Vaughan



Greene

Goldin to be honored

NASA Administrator Daniel S. Goldin will receive this year's National Space Trophy, bestowed by the Rotary National Award for Space Achievement Foundation.

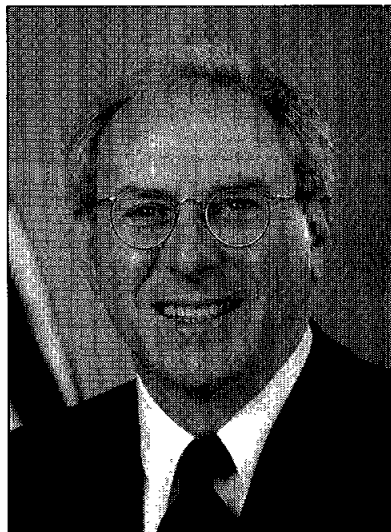
Goldin will receive the award during a banquet in his honor Feb. 16 at the Houston Hyatt Regency. Goldin is the ninth recipient of the award, which recognized outstanding contributions to space exploration.

Rep. Tom DeLay, R-Texas, who will present the award, cited him, "for outstanding executive leadership in pioneering a sea change at NASA, creating a culture that values technological innovation, fiscal accountability, creative manage-

ment, and workforce diversity."

Dr. Carolyn Huntoon called Goldin, "the driving force behind America's future accomplishments in space. At TRW, his technical expertise and sound management practices led the company to the leading edge of new space technologies, the technologies that will be utilized in the year 2000 and beyond. Here at NASA, his bold new initiatives and visionary management style are reshaping the Agency."

For information on the foundation or to purchase tickets to attend the banquet contact Charles Hartman at 480-6167.



Daniel Goldin

Discovery rolls to pad

Work continues on three Shuttles at the Kennedy Space Center as the first launch of the New Year approaches.

Engineers hauled *Discovery* to Launch Pad 39-B this week for final preparations for its scheduled liftoff just after midnight, Eastern time, on Feb. 2 on the STS-63.

Discovery's six crewmembers, Commander Jim Wetherbee, Pilot Eileen Collins, and Mission Specialists Bernard Harris, Mike Foale, Janice Voss and Vladimir Titov will fly to the launch site next week for their countdown dress rehearsal for the flight, which will be highlighted by the first rendezvous and flyaround of the Russian Space Station *Mir*.

If *Discovery* launches on time, *Discovery's* rendezvous to within 33 feet of *Mir* would take place mid-

afternoon on Feb. 5. Other than the astronauts' dress rehearsal aboard *Discovery*, engineers planned to hot-fire the shuttle's auxiliary power unit #2 at the pad to verify its health. It was installed in the shuttle before the New Year to replace another hydraulic unit. The countdown for *Discovery's* launch is set to begin at 3 p.m. JSC time on Jan. 29, a few hours before the astronauts fly from JSC to KSC for final prelaunch preparations.

Technicians are also putting the final touches on *Endeavour* for its scheduled 16-day flight in early March on the record-setting STS-67/*Astro-2* mission.

The seven astronauts, led by Commander Steve Oswald, completed a successful Crew Equipment Interface Test at KSC as a separate



Please see ATLANTIS, Page 4

JSC

Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Store from 10 a.m.-2 p.m. Monday-Thursday and 9 a.m.-3 p.m. Friday. For more information, call x35350 or x30990.

Hockey tickets: Houston Aeros vs. Cincinnati 7 p.m. Feb. 3 at the Summit. Cost is \$11 for lower prom. Tickets on sale through Jan. 25.

Moody Gardens: Discount tickets for two of three different attractions: \$9.50

Space Center Houston: Discount tickets: adult, \$8.75; child (3-11), \$7.10.

Metro tickets: Passes, books and single tickets available.

Movie discounts: General Cinema, \$4.75; AMC Theater, \$4; Loew's Theater, \$4.75.

Stamps: Book of 20, \$5.80

JSC history: *Suddenly, Tomorrow Came: A History of the Johnson Space Center.* Cost is \$11.

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 NASA badge or yellow EAA dependent badge. Classes tend to fill up two weeks in advance. Payment must be made in full, in exact change or by check, at the time of registration. No registration will be taken by telephone. For more information, call x30304.

EAA badges: Dependents and spouses may apply for photo identification badges from 7 a.m.-9 p.m. Monday-Friday; and 8 a.m.-4 p.m. Saturdays. Dependents must be between 16 and 23 years old.

Weight safety: Required course for employees wishing to use the weight room is offered from 8-9:30 p.m. Jan. 26 and Feb. 7. Pre-registration is required. Cost is \$5.

Defensive driving: Course is offered from 8:15 a.m.-3 p.m. Saturday. Next class is Feb. 11. Cost is \$19.

Aerobics: High/low-impact class meets from 5:15-6:15 p.m. Tuesdays and Thursdays. Cost is \$32 for eight weeks.

Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays.

Aikido: Martial arts class meets from 5-7 p.m. Tuesdays and Wednesdays. Cost is \$25 per month. New classes begin the first of each month.

Tennis league: A spring tennis league may be started if there is sufficient interest. Contact the Gilruth Center at x33345.

Country dancing: Beginners class meets from 7-9 p.m.; advanced class meets from 8:30-10 p.m. Partners are required. For information, contact the Gilruth Center at x33345.

Ballroom dancing: Ballroom dancing classes. Cost is \$60 per couple. For additional information call the Gilruth Center at x33345.

Golf Association: Sign up for the 1995 league will begin in Feb. To join call Harry Kolkhorst at x33312.

Fitness program: Health Related Fitness Program includes a medical examination screening and a 12-week individually prescribed exercise program. For more information, call Larry Wier at x30301.

JSC

JSC

Dates & Data

Today

Cafeteria menu: Special: tuna noodle casserole. Total Health: broiled chicken breast. Entrees: deviled crabs, broiled pollock, liver and onions, broiled chicken with peach half, Reuben sandwich. Soup: seafood gumbo. Vegetables: Italian green beans, cauliflower au gratin, steamed rice, vegetable sticks.

Monday

Cafeteria menu: Special: Italian cutlet. Total Health: herb flavored steamed pollock. Entrees: barbecue beef spare ribs, steamed pollock, baked chicken. French dip sandwich. Soup: black bean and rice. Vegetables: California mix, okra and tomatoes, vegetable sticks, ranch style beans.

Tuesday

Blood drive: Loral will host a blood drive from 8 to 11 a.m. and 1:30 to 3 p.m. Jan. 17 for location call Ed Barela at 335-5023.

Cafeteria menu: Special: spaghetti with meatballs. Total Health: baked potato. Entrees: stir fry beef, liver and onions, beef cannelloni, ham steak French dip sandwich. Soup: split pea. Vegetables: winter blend mix, seasoned cabbage, breaded squash, lima beans.

Wednesday

Blood drive: Loral will host a blood drive from 8 to 11 a.m. and 1:30 to 2:30 p.m. Jan. 18 for location call Ed Barela at 335-5023.

Astronomy seminar: The JSC Astronomy Seminar will meet at noon Jan. 18 in Bldg. 31, Rm. 129. An open discussion meeting is planned. For more information, call Al Jackson at 333-7679.

Toastmasters meet: The Space-land Toastmasters meet at 7 a.m. Jan. 18 at House of Prayer Lutheran Church on Bay Area Blvd. For more

information, contact Darrell Boyd, x36803.

Bike Club: The JSC bicycle club will meet for a 1.1- and a 1.6-mile loop at 5:30 p.m. Jan. 18 behind the Grumman Bldg. at Ellington Field. For more information call Juliette Wolfer at x38459.

PMA meets: The Performance Management Association, Houston Chapter will meet at 11:45 a.m. Jan. 18 at the Gilruth Center. For more information contact Jerry Randolph at x36009.

Cafeteria menu: Special: smoked barbecue link. Total Health: roast pork loin. Entrees: cheese enchiladas, roast pork and dressing, baked chicken, steamed pollock, Reuben sandwich. Soup: seafood gumbo. Vegetables: Italian green beans, Spanish rice, turnip greens, peas and carrots.

Thursday

Blood drive: JSC will host a blood drive from 7:39 to 11:30 a.m. and 1 to 3:30 p.m. Jan. 19 at the Gilruth Center. For more information call Marty Demaret at x36007.

Cafeteria menu: Special: chicken fried steak. Total Health: roast beef with gravy. Entrees: steamed pollock, lasagna with meat, steamed pollock, catfish, French dip sandwich. Soup: cream of turkey. Vegetables: whole green beans, butter squash, cut corn, black-eyed peas.

Friday

Cafeteria menu: Special: fried chicken. Total Health: vegetable lasagna. Entrees: pollock hollandaise, beef stroganoff, vegetable lasagna. Vegetables: steamed broccoli, carrots vichy, Italian zucchini, breaded okra.

Saturday

Career workshop: A Career Transition Workshop will be held

from 9 a.m. to 4 p.m. Jan. 21 at University of Houston Clear Lake. Registration deadline is Jan. 18. For information call Don Cravey at x30148.

Sunday

Salute to Women: Space Center Houston will honor women's contributions to human space exploration at 1 p.m. Jan. 15. For additional information call 244-2133.

Jan. 25

Blood drive: Krug will host a blood drive from 8 to 11:30 a.m. Jan. 25 at the Krug Bldg. For additional information call Beth Brumley at 212-1204.

Astronomy seminar: The JSC Astronomy Seminar will meet at noon Jan. 25 in Bldg. 31, Rm. 129. An open discussion meeting is planned. For additional information, call Al Jackson at 333-7679.

Toastmasters meet: The Space-land Toastmasters meet at 7 a.m. Jan. 25 at House of Prayer Lutheran Church on Bay Area Blvd. For additional information, contact Darrell Boyd, x36803.

Bike Club: The JSC bicycle club will meet for a 1.1- and a 1.6-mile loop at 5:30 p.m. Jan. 25 behind the Grumman Bldg. at Ellington Field. For additional information call Juliette Wolfer at x38459.

Feb. 1

Astronomy seminar: The JSC Astronomy Seminar will meet at noon Feb. 1 in Bldg. 31, Rm. 129. An open discussion meeting is planned. For additional information, call Al Jackson at 333-7679.

AIAA Luncheon: The American Institute of Aeronautics and Astronautics will host a luncheon at 11:45 a.m. Feb. 1 in Rm. 206 at the Gilruth Center. For more information call Naz Bedrossian at 333-2127.

Swap Shop

Swap Shop ads are accepted from current and retired NASA civil service employees and on-site contractor employees. Each ad must be submitted on a separate full-sized, revised JSC Form 1452. Deadline is 5 p.m. every Friday, two weeks before the desired date of publication. Ads may be run only once. Send ads to Roundup Swap Shop, Code AP2, or deliver them to the deposite box outside Rm. 181 in Bldg. 2. No phone or fax ads accepted.

Property

Lease: 1 bedroom condo, Baywind II, CLC, W/D connections, fireplace, no pets, unit JAB, \$425/mo + \$425 deposit. Charli, 488-8102.

Sale: Heritage Park, 3-2-2, new A/C, roof, flooring, appliances, interior/exterior paint, open floor plan w/spiral staircase to loft/game-room/4th BR, 2000 sq ft, \$91.5k/obo. 996-6062.

Sale: San Leon, house on 1 acre, secluded, great trees, 2-3 bedrooms, big bath, hardwood floors, country kitchen, dead-end street, separate apt you can rent to pay note, \$89.5. Stan, 339-1152.

Sale: Baywind II condo, 1-1, new carpet, fresh paint, washer, dryer, fridge, dishwasher, fireplace, near pool, \$23k. 486-8047.

Rent: El Dorado Trace, 2-2, furnished, balcony, FPL, TV/VCR, alarm, microwave, stereo, pools, tennis, exercise room, sauna/hot tub, \$675 + electric. 333-8126 or 488-1327.

Rent: Room(s) in Clear Lake house, \$300/mo + 1/2 utilities. 286-8434.

Rent: Webster, 4-3, large yard, available 1/7, \$700/mo + deposit. 554-5219.

Sale: Baywind I condo, 2-1.5-2, ground floor, immediate occupancy, new dish washer, refrigerator, washer & dryer, like new carpet, financing available, \$29k. 333-3992.

Rent: Taos, New Mexico, house, handy to town & ski valley. 486-5679.

Sale: Friendswood, 1935 Pilgrims Point, 3-2-2, new AC, new roof, \$75k. x38074 or 480-8099.

Sale/Rent: Egret Bay waterfront condo, 1-1, fireplace, fans, washer & dryer, dishwasher, microwave, balcony, covered parking, boat ramp, dock, pool, entry gate, \$530 + deposit. Karl, x33031 or 334-1164.

Rent: Galveston condo, furnished, sleeps 6, Seawall Blvd & 61st, cable TV, weekend/wkly/dly rates. Magdi Yassa, 333-4760 or 486-0788.

Sale: League City, Bayridge sub, 3-2-2, nice yard/floor plan, excellent starter, 15 minutes from NASA, \$55k/obo. 286-1934.

Rent: Lake Placid mobile home on Guadalupe River near New Braunfels & Sequin, waterfront, 3 queen sz beds, sleeps 6, winter \$65/ntly, \$350/wkly. 326-3706.

Lease: Galveston Seawall condo, 1 bedroom, ocean view, heated pool, furnished, long term lease preferred, \$395/mo. x30737.

Rent: Ski in Winter Park, Colorado, 2-2, condo, furnished, sleeps 6. 488-4453.

Sale: Santa Fe/Alta Loma, 2.5 acres, country environment, mineral rights, \$20k. 337-1311.

Cars & Trucks

'85 Nissan Sentra, 5 speed, A/C, 2 door, silver/gray, 140k mi, \$1.2k/obo. 332-2571.

'86 Mercury Topaz GS, silver, 4 door, 1 owner, ex cond, power steering, power brakes, tilt, cruise, AM/FM/cassette, 55k mi, \$2,650. Bob, x33149 or 488-7036.

'92 Accura Legend, dark green, fully loaded, leather, sun roof, telephone, CD, remote security system. 996-7755.

'91 Ford Tempo GL, AC, AM/FM, power windows, low mileage, \$5.3k. x38981 or 333-2476.

'85 Subaru Wagon, 5-speed, A/C. x40250.

'88 Chevy S10 Blazer, 2 door, black/silver, A/C, automatic, tow pkg, Tahoe pkg, all power, AM/FM/cass, 1 owner, 86k mi, \$5.8k. x48788 or 488-6925.

'94 Explorer, 2 door sport package, black exterior & gray interior, ex cond, 15k mi, \$17k. 286-9331.

'71 Chevy step-side PU, 6 cyl, standard, new clutch, new brakes, runs good, \$1.5k/obo. Roger, 331-3304.

'82 Cadillac Sedan deVille, mint cond, leather, loaded, 21k mi actual miles, collector car, \$6.9/obo. Rich, x41089 or 480-8335.

'92 Mazda Miata MX-5, red/black, B-pkg, 24k mi, 6yr/100k warranty, ex cond, \$16k/obo. J., x31064 or 334-1766.

'79 Alfa Romeo Spyder Veloce, 90k mi, Weber conversion, yellow/black, good cond, \$1.9k. Mark, x37370.

'85 Porsche 944, black, 5 speed, sunroof, A/C, AM/FM/cass, ex cond, \$4,995. x35180 or 326-3706.

'84 Outlass Supreme station wagon, 80k mi, ex cond, wood grade siding, Granny, 334-4485.

Boats & Planes

'85 Glouster 20' sailboat with trailer, sails, and '91 Evinrude 9.9hp outboard, \$3k. Carlos, 870-9512.

'80 100hp Chrysler O/B PTT, 18' Larson boat, galv trailer, Hummingbird depth finder, plus more, \$1.1k. x33187 or 488-5162.

'86 Celebrity, 19' 230 hp Mercruiser I/O, full instrumentation & canvas, recently reupholstered, fully outfitted. Sportsman trailer, ex cond, \$11,750. Charlie, 488-4412.

Audiovisual & Computers

Kenwood 440 MHz receiver, TM441A, \$375. Bill, x36650 or 554-6242.

Tektonix 4105 graphics terminal & 4695 color printer, \$600/both; 3 TAB terminals, \$110/ea. 328-3840.

Sony Sports digital radio headphones, model SRF-M50, like new, \$20/firm. John, x31114 or 486-0898.

Mac II cx, 12 MB RAM, 80 MB int HD, 2 ext 80 MB HDs, int & ext FDHD floppy drives, PAS 16. 16 bit sound card, Labtec CS-150 speakers, MacFly joystick, \$700; E-Machines T16 16" monitor 832 x 624 resolution, 8 bit Nubus card, \$650; Zoom 14.4 ext fax modem. w/fax & comm sw, \$100; Imagemaster II printer, \$100. Dean, x31571 or 726-1873.

PC CD-ROM, Aegis Guardian of the Fleet,

unopened, \$35/obo. Ray, 38030.

Citizen CSX-140 printer w/GSX color option, \$250. Magdi Yassa, 333-4760 or 486-0788.

Sony car Discman w/car kit & wireless remote, \$200/obo. Thanh, x31464.

Infinity SM120 200W 3-way speakers, \$500/pr; Proton D1200 100w/channel power amp & Proton P1100 preamp, \$350; entire system, \$800. Chris, 280-4294 or 474-7263.

Compaq Deskpro XT, \$150; HP Laserjet printer, \$350; portable Brother memory typewriter, \$65. Tammy, x32593 or 543-2668.

Dell 386SL 25 MHz subnotebook PC, 2 MB RAM, 60 MB HD, external 3.5 floppy drive, wcase, \$550. 280-0008.

Delco 2001 AM/FM/CD car stereo, 16W/channel, 7 band eq, 12 preset stations, \$200. Ken, 333-7167.

Musical Instruments

TAMA Rockstar DX drums, red, China cymbals, Gibraltar double pedal, extra cymbal stands, cowbell, \$800. 452-9522.

Bach Strat silver trumpet, \$595; LP Jam Block, \$35. David, x40211 or Robynn, 488-4876.

Household

Student desk and hutch with matching chair, Cargo, \$325. Bill, x36650 or 554-6242.

Love seat, brown velour print, contemporary style. x40250.

Light brown couch, \$30; twin bed, \$25; stand up bar, \$25; computer credenza, \$25/obo. Brian, 480-5430.

Dining set, oak with 6 chairs, antique; small drop leaf with 2 rattan chairs; 7 piece wicker set w/cushions, \$185. 339-1152 or 339-0327.

King size waterbed black w/floating night stands, \$100; Magnavox, 27" color TV with remote, needs repair, \$25. Steve, x31669.

Queen waterbed, mirrored headboard, mattress, liner, heater, 8 drawers, 4 cabinets, \$150; coffee & end table, cherry, ex cond, \$85; couch & chair, taupe, arms lined with oak, \$100; dining table, 3 leaves, 5 chairs, \$75; glass/oak table w/brass base, 6 chairs, \$85; sturdy metal desk, chair, \$75. x34372 or 486-8851.

Oak entertainment center, \$295; rollaway bed, \$35. David, x40211 or Robynn, 488-4876.

Futon, ex cond, \$100; sofa/sleeper, good cond, \$175; chair & ottoman, \$20; kitchen table & 6 chairs, \$75. Mark, x37370.

Wanted

Want roommate(s), modern 2,300 sq ft, 2-story, 4 bedroom house with separate living quarters, 12 minutes from NASA in Seabrook, cable, fax, washer & dryer, separate phone, \$450. 474-4742.

Want housemate to share new Kemah home, 4-2.5, garage, \$300/mo + 1/2 utilities, + deposit. Jeri, 333-7552.

Want non-smoking female roommate to

share house, large bedroom, own bath, \$325/mo + 1/2 utilities. 943-3842.

Want farm tractor, used but dependable, attachments desired. x30737.

Want personnel to join VPSI vanpool, West Loop Park & Ride lot at 6:50 p.m. to NASA/Contractors. Richard Heetderks, x37557 or Ed Rangel, x36124.

Want lawnmaster for Pony baseball stadium, CD player & amp, tax deductible. Bob Kelso, x35483 or 480-2997.

Want non-smoking roommate to share 4-2.5, country home in Alvin, able to tolerate large outdoor pets, ref required, \$350/mo. x46121 or 331-3963.

Want personnel to join VPSI Vanpool departing Meyerland Park & Ride lot at 7:05 a.m. for JSC, vanpool consists of on-site personnel working the 8 a.m.-4:30 p.m. shift, currently have 15 good members, looking for 2 to 3 more. Travis Moebes, x45765 or Don Pipkins, x35346.

Want to rent garge apt or private living quarters in Clear Lake area, need ASAP. 334-5215.

Miscellaneous

Stomach cruncher with weights, \$75. x34372 or 486-8851.

Tropical plants, all in permanent pots, large to small sizes, various kinds, \$5 and up/peg. Bob, x33149.

Motorcycle trailer, \$150. 332-9105.

Exercise bike, peddle & row. 337-2333.

Miscellaneous baby stuff, swing, stroller, clothes, etc, \$5-\$25. 488-0054.

Men's ski jacket, Raven, medium, \$40; ski boots, Raichle, sz 9 1/2, \$60; after ski boots, sz 9 1/2, \$10. Jeri, 333-7552.

Above the ground pool, 24' round, 4' deep, wood deck, new pump, filter & liner, will help with installation, \$1k/obo. Sharon, 474-9155.

Seaclear acrylic aquariums, 55 gal, \$95; 35 gal, \$60; fish, calico fantail goldfish, \$12; several African cichlids, \$9-\$12/ea; Schwartz cory cat, \$6; silver dollar, \$5. David, x40211 or Robynn, 488-4876.

Rowing machine, \$75; stair climber, \$350. 328-3840.

Orbiter/Mir Rendezvous Docking tee shirt, \$7.50. 282-3479.

Bike Avocet seat, \$20; Profile aerobars, \$60; roof rack, for vehicles with rain gutters on roof, \$50. 333-8126 or 488-1327.

10" De Walt power miter saw, w/elect brake, 60 tooth Freud carbide blade included, ex cond, \$90; Emerson, digital portable CD player, MDL# AD2525 w/carry case, AC power adaptor, complete auto adaptors, \$85; LUXO magnifier/swing arm lamp, w/22w Circline fluorescent tube w/weighted table top base, new bulb installed, ex cond, \$65. Doug, x48851 or 486-7412.

Wood desk, 38" x 78", 6 drawer, good cond, \$40. John, x31114 or 486-0898.

Bicycling roller trainer, \$60; wood drawing table, \$60. Scott, x30998 or 480-5508.

Complete set of Do-It-Yourself service/shop manuals including powertrain, electrical, cool-

ing system for '87 Ford Tempo/Topaz/ Escort/ Lynx, \$10. x31658 or 333-2752.

Genie garage door opener, one-half horsepower, screwdrive, remote controls, \$60. 280-9621.

Jenny-Lind cradle w/bumper pad, mattress pad, pillow & comforter, \$75; much more to come as outgrown including infant & children car seats, baby beds, clothes, & toys. Dennis or Cindy, 992-5285.

Honda three wheeler, \$700; 3 piece king sz BR suite, dark color, double mirror dresser & night stand, \$400; girl's 5-piece BR set, white, \$450; 4 book cases, dark, \$100; Baldwin Interlude organ w/fun machine, \$700; 4 bar, \$200; Foosball table, \$100; coffee and end table, \$150; game table plus 4 chairs, \$100. 992-8764.

Several new rifle and pistol gun cases, \$10 ea/obo. 479-3297.

Model Builder, Mechanix & Popular Science magazines, free. 534-3021.

Regulation 4' x 8' pool table w/cover, balls, ball rack, cues & cue rack, table light, \$900/obo. 488-6128.

Wedding dress, size 6, w/slip and veil, sweetheart neck, beaded, short



Virtual Presence

Scientists now able to operate robot with 'Body English'

Top—From left to right, DART project engineer Larry Li and team members Ron Diftler, Susan Shelton and Brian Cox check the dexterous right hand of the robot. Center—DART is an ambidextrous robot that can see, hear, and soon will have the sense of touch. Bottom — Ron Diftler dons a virtual reality helmet, gloves and sits in a special chair to tie a knot in a rope with the robot. The stereoscopic view the operator sees comes from two video camera "eyes." The operator's arm, hand, and head movements are transferred to the robot in real time.

[Editor's note: This is the first of a two-part series on the development and application of the Dexterous Anthropomorphic Robotic Testbed.]

By James Hartsfield

Looking up, the lunar sky is jet-black, save a brilliant, uninterrupted Sun. Another day at work. Pick in hand, sample bags ready, you begin chipping away at the rock outcropping that has held your interest for the past week. Suddenly, what seems to be a dull ring penetrates your helmet.

Soon, it rings louder. "Freeze arm," you command, and step to your desk. It's only the phone. The above scene could become just another day at the office for those exploring the planets as robotics engineers in JSC's Automation, Robotics and Simulation Division take virtual reality a step further—to a virtual presence.

The innovative project uses a virtual reality helmet, stereoscopic television cameras, special gloves and a chair fitted with magnetic sensors to control an ambidextrous, seeing, hearing, and soon-to-be feeling robot.

"The beauty of this is that you can operate the robot the way you operate your own body," Project Engineer Larry Li explained. The project, called the Dexterous Anthropomorphic Robotic Testbed, or DART, and Full-Immersion Telepresence Testbed, or FITT, combines the remote control of robots with virtual reality.

The work could have far-reaching potential, not only in the exploration of other planets, but also for robotics aboard spacecraft and the more complex control of almost any robotic operation that requires real-time, human decision-making, Li said. The virtual reality-like control system being developed by Li and the other members of the DART team—Ron Diftler, Susan Shelton and Brian Cox—seeks to literally put the person inside the robot.

"We are experts at using our own bodies naturally," Li said. "Instead of having a person control something foreign like a joystick, we want to design a system that reads the body's natural movements."

"In virtual reality, the other side is an artificially generated world," Li said. "But in this type of telepresence, the other side is a real world."

The majority of robotic teleoperations today use a joystick-type of control mechanism,

forcing the operator to think and move the robot in what is often a tedious, training-intensive fashion. Joystick-type controls for robots have a variety of limitations. Controlling two robotic arms simultaneously with a joystick is extremely difficult. If you add movements of the robot's head and eyes and its rotating torso, controlling simultaneous movement is almost impossible, Li said.

The control equipment for Li's robot is carefully designed to track the body's moves without impeding them.

"The understanding of the basic human skills is our biggest challenge," he said. "I always have to look at how I can design the mechanism around the human without making the apparatus too encumbering. Any time a control is too cumbersome or too difficult to understand, the operator is going to work slower, a lot slower. As a consequence, the robot may not be able to do a lot of tasks that the human can do."

In Li's laboratory, the robot operator dons a virtual reality helmet and sees the scenes from two color video cameras mounted as the robot's eyes. He sits in a chair and dons two gloves fitted with sensors that read movements of the hands and fingers. Magnetic sensors are mounted on the helmet and on the wrists of the gloves which read movements of the head and arms. More than just the robotic controls, Li's research focuses on creating a robot with human dexterity, capable of performing the complex tasks a human can perform. The DART robot has 26 degrees of freedom, but that amount of possible movement still does not approach the freedom of movement available to the human body.

"The physical behavior of the robot and human will generally be different," Li said. "That problem requires intelligence on the part of the robot. It must be able to make decisions on its own to compensate for the difference." If the robot operator's arm moves from one position

to another along a course that is impossible for the robot to follow, the robot has an artificial intelligence that can translate that movement into an acceptable route it can follow and reach the same final arm position.

"Having a shared control between the robot's own intelligence and the operator, a cooperation between teleoperation and automation, allows the robot to overcome shortcomings," Li said. "It makes operating the robot easier and more efficient."

Mounted on the operator's helmet is a microphone that allows the robot to respond to simple voice commands as well. Those commands include "freeze arm," a command that locks the robot's position, allowing the operator to take a break; "dial," "clockwise," and "counterclockwise," commands that instruct the robot to perform a turning motion with its hand to manipulate a rotary switch; and "palm view" or "head view," commands that allow the operator to switch his view from the robot's television camera eyes to a camera mounted near the palm of the robot's right hand. The hand camera allows the operator to see a different perspective when needed.

"You can't use the palm camera for hand-eye coordinated movements. It is for close-ups," Li explained. "When you want to inspect something very closely, or see it from a different angle, it basically allows you to take your eyeball out and put it in your hand."

Li originated the current project in 1990, after the emerging technology of virtual reality caught his attention.

"I realized there seemed to be a happy marriage between the very human compatibility of virtual reality and the type of human dexterity robot I was trying to build," he said. DART has used mainly existing equipment from other robotics work—commercially available robotic arms, hands, cameras and virtual reality equipment—and has been done at a minimum cost as a technology demonstration.

The next step for Li will be to add a sense of touch to the robot and operator. An arm brace

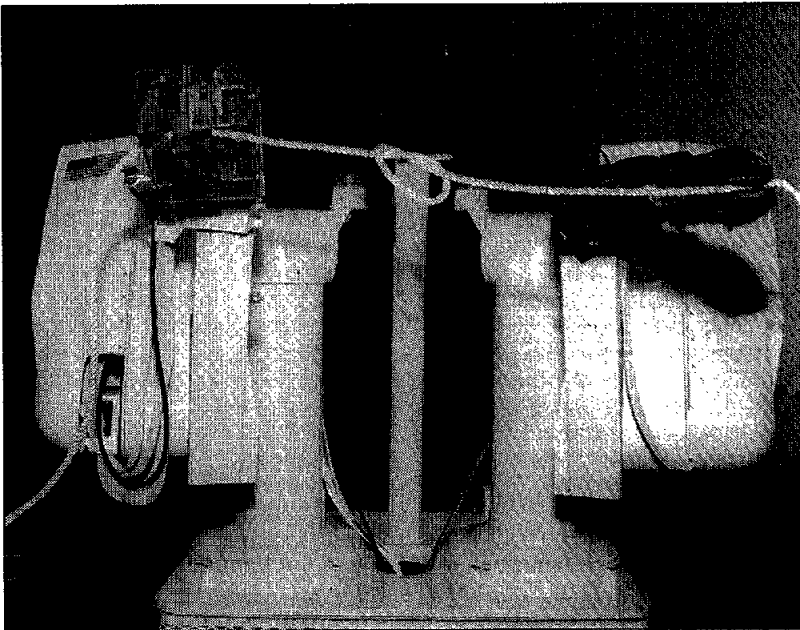
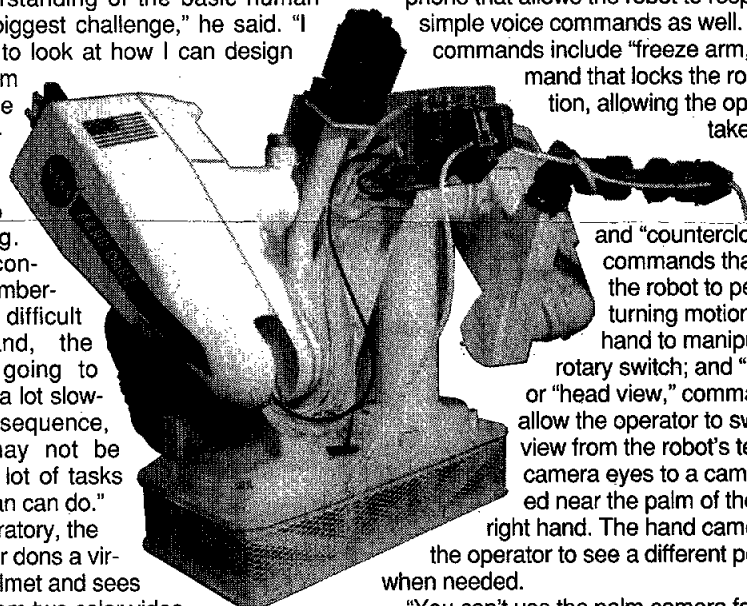
has been designed for the virtual reality control system, called an Exoskeleton Arm Master, by Exos, Inc., of Woburn, Mass., through a NASA Small Business Innovative Research grant. When mounted on the operator's chair, small, electric motors in the brace will turn on when the robot encounters resistance, passing that sensation of resistance on to the operator.

The immersion control of robots such as DART could hold vast potential in space. "The best use is probably for close proximity operation of robots in orbit or on planetary surfaces," Li said. "The delay factor for extremely long-distance operations, such as from an operator on Earth to a robot on Mars, may be too great for real-time control."

But the delay in real-time commands—for example, the eight to 20 minutes it takes for radio signals from Earth to reach Mars—could be circumvented by combining virtual reality with the robotic operation, Li added. From television scenes generated by the robot, a graphical representation of the surrounding landscape could be produced and the robot's desired actions practiced. Once the planned activity is perfected in the imaginary realm of virtual reality, the actual activity would then be sent to the distant robot. For less distant operations, the communications delay is less significant. For example, real-time control and operations of a robot on the Moon may be possible from Earth.

In operations aboard a spacecraft, control of a robot via an immersion system could allow real-time work with robots capable of performing much more complex tasks than is now possible. "It could optimize the uses of an astronaut's space-walking time by allowing a robot to do more laborious, tedious tasks outside the spacecraft," Li said. And, from a spacecraft or mother vehicle that has landed on Mars or another planet, the system could be used for real-time control of roving robots remotely exploring the surface. Such a capability for complex, real-time control of robots also could have a variety of Earth-bound applications as well, among them allowing difficult tasks to be performed by robots in hazardous areas.

"Robots at present are primarily used only for inspections in hazardous areas," Li said. "Eventually, humans still have to enter the area to perform the actual work. In the future, a DART-like robot may be able to both inspect the hazardous area and perform the actual work." □



If you are working on innovative research or technology development that you believe would be well-suited for an article such as this, please contact James Hartsfield, x34934, in Public Affairs' News and Media Services Branch, AP3.

Auditor receives award

JSC

People

Ronald Marta, a senior auditor for the Inspector General recently received a Special Service Award at NASA Headquarters from Administrator Dan Goldin in a ceremony held in Washington, DC.

Marta was recognized for his dedicated and tenacious efforts during the two and a half year investigation of Omniplan Corporation.

The investigation resulted in a 285-count criminal indictment and cost savings to the Government of seven million dollars. The Justice department anticipates the recovery of an additional five million dollars

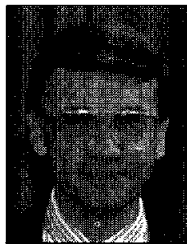
that represents actual fraud damages to NASA.

Engineers join elite group

Kathryn Packard of the Test, Operations, and Institutional Safety branch and Terry Michael of Hernandez Engineering recently passed the Board of Certified Safety Professional examinations making them Certified Safety Professionals.

They join an elite group of 8,000 individuals nationwide recognized for excellence in the safety profession. Certification requires a minimum of five years experience in the field and successful completion of two seven hour examinations covering all aspects of safety.

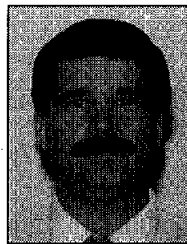
Packard received her CSP in Comprehensive Practice and



Marta



Packard



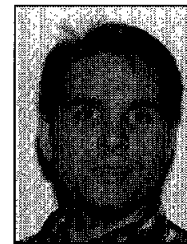
Michael



Cogan



Everling



Cilento

Michael received his in System Safety Aspects.

Secretaries recognized

Two secretaries recently received the Marilyn J. Bocking award for secretarial excellence.

Nancy Cogan, division secretary in the Financial Management Division, recently received the award for a variety of reasons.

Cogan was cited for her ability to juggle several branches' workloads, ensure customer satisfaction and

handle all types of crisis situations.

Jeanette Everling secretary for the Simulation Systems Branch and licensed pilot received the award for her diversity on the job.

Everling was selected due to her ability to disseminate technical information and her knowledge of branch operating policy, and her positive attitude.

STS-66 plaque hanging

Bob Castle, lead flight director for STS-66, presented the plaque

to Rich Cilento, the Flight Activities Officer, and his team, in recognition of their outstanding work, both pre-flight and post-flight.

The planning of the mission and working with the multitude of activities on this flight earned Cilento's team recognition.

Assisting in hanging the plaque was Madeline Stripling who was honored for her many years of outstanding and critical support in mission control on the eve of her retirement.

Civil servants receive pay increase

Employees can look forward to a few extra dollars on their Jan. 31 paycheck and now may use sick leave to care for family members.

A 3.92 percent pay hike, a combination of general schedule and locality pay increases, will take effect Jan. 8 and will appear on checks dated Jan. 31. This percentage does not apply to all JSC employees.

Employees with duty stations at White Sands, NM, and Kennedy Space Center will receive net pay increases of approximately 2.64 percent. Employees on special occupation pay schedules or Interim Geographic Schedule (California-based) will receive only the 2 percent general increase. Senior Executive Service, Senior Scientific and Professional, and NASA Excepted pay schedules will receive only a 2 percent locality pay increase.

Sick leave regulations have changed as a result of the Federal Employees Family Friendly Leave Act passed in October. Employees may now use sick leave to care for a sick child, spouse, parent, spouse's parent, sibling, siblings' spouse, any individual related by blood or affinity whose close association with the employee is the equivalent of a family relationship.

New temporary regulations require an annotated SF71 for any sick leave used for these purposes. A three-year study will be conducted and Congress will evaluate the results before making the new rules permanent.

Atlantis to receive docking system for STS-71 May flight

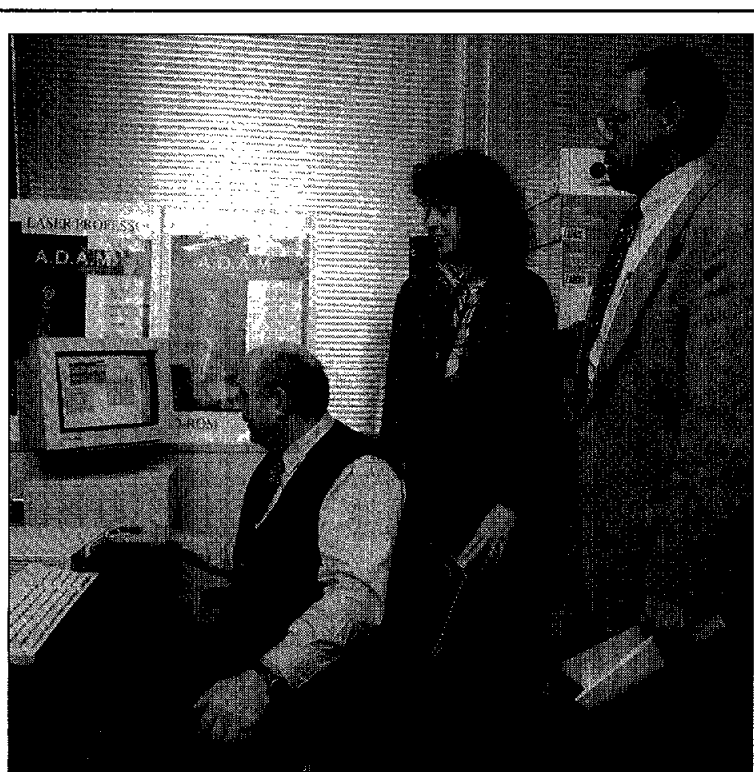
(Continued from Page 1)

test of the battery of ultraviolet telescopes housed in *Endeavour's* cargo bay was being conducted.

The astronauts will work in two shifts around-the-clock during the flight, aiming the Astro-2 telescopes at various celestial targets to gather new data about the phenomena of ultraviolet radiation emanating from the universe. *Endeavour* is scheduled to be rolled to Launch Pad 39-A in early February.

Meanwhile, NASA engineers, engineers from Rockwell International and Russian technicians from RSC Energia gathered at KSC to begin the replacement of a half dozen ball-screws in the docking mechanism which will be installed in the cargo bay of *Atlantis* for the first Shuttle linkup to the Mir Space Station in the spring on mission STS-71.

The ball-screws act as a type of shock absorber to enable the compatible docking apparatus of *Atlantis* and Mir to gently come into contact with one another after the Shuttle aligns itself for the final approach to the Mir's Krystall module docking port. The ball-screw replacement and retest should have no impact to launch preparations.



Computer tutor—Joe Marcinkowski, left, president of The Laser Professor, shows Dr. Jill Fabricant and Hank Davis how the computer physics tutor works.

Computer tutor moves from JSC to high schools

JSC has awarded a copyright license for software technology originally developed for training astronauts to be used to develop and market a multimedia program aimed at helping high school physics students.

JSC signed the license agreement with The Laser Professor Inc., of Clear Lake, a company that plans to begin marketing a compact disc software package called "The Physics Tutor" later this year. The license is part of JSC's continuing transfer of technology to the private sector, creating jobs and applications outside of the space program.

"The Physics Tutor" grew out of NASA's development of a unique, artificial intelligence software architecture called Intelligent Computer-Aided Training. ICAT has been used for a variety of specific applications by NASA, including astronaut and flight controller training. In fact, a program derived from ICAT was used to train astronauts for their work in the Spacehab-3 module that will fly aboard the shuttle *Discovery* on mission STS-63 next month.

"The unique property of ICAT is that it is a very general architecture from which specific uses can be developed without making wholesale changes," said Dr. R. Bowen Loftin, Ph.D., principal investigator for advanced training technologies at JSC.

Loftin, also a physics professor at the University of Houston, saw the potential for using an ICAT-derived program as a tutorial for physics students and began developing "The Physics Tutor." The program was developed and evaluated using input from actual high school physics students in a class at nearby Clear Creek High

School, Loftin said. NASA was the single largest contributor to funding the development, however, state grants and grants from commercial companies also funded much of the work. NASA was awarded a copyright for the program once completed.

A license to market "The Physics Tutor" was then obtained by The Laser Professor Inc., with the assistance of JSC's Technology Transfer and Commercialization Office.

"The Physics Tutor is unique in that it behaves the way a teacher behaves when they can work one-on-one with a student," explained Joe Marcinkowski, president of The Laser Professor Inc.

"It detects errors as they happen when the student is solving a problem and points out the correct method. It also tracks the student's strengths and weaknesses and chooses the next problem to present to the student accordingly."

Teachers also can use the program's tracking of students' weaknesses over time as insight for better focusing their instruction. Two forms of The Physics Tutor are planned: one for classroom use and another for personal home use by students, Marcinkowski said.

The Laser Professor will do additional development work on the program, upgrading it for use on Macintosh and IBM-compatible machines as well as incorporating full-motion video and audio.

The program is planned to begin a user evaluation designed to be its final preparation for the market this summer and it will be available for purchase by late this year.

NASA year in review

Twenty-five years after the first lunar landing, a Russian cosmonaut flew aboard a US spacecraft for the first time and a spectacular cosmic collision took place on Jupiter, but it was the work of the newly refurbished Hubble Space Telescope that dominated NASA news in 1994.

Results from HST touched on some of the most fundamental astronomical questions of the 20th Century.

Highlights included, compelling evidence for a massive black hole in the center of a giant elliptical galaxy located 50 million light years away from Earth. Observations of great pancake-shaped disks of dust—raw material for planet formation—swirling around at least half of the stars in the Orion Nebula.

Confirmation of a critical prediction of the Big Bang theory—that the chemical element helium should be widespread in the early universe.

The detection of this helium may mark the discovery of a tenuous plasma that fills the vast volumes of space between the galaxies—the long-sought intergalactic medium.

Significant progress in determining the age and size of the universe. Astronomers announced measurements that showed the universe to be between 8 and 12 billion years old, far younger than previous estimate. This was the first step in a three-year program to measure the scale, size and age of the universe.

Ruling out a leading explanation for dark matter, thought to make up over 90 percent of the mass of the universe. This major finding means that dark matter probably consists of

exotic sub-atomic particles or other unknown material.

The year also saw continued progress on the space station program, which produced almost 25,000 pounds of flight-qualified hardware in 1994.

Among the major developments of 1994 were a series of formal agreements bringing Russia into the partnership. The year also saw completion of a crucial systems design review for the new Space Station architecture, the culmination of months of intensive work following President Bill Clinton's order in February 1993 to substantially reduce the cost and time required to build the orbital laboratory.

In the space shuttle program, NASA launched seven highly successful science

and technology missions which acquired a total flight time of more than 81 days in orbit. In 1994, the Shuttle fleet deployed 832 tons of cargo into space, carried an additional 105 tons of cargo to orbit and back, and lofted 42 astronauts into space, including crew members from Russia, Japan and the European Space Agency.

NASA's "Year-Ender," a review highlighting 1994, is available via the Internet at ftp.hq.nasa.gov/pub/pao/pressrel/1994/94-216.txt.

Message to federal workers

Vice President Al Gore sent a new year's message to all federal workers emphasizing the importance of their ideas and initiatives to the government reinvention effort.

"Two years ago the President asked me to lead an effort to reinvent the federal government. We're doing this by building on your ideas and initiatives. For me, far and away the most rewarding part of reinvention has been seeing first-hand the talent and dedication you bring to your work," Gore said.

"Now the President has asked me to carry out a fundamental reassessment of the missions of the federal government. We all face uncertain times as we sort out tomorrow's government. But as we do so, the President and I want you to know that we believe absolutely in the federal worker. We value both your past contributions and your role as the most important resource in the government of the future. Our goal is a government with systems that allow federal workers to do what they signed up to do: to make a difference," he added.

Space News Roundup

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EditorKelly Humphries
Associate EditorKaren Schmidt

JSC remembers Martin Luther King

In observance of the birthday of Dr. Martin Luther King, the JSC Black Cultural Association will present a program commemorating King's contributions to American life from 11:30 a.m. to 1 p.m. today in the Gilruth Center Ballroom.

The program includes a fifteen minute film honoring King, invocation by Minister Barbara Guthrie, presentation of the Dr. Ronald McNair Scholarship award by Cleo Glenn Johnson, president of the Black United Fund, and keynote speaker Minister Robert Muhammed of the Houston Area Nation of Islam.

For additional information contact Judith Elam at x34028.