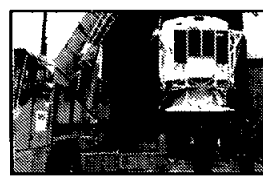




JSC Director Aaron Cohen discussed the recently completed 90-day study on lunar and Mars exploration. Story on Page 3.



Worker at JSC have begun moving the Skylab trainer from Bldg. 5 to make room for space station simulators. Story on Page 4.

Space News Roundup

Vol. 29

January 12, 1990

No. 2

SYNCOM deployed

Columbia, crew ready to bring LDEF back home

The crew of STS-32 began the first mission of the new decade with a near perfect lift-off from Pad 39A at 6:35 a.m. CST Tuesday, after a one-day weather delay.

The SYNCOM IV-F5 Navy communications satellite was successfully deployed Wednesday, and retrieval of the Long Duration Exposure Facility (LDEF) is scheduled for today.



STS-32

Commander Dan Brandenstein, Pilot Jim Wetherbee, and Mission Specialists Bonnie Dunbar, David Low and Marsha Ivins reported a smooth ascent for *Columbia* and were given a "go" for orbit operations after the payload bay doors were opened about 8:15 a.m. CST.

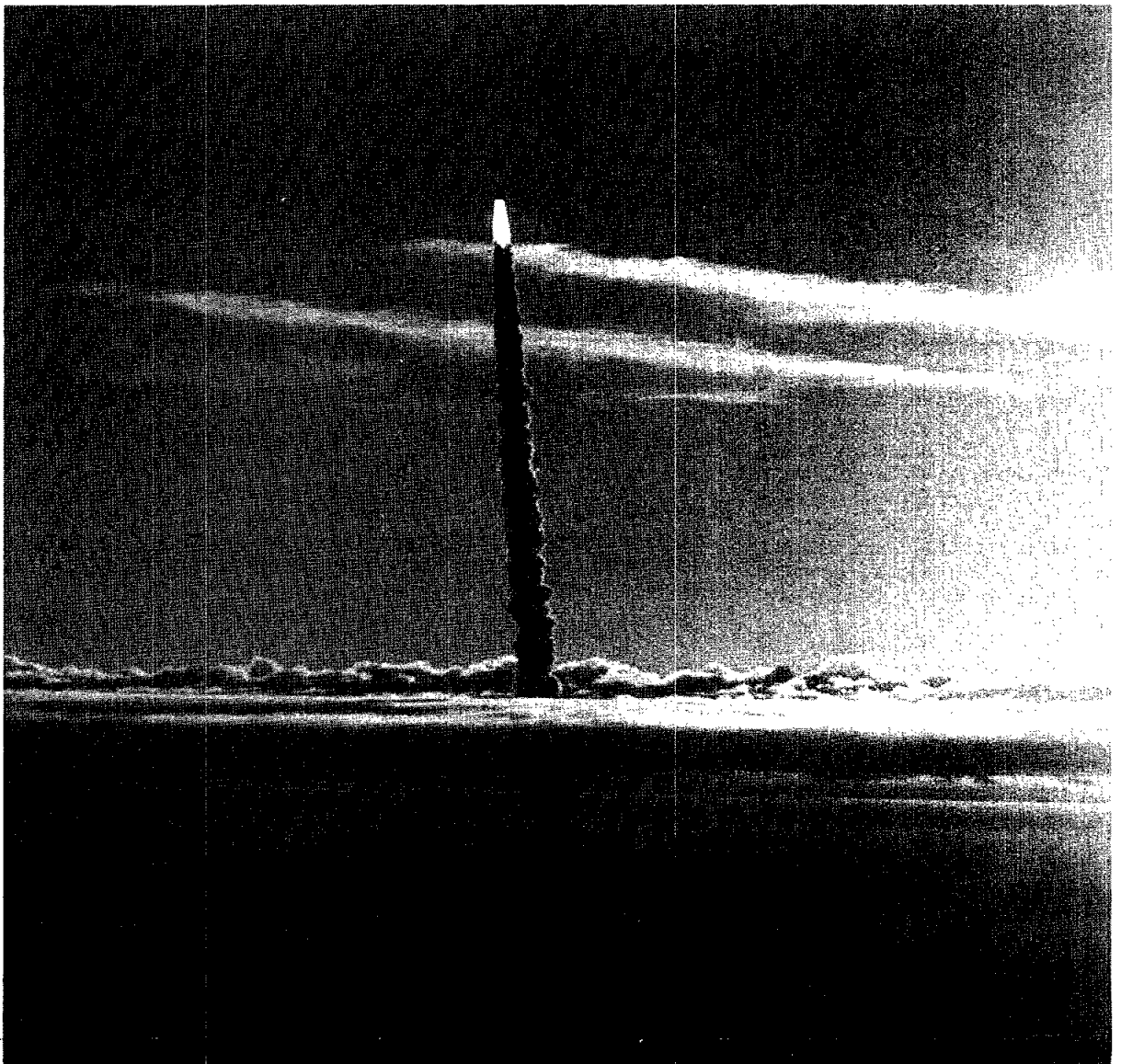
In anticipation of the LDEF retrieval, the crew and flight controllers checked out *Columbia's* robot arm, the remote manipulator system (RMS), a few hours after launch. The crew also activated four middeck experiments—two Protein Crystal Growth (PCG) experiments—one Fluids Experiment Apparatus (FEA) test and the Characteristics of Neurospora Circadian Rhythms (CNCR) experiment.

The last of the five SYNCOM IV

satellites leased to the Navy to provide high-priority communications was successfully deployed by Low and Dunbar at 7:19 a.m. Wednesday morning. The crew continued to perform secondary experiments on the middeck, and was working a few minor problems, including a balky Text and Graphics System (TAGS), an inadvertently unplugged PCG experiment and a minor data problem with the exercise treadmill.

The crew also has run into a small difficulty with the American Flight Echocardiograph (AFE). The AFE is an off-the-shelf medical ultrasonic imaging system modified for space flight. The problem is distortion on half of the screen the crew is using as a monitor. Flight controllers believe the problem is being caused by electromagnetic interference and is affecting only the display screen. Video also is being recorded on the on-board camcorder, and that camera's viewfinder is not showing any distortion. The AFE generates a two-dimensional, cross-section of the heart or other soft tissues and displays it

Please see **COLUMBIA**, Page 4



NASA Photo

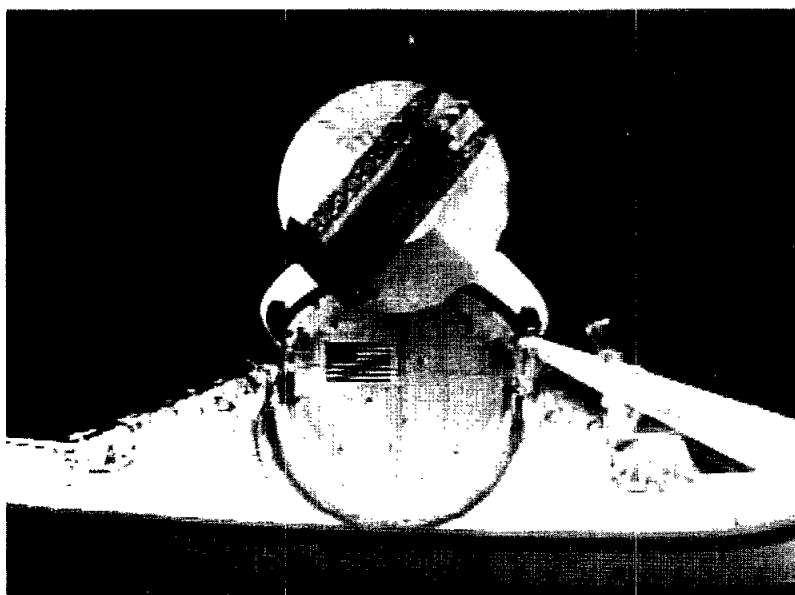
Columbia rises through the clouds over Kennedy Space Center on Tuesday as it begins its journey to deploy the SYNCOM communications satellite, retrieve the Long Duration Exposure Facility (LDEF) and conduct numerous significant scientific studies.

Welcome plans set

Current welcome home plans for the crew of STS-32 call for a ceremony to be held on the grounds of JSC on the afternoon of Jan. 19 on the north side of Bldg. 1.

The exact time of the event has yet to be determined and employees should check the employee information line, x36765, for the exact time and any changes that may occur.

STS-32 Mission Control viewing hours for badged employees and their guests for this week will be from 11 a.m. to 2 p.m. on the following days: Saturday, Jan. 13; Sunday, Jan. 14; Tuesday, Jan. 16; and Wednesday, Jan. 17. Because of the many variables associated with the mission, please check the employee information line daily for the latest schedule.



NASA Photo

The SYNCOM IV-F5 satellite is deployed Frisbee-style from *Columbia's* payload bay. This photo was taken from taped video transmissions provided by the crew.

Quayle addresses new space goals

Editor's note - Vice President Dan Quayle outlined America's future plans for the exploration and use of space in an address Wednesday to the American Astronomical Society in Arlington, Virginia. A transcript of his speech follows:

As you know, Space Shuttle *Columbia* is well into its second day. At this moment it is over Indonesia at an altitude of 338 kilometers. Its mission signifies America's successful return to space.

I am told the last time the American Astronomical Society dealt formally with the White House was in 1902, when you visited President Teddy

Roosevelt. We've got to stop meeting so often.

Today, the United States leads the world in space science. In large part this is because of our leadership in space astronomy. And this leadership, in turn, reflects your efforts. So let me begin by paying tribute to you for your magnificent contributions to advancing our scientific understanding over the years.

America has been a leader in the scientific understanding of space. We also pioneered the space age. In the 1960s, we made a national commitment to both space science and space exploration.

Please see **QUAYLE**, Page 4

New graphic gives controllers three-dimensional view of space

By James Hartsfield

A new graphic display first used in Mission Control during the space shuttle *Atlantis's* October 1989 flight is again providing three-dimensional views of the Shuttle and Earth during *Columbia's* mission STS-32.

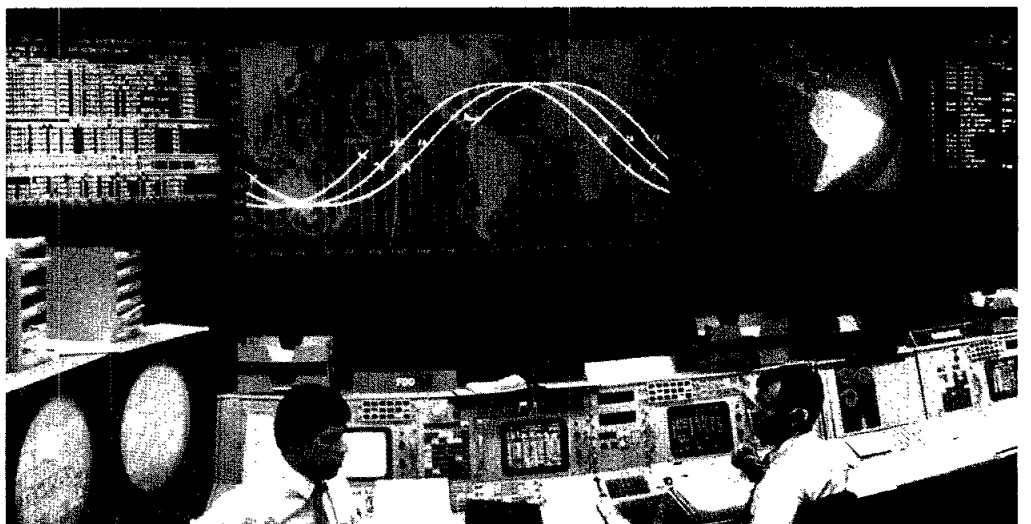
The Distributed Earth Model Orbiter Simulation (DEMOS) is a joint project between the Mission Operations Directorate and the Mission Support Directorate. The display is based on live position and attitude data from the shuttle and provides a color view of the way the shuttle looks as it orbits the Earth. The view is presented as if seen from a variety of imaginary points, ranging from a look at the whole planet with an exaggerated shuttle orbiter circling it to a rear-position view of the orbiter as it reenters the

atmosphere, banking as it slows for approach and landing.

Although it is based on live data, the display is driven by predicted simulations of the Orbiter's position during times when such data is not available. In addition to showing the Earth and the shuttle, the display includes the Sun, the Moon, 100 of the brightest navigational stars, and payloads, including the Long Duration Exposure Facility (LDEF). The groundtrack of the shuttle also is displayed as part of the new graphic.

The new display will be projected on one of the four large screens that flank the 10-foot by 20-foot global tracking map at the front of the Flight Control Room. DEMOS is not a replacement graphic for the global

Please see **DEMOS**, Page 4



JSC Photo

Flight controllers check out the three-dimensional Distributed Earth Model Orbiter Simulation (DEMOS) graphic display during STS-34.

JSC

Ticket Window

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

General Cinema (valid for one year): \$3.75 each.

AMC Theater (valid until May 1990): \$3 each.

Sea World (San Antonio, year long): adults, \$17.25; children \$14.75. \$11.

JSC

Gilruth Center News

Sign up policy—All classes and athletic activities are first come, first served. To enroll, you must sign up in person at the Gilruth Recreation Center. Everyone will be required to show a badge or EAA membership card. Payment must be made in full at the time of registration. Classes tend to fill up four weeks in advance. For more information, call x35789 or x30304.

EAA badges—Dependents and spouses may apply for a photo I.D. 6:30-9:30 p.m. Monday-Friday.

Defensive driving—Course is offered from 8 a.m.-5 p.m., Jan. 20 and Feb.3; cost is \$15.

Weight safety—Required course will be held 8-9:30 p.m., Jan. 17; cost is \$4.

Taekwondo/hapkido—Classes in the Korean art of self-defense, and mental and physical discipline are held Tuesday and Wednesday nights; cost is \$40 monthly.

Low-impact aerobics and exercise—Each eight-week session runs twice a week from 5:15-6:15 p.m. Cost is \$24.

Country and Western dance lessons—Dance lessons begin Jan. 22 and are held each Monday night for six weeks. Cost is \$20 per couple.

JSC

JSC

Today

Astronomical Society meets—The JSC Astronomical Society will meet at 7:30 p.m. Jan. 12 in the Berkner Room of the Lunar and Planetary Institute. Dr. Mike Stanford will speak on radiation concerns for manned lunar and planetary missions. Contact Bill Williams, x33849 or 339-1367 for information.

Ground testing seminar—An AIAA Ground Testing and Simulation Technical Committee lunch and learn meeting will discuss "Flow Diagnostics of Arc Jets" at 11:45 a.m. Jan. 12 in the Bldg. 3 cafeteria. Dr. Carl Scott of JSC's Advanced Programs Office will be the featured speaker. For more information, call Sivaram Arepalli at x35910.

Cafeteria menu—Special: barbecue link. Entrees: deviled crabs, broiled codfish, liver and onions. Soup: seafood gumbo. Vegetables: buttered corn, green beans, new potatoes.

Monday

Martin Luther King Day—Most JSC offices will be closed in observance of the Martin Luther King Day holiday.

Tuesday

AFCEA meets—The monthly Armed Forces Communications and Electronics Association (AFCEA) Houston Chapter luncheon meeting will begin at 11:30 a.m., Jan. 16, at the Nassau Bay Hilton. Thomas J. Lee, director of Marshall Space Flight Center, will be the featured speaker. The member price is \$10, and non-members are \$12 each. Reservations must be made by noon, Jan. 15, by calling Debbie Williams at 283-6667.

Cafeteria menu—Special: corned beef hash. Entrees: meatballs and spaghetti, liver and onions, baked ham with sauce. Soup: split pea. Vegetables: buttered cabbage, cream style corn, whipped potatoes.

Wednesday

Astronomy seminar—The JSC Astronomy luncheon seminar will feature an open discussion from noon-1 p.m. Jan. 17 in Bldg. 31, conference room 193. For information, contact Al Jackson, x33709.

Threshold Group meets—The Threshold Group will have a coordinating committee meeting from 4-5 p.m. Jan. 17, in Bldg. 45, Rm. 128. All JSC civil servants are invited to attend; contact James Sturm at x33085 for additional information.

Cafeteria menu—Special: barbecue link. Entrees: cheese enchiladas, roast pork and dressing. Soup: seafood gumbo. Vegetables: pinto beans, Spanish rice, turnip greens.

Thursday

NCMA luncheon—The Space Center Houston Chapter of the National Contract Management Association (NCMA) will have a luncheon meeting from 11:30 a.m.-1:30 p.m. Jan. 18, at the Gilruth Rec Center. The featured speaker is Maj. Lloyd Schneider, NCMA regional director for certification. Contact Liz Aldridge at x38518 or Shannon Romine at 282-1770 for luncheon prices and information; reservations must be made by noon, Jan. 12.

Cafeteria menu—Special: chicken fried steak. Entrees: roast beef with dressing, fried perch, chopped sirloin. Soup: beef and barley. Vegetables: whipped potatoes, peas and carrots, buttered squash.

Jan. 19

Space society presentation—The Houston Space Society will meet at 7:30 p.m. Jan. 19, in the Alaney Room, University of Houston. Blarney Roberts, manager of JSC's Planet Surface System Office, will speak on NASA's plans to continue the manned exploration of space. For additional information, call the Houston Space Society, 639-4221.

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.

Jan. 23

BAPCO meets—The Bay Area PC Organization (BAPCO) will meet at 7:30 p.m. Jan. 23 at the League City Bank & Trust. For information, contact Earl Rubenstein at 483-4807 or Ron Waldbillig at 337-5074.

Jan. 24

Astronomy seminar—A JSC Astronomy seminar will feature Dr. Nadine Barlow reporting on the "Evolution of Magma Bodies on Mars" conference from noon-1 p.m. Jan. 24 in Bldg. 31, conference room 193. For additional information, contact Al Jackson, 483-3709.

Jan. 25

AIAA meeting—The American Institute of Aeronautics and Astronautics (AIAA) will feature Dr. James L. Rand, president and chief operating officer of Winzen International, Inc., as speaker at its dinner meeting at 5:30 p.m. Jan. 25 at the Gilruth Rec Center. Tickets are \$8 for members, \$9 for non-members; contact Sarah Leggio at 282-3160 for reservations and information.

NCMA workshop—The National Contract Management Association (NCMA) will hold a "Developing People Skills Workshop," given by Peggy Morrow, from 8:30-11:30 a.m. Jan. 25 at the Gilruth Rec Center, Rm. 216. Registration is from 8-8:15 a.m.; contact Tim Boyes, x36864 for information.

Jan. 31

Thrift Savings Plan—Federal employees wishing to join or make changes during Thrift Savings Plan Open Season must do so by Jan.

31. For information, contact the benefits area at x32681.

Threshold Group meeting—The Threshold Group will hold a coordinating committee meeting from 4-5 p.m. Jan. 31 in Bldg. 45, Rm. 304. All JSC civil servants are invited, contact James Sturm at x33085 for information.

Feb. 12

AIAA lecture seminar—The Houston Section of the American Institute of Aeronautics and Astronautics (AIAA) will present a Guidance, Navigation and Control Invited Lecture Seminar from 8 a.m.-5:30 p.m. Feb. 12 at the Gilruth Rec Center. Admission is \$25 for AIAA members. \$30 for non-members, and \$10 for students, and includes lunch. Reservations must be made by calling Chris Burmeister at 333-6866 by Feb. 7.

April 2

AIAA conference—The Office of Aeronautics and Space Technology (OAST) and the American Institute of Aeronautics and Astronautics (AIAA) will sponsor the Second Technology for Future NASA Missions Conference on April 2-3, 1990, at the Sheraton Premiere at Tysons Corner in Vienna, Va. The conference will provide an interactive review of the NASA/OAST space technology programs. For information, contact AIAA's Rosie Patterson at (202) 646-7453.

April 24

Twenty-Seventh Space Congress—The Canaveral Council of Technical Societies will hold its 27th Space Congress April 24-27 in Cocoa Beach, Fla. Congressman Bill Nelson, chairman of the House Subcommittee on Space Science and Applications and crew member of STS-61C, will address the opening session. Contact Stuart Shabolt, (407) 783-0220, x201, for additional information.

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. Send ads to Roundup Swap Shop, Code AP3, or deliver them to the deposit box outside Rm. 147 in Bldg. 2.

Property

Sale: 60 acres, 3 mi. from Karnes City, TX, on Hwy. 80, 50 mi. from San Antonio; 2-story house, well-built, on 1.5 lots. 783-9164.

Rent: Dickinson mobile home lot, 5 mi. from NASA Rd. 1, \$70/mo. 332-0365 or 282-2802.

Sale: Lg. lots, excl. subdiv., near NASA, mid \$30's, can fin. Don, x38039 or 333-3313.

Sale: Ganado, TX, 1.5 acre lot, 5 min. from Lake Texana. 335-1250.

Sale: Shoreacres, 4-2-2, 1,800 sq. ft., new paint and carpet, many renov., \$65,000. Sally, x37485 or 488-5501.

Sale: Meadowgreen, immac., 3-2-2 David Weekley home, 2 yrs. old, FPL, lg. deck, near pool and tennis, 2,000 sq. ft., 8.5 assum., \$119,000. 282-2810 or 480-3909.

Sale/Rent: Nassau Bay townhouse, 4-2-2, over 2,000 sq. ft., 2 story, den, deck, atrium, FPL, oversized gar., \$995/mo. or \$109,900. Jerry, x38922 or 488-5307.

Rent: Baywind I, 2 BD/split plan, 2 pkg. spaces, refrig., W/D conn., FPL, w/ig. closets, good cond., no pets, \$425/mo. plus \$200 dep. Mary Paige, 222-1543 or 558-1456.

Sale: Seabrook, 3-2-2, formals, lg. den w/ FPL, 1,800 sq. ft., remod. w/new A/CH, roof, int., deck w/spa, trees, never flooded, \$4K total move-in, \$67,500. Richard, x30271 or 474-9334.

Sale: '77 14 x 68 Ridgmont w/lot in League City, fenced yard, stor. bldg., \$18,000. 943-3842.

Trade: Custom canyon view 4-3 off 360 West of Austin, prefer 5 yr. old, open plan, near JSC. 471-8795 or 333-6083.

Cars & Trucks

'83 Chev. Scottsdale PU w/camper, PB, PS, AC, auto. trans., ex. cond., 74K mi., \$3,500. 980-7479.

'84 Chev. Caprice, new paint, ex. cond., in and out, auto., AC, \$3,500. 331-4643.

'75 Lincoln Towncar, needs paint, carpet, runs well, 460 eng., new steel radials, BO. 283-4402 or 480-6528.

'86 Mazda RX-7, silver, 5-spnd., AC, sunroof, AM/FM stereo cass., sec. sys., alloy wheels,

\$8,200. 532-2353.

'87 Ford F-150 XLT Lariat pkg., 2-tone grey, ex. cond., \$8,750. Mike, 282-4258 or 333-2916.

'83 Pontiac Parisienne, 4-dr., good cond., \$2,500. 486-6133.

'86 Dodge mini-ram van, custom, auto., AC, tilt, AM/FM/cass., 67K, \$6,400. 480-4589.

'86 Toyota Celica GTS, loaded, all pwr., 5-spnd., manual, pwr. driver seat, moonroof, tinted windows, immac. cond., 70K mi., \$9,500. x31188 or 424-7556.

'85 Toyota MR2, silver, tail fin, loaded, 5-spnd., ex. cond., 54K, \$6,500. OBO. Cindy, 779-4515 or Darwin, x32142.

'85 Ford PU, F150 supercab, low mi., all extras. 473-2505.

'79 Cutlass Supreme Brougham, V-8, 2-dr., AC, PS, auto., tilt, deluxe uphol., stereo cass., clean, ex. cond., \$1,895. 280-8796.

'77 Camaro, looks good, runs good, \$1,500. 474-2200.

'79 VW Rabbit, clean, tuned up, AC, cass., htchbk., good mpg, \$750. Mike, 480-7359.

'83 Jeep, CJ-7, ex. cond., low mi., runs great, \$4,900. Brian, 480-5430.

'88 Honda Accord Coupe DX, AC, PS, PB, AM/FM cass., 18K mi., ex. cond., \$10,000 nego. Brian, 283-4126 or 996-9415.

'87 Volvo 245 GL, ex. cond., loaded, pwr., warr., AM/FM/cass., \$16,800. Scott, x34318 or 482-1809.

'76 Mercury Mrqs. Brougham, 4-dr. sedan, all pwr., runs good, \$1,600. OBO. Thom, 474-4663.

'86 Mazda B2000 truck, well-maint., red w/ gray int., 5-spnd., stereo, bedliner, AC, new batt., \$4,400. 482-8820.

'80 Dodge window van, 3/4 ton, V-8, seats 8, ex. cond., \$1,950. 280-8796.

'79 Mercury Capri, needs minor work and paint, less than 12K mi. on '85 reb. eng., \$600, nego. Roger, x31909 or (409) 925-2621.

Cycles

Men's Fuji 27 x 1 1/4, tall frame, red, w/ Shimano twist-grip, 3-spnd. hub, sm. rear sprocket, \$60. 996-8020.

Suzuki 850 touring bike, windscreen/fairing rests, shaft drive, bk. rest, low mi., ex. cond., \$1,300. Patrick, x32635 or 488-1079.

Audiovisual & Computers

Sega base and access., was \$700, now \$350, great cond., incl. 3-D glasses, 12 games, laser guns and extra joysticks. Jay, 482-2231.

Magnavox CD player, 16 bit DAC, 4X sampling, dig. filter, \$75. OBO. x32381 or 480-

5487.

TI-994A comp. w/assorted software cartridges and access., \$150. Ed, x36969 or 332-0442.

IBM clone XT model, 640K CPU, Samsung green screen, Panasonic KX-P1080 printer, \$500; modular 3-pc. comp. desk, \$125. Jill, x37792.

10 MHz XT, mint cond., baby-at case, new 10 meg HD, 640K, 2400 Baud modem, 101 key, mono w/HERC, s/p/g/clk., 360K floppy, \$650. 487-3799.

Listen!

Need the latest information on what's happening at JSC?

The JSC Employee Information Service may have just what you're looking for.

Updated every day at 11:30 a.m. the recorded announcement can be reached by calling:

483-6765

Household

Sleeper sofa and loveseat, ex. cond., \$350. Matt, x34285 or 486-7260.

Sears Cold Spot 19 cu. freezer, wks. good, \$100. Dick, x34037 or 554-7206.

BF set, full bed w/bkcase hdbd., 6-dwr., dresser, wall mirror, 5-dwr. desk w/chair, antique white/blue, \$300. x38163 or 486-0830.

Perfection sofa, multicolor pastel, rayon/poly, Fabricare stain resist. coat, was \$750, now \$300. 283-4116 or 996-9415.

Waterbed frame w/hdbd., good cond., dk. wood, 6-dwr., no matt., \$50. Roger, x31909 or (409) 925-2621.

Sofa pit group, contemp. design, 4 pcs., brn./ blk./white and tan, \$300. Fran, 333-6277 or 339-3562.

China cab., solid oak, beveled glass sides, front 38"Wx72"Hx18"D, lighted, was \$2,200, now \$800. Fran, 333-6277 or 339-3562.

Musical Instruments

Soprano sax, CG Conn, very good cond., \$450; alto sax, Bundy, very good student horn, \$150; tenor sax, Buescher Pro, plays well, \$400. Karl, 944-8717.

Fender concert amp, tube type, one-12" spkr., like new, \$295; Ibanez Hot Foot distortion pedal, \$80; Gibson-Epiphone Emperor jazz guitar, new \$1,800, sell \$895. 896-1035.

Lost & Found

Lost, bi-focal sunglasses. 333-6083.

Pets & Livestock

Toy poodles, silver, will be 6 wks. old around Valentine's Day. Wendell, x36182 or Diane, 466-3203.

Wanted

Would like to buy any Eric Davis baseball cards. Jay, 482-2231.

Want 17' to 18' V-hull ski boat, walk thru windshield, open bow, w/o w/out motor/trlr. Andy, 333-6671 or 332-9105.

Want roommate to share lg. 2 BD apt. in Seabrook, \$385/mo., all bills pd., male or fem., non-smokers only. 326-1228.

Want cheap work car or truck. 482-4156.

Want fem., nonsmoker to share 3-2 house in the Landing, \$200/mo. plus 1/3 bills. Karen, x36178.

Need Bluegrass gospel musicians to practice w/ly. and perhaps perform in church services, fiddle, mandolin, 5-string, Dobro, blues harp, etc. Jim, 283-4402 or 480-6528.

Want roommate for 2-2 apt. in Seabrook, \$250/mo. plus 1/2 util., 5 min. from JSC, W/D, sec. gate. Kathy, x32021 or 326-3801.

Want gas-pwd. nylon line weed trimmer in good cond. Gary, x33786 or 499-5786.

Ride van pool riders from Little York Park & Ride to JSC and area, starts 1/29/90, \$70/mo. Ed, 333-6963 or Ram, 333-6490.

Miscellaneous

Rowing machine, ex. cond., like new, \$60; 1.5KW, 28VDC MG set w/3hp gas eng., new, \$200. 921-7212.

Antiques, wheel chair, heavy wooden, good cond., iron bed, sewing mach., walking plow,

1847 Wm. Rogers silverplate set of 56 plus 7 extra pcs. 783-9164.

Suzuki wet bike, 70hp, incl. trlr., ex. cond., \$950. 326-1254 or 333-6462.

Alcon Boil n Soak kit for contacts, never used, \$20. 332-0365 or 282-2802.

DP stomach/back exer. mach., \$150, incl. adj. seat and foot rests, max. wt. 150 lbs. Johnny, x36778 or 922-1811.

Nordica Forest II ski boots, sz. 10 1/2, like new, worn once, \$20. 337-3977.

Sears elec. correction typewriter, ex. cond., \$65. 337-3977.

Rims, blk. wire mesh, American Racing, 5-100s, 14", used one mo., \$300 for all four. Flick, 996-8961 or 280-1500, x3323.

Skiing exer. mach., \$30; Zenith 25" remote control console TV, \$200; clean water filter appli., \$120. 482-4156.

Wedding gown, white w/Queen Anne neckline, tiers of lace, chapel length train, sz. 5/6, \$250. Sue, x33938 or 944-1994.

Sears 3.5hp mower, \$50; Sears self-prop. mower, \$80. 921-7212.

Slopeside accom. ski pkg., Keystone, 10-14 Feb., need one couple to compl. group, 4-day lift, rent car for \$306. Richard Juday, x31486.

Port folding crib, like new; walker; kangaroo; baby swing; misc. baby access.; toys and clothing. Pat, 332-0442.

Graco high chair, \$30; Cosco baby walker, \$25; baby crib w/matt and sheet, \$50; all new, all \$100. Youm Nguyen, x32142.

Aquarium, 105 gal., freshwater, mirrorback, 2 magnum 330 pumps, stand, cover, air pumps, BO. Patrick, x35629 or 488-3625.

Pool table 3.5' x 7', 3-pc. slate, ex. cond., \$300. 474-2200.

Astron. 4.5" reflector telescope, Telrad Finder, 2x and 3x Barlow, 18mm 1 1/4" eyepc., 2-axis base, mint cond., \$100. 487-3799.

.52 carat pear-shaped diamond VS1 quality, G/H color on wide (7-8mm), 14K yellow gold band, \$1,500. 283-4116 or 996-9415.

Bridal ring set, 1 carat total wt., new, \$1,500, OBO. Dennis, x35629 or 488-3625.

Fiberglass camper, fits shortbed PU, w/ carpet sleeper insert, \$300. x38497.

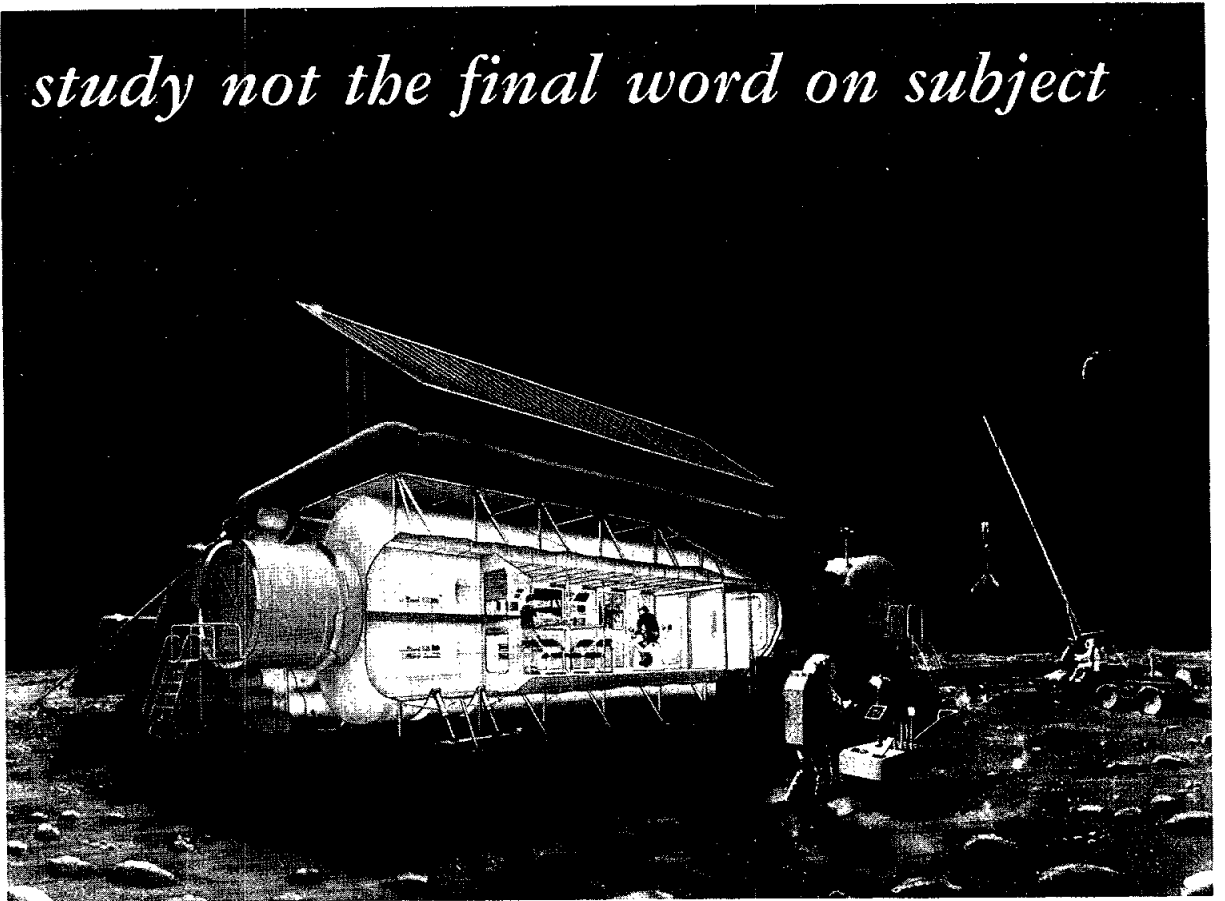
Wedding gown, sz. 12, Sweetheart neckline, lace sleeves, pearls and sequins on bodice and sleeves, was \$1,250, now \$250; petticoat, \$25. x30554 or 486-4369.

Kyosho remote control car, Javelin, 4WD w/ Futaba remote control unit, batt. pwr. pk. incl. Fred, 488-8111 or 944-0493.

Water softener, Kinetico whole house system, BO. Steve, x38651 or 996-7742.

Recently completed 90-day study not the final word on subject

The Human Exploration Initiative



(Editor's note: This is the first installment in a series of articles summarizing the Report of the 90-Day Study on Human Exploration of the Moon and Mars. JSC Director Aaron Cohen directed the study, which was completed in November. Excerpts of the report will be published beginning next week.)

By Kelly Humphries

The recently completed 90-day study on Human Exploration of the Moon and Mars is an important reference work, but not the final word on the subject, according to JSC Director Aaron Cohen, who headed the effort.

The report on what is being called the "Human Exploration Initiative" details a variety of approaches to lunar and Mars exploration, and explains the resources and strategies needed to accomplish their respective goals.

The study was NASA Administrator Richard H. Truly's response to President George Bush's call on the Apollo 11 anniversary for America to establish a Moon base and send humans to Mars. Truly presented the report to the National Space Council on Nov. 17. The council, led by Vice President Dan Quayle, is continuing to formulate its recommendations for the President.

"I think we have come up with a reference way to do the lunar-Mars initiative," said Cohen, who has returned to full-time duty here at JSC but will remain to be involved in the continuing studies. "On the other hand, I've also got to say that I don't

think this is the only way to do it.

"The study doesn't make recommendations," he explained. "It is a reference document and a technical data base that can be used as a basis for additional trade studies and for looking at additional ways of doing things."

SCOUR THE COUNTRY

The next step, Cohen said, is to scour the country for innovative ideas about different architectures, new systems concepts, promising new technologies and innovative uses of existing technologies. NASA will be taking the lead in seeking out and gathering these ideas from creative minds at universities, research centers, aerospace companies and elsewhere. NASA will screen out the ideas that clearly do not warrant serious attention and pass on the rest for National Space Council review. This will ensure that all reasonable conceptual space exploration alternatives are explored before a strategy is recommended to the President, he said.

Cohen said he believes the initial study went well, partially because of the work that had been done for the Paine Commission report, the Ride Report and the initial

studies of the Office of Exploration under the direction of John Aaron and Frank Martin. He said he received "fantastic" cooperation from all of the associate administrators and all of the NASA centers.

The study was an intensive look at how to establish and continue a permanent lunar base, and how to send a human expedition to Mars and return it safely to Earth. Cohen

needed to get the performance we want.

"We looked at the science we would do along the way, and at the robotic missions that will provide not only science but also information about the planetary surface needed for site selection. We looked at what type of planetary surface operations had to take place and what type of resources could be extracted from the planet to make the crews more self sufficient.

"We also looked at what changes could make the agency more efficient in terms of procurement, human resources and contracting for a long-term initiative. We looked at potential international opportunities. And, we looked

use either a chemical propulsion system or a nuclear propulsion system. In the report, we selected a chemical system with an aerobrake. The best propulsion system we have now is the RL-10, which provides about 16,000 pounds of thrust with an ISP (specific impulse) of 444 seconds. For the lunar mission, we need a 20,000 pound thrust engine with an ISP of about 480 seconds. For a Mars mission, we need about a 200,000 pound thrust engine with an ISP of 480 seconds. So there's a lot of technology development on those three items alone.

"On Apollo, for every 10 pounds we put in low-Earth orbit, we had 1 pound on the lunar surface. That's 10-to-1. We're assuming that with this technology I talked about it's going to be more like 7-to-1. There is a great deal of technology development. Nuclear propulsion would be more beneficial. Nuclear power would help. More automation and robotics would help. But my point is, you need an awful lot of new technology to do the job we've talked about doing in the report."

DEBATE HEALTHY

Cohen said he thinks the report was favorably received by the National Space Council, but that it is just one element that will go into its decision-making process. He said the report needs to be debated in a technical fashion — "Is this the right way to do it?"

"I'm not sure it answered all their questions," he said. "I think there still are some questions that need to be answered. There may be some changes and breakthroughs that will make us do it a different way."



'I think there still are some questions that need to be answered. There may be some changes and breakthroughs that will make us do it a different way.'

—JSC Director Aaron Cohen

emphasized the increased degree of difficulty involved in maintaining a manned lunar base over the years.

INFRASTRUCTURE

"We looked at the infrastructure. What I mean by that is we looked at the heavy-lift capability needed to put components into low-Earth orbit, we looked at the implications on space station as a transportation node, what kind of transfer vehicles would be needed, what technologies are

at the total resources required."

Cohen said that in spite of the importance of the work and who had ordered it, no one involved seemed to feel any pressure.

"I think it was more enthusiasm than pressure," he said. "We got fantastic enthusiasm from everybody who worked on it; the people here who worked under Mark Craig, plus the individual centers and the associate administrators."

NEW TECHNOLOGY

The report has received criticism from some circles as not being visionary and not anticipating technological developments that could make some current thinking about the initiative obsolete. But Cohen said the 90-day report identified some challenging technologies that will need to be mastered.

"The elements of doing the lunar-Mars initiative are as follows," he said. "No. 1, you need some way to get heavy-lift weight into low-Earth orbit. We're quoting that you need about 150,000 pounds per launch into low-Earth orbit for the lunar mission and about 300,000 pounds per launch into low-Earth orbit for a Mars mission. To do one lunar mission, you need between 400,000 and 450,000 pounds, and you need almost 2 million pounds into low-Earth orbit for a Mars mission. For each lunar mission you need about three launches, and for each Mars mission you need about six launches.

"The other type of technology you need is transfer vehicles for both the lunar mission and the Mars mission, and you need an excursion vehicle for both the lunar mission and the Mars mission. For those, you could



The 90-day study discussed both the vehicles and planetary surface systems needed for lunar and Mars exploration. The human systems elements to be used on the Moon and Mars are expected to be essentially the same. Early habitats would be based on space station-derived habitation and laboratory modules such as those above. Larger, constructible habitats would be put in place as the activities matured. One of the key technologies necessary to mount the ambitious exploration initiative is the engines for transfer vehicles and excursion vehicles. At right, one concept of a lunar excursion vehicle lifts off from a lunar base.

Key Technical Variables Studied

- Launch vehicle size
- In-space assembly or direct to surface
- Space Station Freedom, new spaceport, or direct assembly
- Chemical, electric, nuclear, or unconventional propulsion
- Aerobraking or all-propulsive vehicles
- Expendable or reusable spacecraft
- Propellant or tank transfer
- Open or closed life support
- Zero-gravity or artificial-gravity Mars vehicle
- *In situ* or Earth-supplied resources

Atlantis prep moves ahead on schedule

Even as *Columbia* orbits above, work on *Atlantis* continues in the Orbiter Processing Facility preparing the vehicle for launch on a Department of Defense mission in February.

Atlantis is currently undergoing a positive pressure leak test scheduled to continue through Sunday.

Once work is completed in the OPF, *Atlantis* will be mounted on a crane to take it to its mating position on top of the external tank.

Earlier this week the orbiters' midbody was cleaned, closeout inspections were performed, and main engine leak check were started. Technicians also replaced the low pressure oxidizer turbo pump on main engine 3.

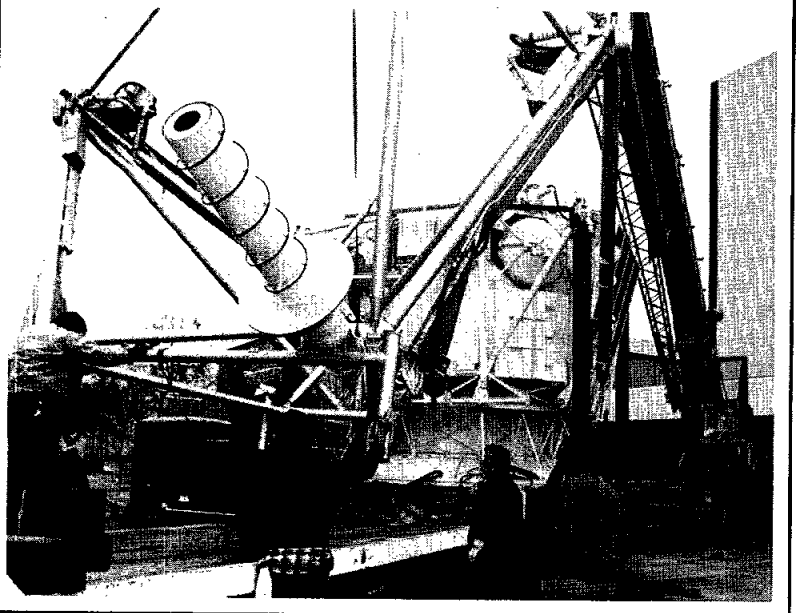
Also, all *Atlantis*' heat resistant tiles were bonded in preparation for the flight.

Orbiter hydraulic system operations were planned for Thursday and today including cycling of the brakes.

The STS-36 crew, lead by USN Capt. John O. Creighton, will depart for their Terminal Countdown Demonstration Test Jan. 22 with T-0 set for Jan. 24.



History was moved recently as workers completed the job of removing the Skylab trainers from Bldg. 5 and placing them in storage until used as displays in Space Center Houston. The Bldg. 5 space will be needed for working simulators and mockups as JSC begins the Space Station Freedom decade. JSC Photos



STS-32 moves smoothly toward LDEF grapple

(Continued from Page 1)

in a standard video format. It is designed to provide in-flight measurements of the size and functioning of the heart. Investigators hope daily scans will provide clues to the effects of space flight on the heart.

Several plane-change burns to bring *Columbia*'s orbit in line with LDEF's and to overtake the school bus-sized treasure trove of information about the orbital environment. Dunbar is preparing to grapple LDEF with the RMS at 8:48 a.m. today, and Ivins will supervise a detailed photographic survey of the 57 experi-

ments on board before it is cradled in the payload bay.

During the LDEF phasing burns and treadmill exercise sessions, onboard accelerometers in the payload bay and connected to the FEA are measuring changes in the microgravity level as part of the Microgravity Disturbances Experiment (MDE). MDE is designed to quantitatively measure the effects of such disturbances on materials processing such as those on the FEA, and to accurately characterize the shuttle middeck as a microgravity laboratory for the first time.

New graphic is following flight

(Continued from Page 1)

tracking map, nor a graphic that has been certified for use in making operational mission decisions. For STS-32, DEMOS is being used only during periods of high activity and interest, including the rendezvous with LDEF and landing.

DEMOS was developed by a small team in the Mission Operations Systems Lab at JSC. Its development is part of a continuing effort to upgrade the graphics and information displayed for flight controllers to aid them in visualizing the Orbiter's positions.

Rockwell contract extends

JSC has awarded Rockwell International Corp., Space Transportation Systems (STS) Division, Downey, Calif., a 5-year extension on a systems integration contract, beginning Jan. 1, 1990.

The total estimated value of the cost-plus-award-fee arrangement is \$580,729,000, for approximately 8,337,000 level-of-effort manhours. Additionally, an option valued at \$91,873,000 was negotiated for 1,251,100 level-of-effort manhours.

The work will be completed at

Rockwell's Downey facility, as well as onsite at JSC, the Marshall Space Flight Center, and the Kennedy Space Center.

Systems integration includes both flight and ground systems engineering maintenance and analysis; safety, quality assurance, and reliability analysis; configuration and information management; and integration of systems within the orbiter. The activity on this contract includes configuring the hardware required for each orbiter flight.

Space News Roundup

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

Editor Kelly Humphries
Associate Editor Linda Copley

Quayle outlines future in space to astronomers' society

(Continued from Page 1)

For someone like myself, who grew up in the 1960s, the memories of those years are vivid. Like millions of other Americans, I especially remember July 20, 1969, the day Apollo landed on the Moon. I had just graduated from college and was at home with my parents awaiting word of my active duty assignment. As some of you may have heard, I served in the National Guard.

Quite frankly, my parents were much more impressed than I was that America was actually landing on the Moon. You see, my generation grew up expecting Americans to land on the Moon. And my children's generation expects even more from us. As a 17 year-old New Yorker said to me during my visit to a Space Camp in Huntsville, Alabama, "Mr. Vice President, my generation is going to plant the American flag on Mars."

So we've got our work cut out for us. Unfortunately, over the past two decades, we have not maintained the momentum of the 1960s.

In space launch, our competitive advantage in technology has disappeared.

We have not sufficiently developed space as an arena for private enterprise; and, after developing the world's first space station in the early 1970s, we will be waiting until the late 1990s for a replacement.

We have continued to have good ideas — but our programs seem to be taking too long and costing too much to build. As a result, the rest of the world is catching up and may pass us by.

And despite our continued scientific and technological preeminence, our government has not done as well as it could have in marshalling the resources and the leadership necessary to keep us ahead in space.

When President Bush established the National Space Council on April 20 last year, he asked me, as its Chairman, to take a fresh look at our program. He asked me to work with others in the Administration and outside to reassert our world leadership in space. He asked that we shape a space program that is aggressive and innovative, and that we challenge accepted ways of doing business.

As soon as I became Chairman of the Space Council, I began meeting with various groups of experts on our space program. And whatever their particular differences, I heard much the same

thing from almost all of them; they told me that we can no longer accept the status quo.

And let me say this, we will not. Indeed, as Chairman of the National Space Council, I intend to bring the kind of innovative approaches to the space program of the 90s that were characteristic of Polaris, Atlas, Apollo, Voyager, and some programs in the Defense Advanced Research Projects Agency.

To do this, the Council is looking across the traditional divisions among civil, commercial, and national security activities. We are building a program that is more than the sum of these parts. Our strategy has several elements:

First, we intend to develop our space launch capability and its related infrastructure as a national resource. These large, complex, and expensive infrastructure elements are like the great railroad, highway, and dam programs of the past. They are as vital to space travel as the interstate highway system is to motor travel.

Moreover, they cannot be considered only within the context of a single government agency. They cannot be built to meet the needs only of a specific space program. They must be structured to accommodate both our current needs and our future programs.

We need to ensure reliable and affordable access to space. The Space Council is consulting widely on ways to accomplish this. I believe we can lower the cost of space launch.

Our second goal is to open the frontiers of space. This includes manned and unmanned programs. Last July the President announced the goals of completing Space Station Freedom, going back to the Moon to stay, and going to Mars. I reaffirm those goals today. I believe they have given focus to our manned space efforts, and are crucial to our space program as a whole.

But our manned space program will move ahead in conjunction with our unmanned program. Our unmanned space exploration provides excitement and fascinating results. Remember Voyager's encounter with Neptune last August?

I do. I was at the Jet Propulsion Laboratory on August 29th, congratulating the scientists there for a job well done. That mission taught all of us how central unmanned exploration is to space science and discovery. As Magellan now makes its way toward Venus and Galileo toward Jupiter, let me

reaffirm our commitment to the unmanned, as well as the manned, exploration of space.

Let me also emphasize today the role of science in our future programs.

We are committed to a balanced scientific program. The large exploration programs we are planning will not emphasize human activities at the expense of scientific excellence.

When we return to the Moon, we will devote much of our effort to scientific research. At some point we hope to establish lunar astronomical observatories, to build on the foundations laid by the Hubble Space Telescope and other Great Observatory satellites.

Similarly, our exploration of Mars will begin with an expanded series of unmanned scientific probes, perhaps including return of Mars surface samples. This is the way we will use space to reassert America's leadership in basic sciences.

I believe that a great nation like ours, at the dawn of the 21st century, should explore space even if there were not tangible benefits on Earth. But of course there are, and the National Space Council is committed to intensifying our use of space to deal with problems on Earth. Environmental concerns are a top priority of people everywhere. Space can give us the means to understand the problems and devise solutions. This is our third goal.

In this regard, the most hopeful new initiative is the Mission to Planet Earth. At our Space Council meeting last November, we began a review of current plans for Mission to Planet Earth to make sure it is structured to give us the knowledge we need as efficiently and as soon as possible. We intend to move forward on this.

In addition, we believe the exploration of space will enhance our economic well-being and our overall national competitiveness.

Let me add here that besides heading the Space Council, there's another Council that I chair — the Competitiveness Council. I believe these two are closely related and that space science and space exploration are crucial to our nation's technological and scientific development and economic competitiveness.

The final element of our strategy, of course, is ensuring that our space program contributes to our nation's security.

To achieve these goals, the Space

Council is taking a fresh look at our current programs and options. In the Space Council we have already made some real contributions. We have restructured and improved the National Aerospace Plane Program which is leading technology for the future. And, we have preserved a national capability for civil Earth remote sensing with LANDSAT.

Within weeks we'll meet on the issue of international participation in our new space exploration program. Shortly after the President's announcement, during my visit to Japan last September, I met with Prime Minister Kaifu. He and I agreed to start a dialogue about joint U.S.-Japanese ventures in space. This dialogue is likely to grow in importance in the years ahead, but now is the time to think through the whole issue of international cooperation.

In this as in other parts of our space program, we will be seeking new ways to accomplish our goals in space. In general, we will be seeking to do things faster and more economically, while maintaining high standards of safety and performance.

I know many of us are concerned over the time it takes to translate promising ideas into real space capability. A few months ago we launched the Galileo probe to Jupiter — it will arrive there in the mid-1990s. A few months from now we will launch the Hubble Space Telescope — a major milestone in the history of astronomy. But these projects began in the 1970s. Many of you started work on these magnificent instruments when you were students; only now are you seeing the results of your labors.

I think you will agree this just isn't good enough. Our performance hasn't kept up with our science. We've got to figure out how to reduce the time from idea to realization from decades to a few years. I believe that this can be done.

That's why last month, I asked NASA Administrator Dick Truly to ensure that our space exploration program is benefiting from a broad range of ideas about different architectures, new systems concepts, promising new technologies, and the innovative use of existing technologies for space exploration. In performing this task, I asked him to query the best and most innovative minds in the country — at universities, federal research centers, within our aerospace industry and elsewhere.

I have also asked the National