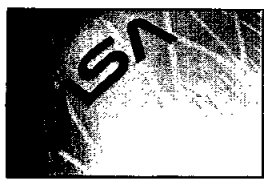
NASA
National Aeronautics and Space Administration
**Lyndon B. Johnson Space Center**
Houston, Texas



## Inflatable base

A recent test of inflatable structures holds promise for use in the planned lunar base. Story on Page 3.

## Mars moves

Some temporary and permanent personnel moves are happening in the Lunar and Mars Exploration Program Office. People column on Page 4.

# Space News Roundup

Vol. 29 **March 23, 1990** No. 12

## *Ozone loss over Arctic documented*

Chemical processes that lead to ozone depletion in the Antarctic are present in the far northern hemisphere, according to a NASA-coordinated study released this month.

Some regions of the Arctic stratosphere may have suffered ozone losses up to 17 percent during the winter of 1988-89, results of the 1989 Airborne Arctic Stratospheric Expedition (AASE) indicate.

At the conclusion of the mission in February, AASE scientists released a statement that "no unequivocal signature of photochemical loss of Arctic ozone was identified before the end of this mission. However, by the end of this mission a considerable portion of the vortex air was primed for destruction."

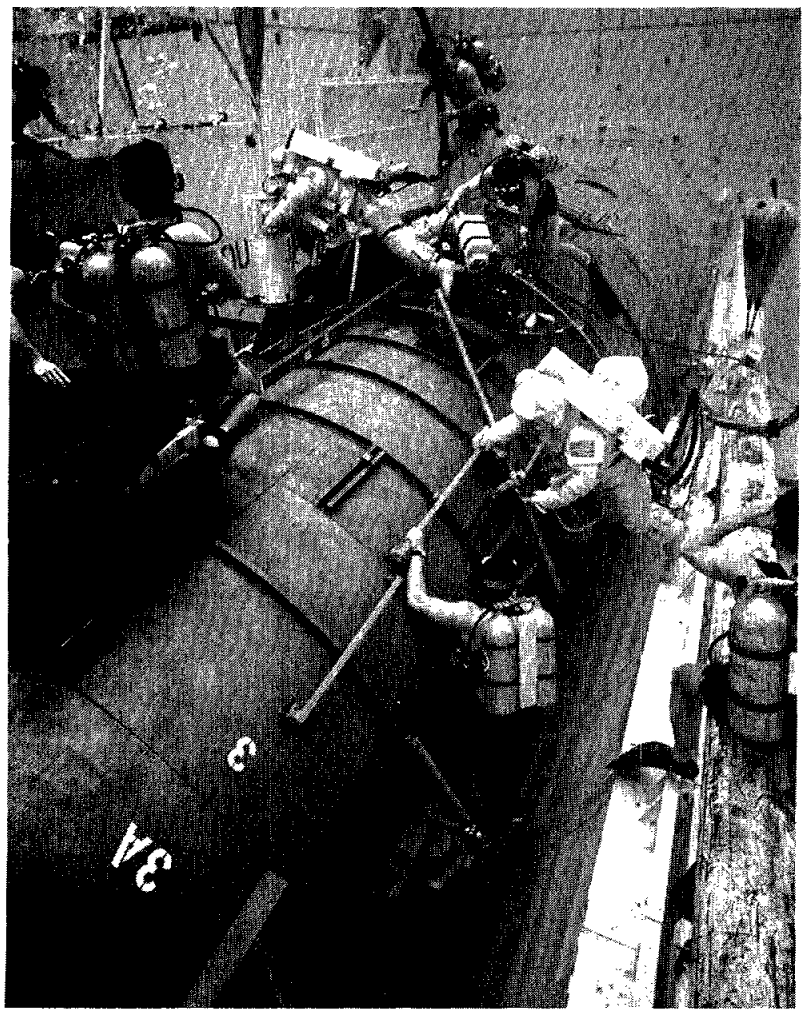
Almost a year of analysis has refined that conclusion. Several investigators, using different analytical methods, reported the Arctic ozone losses. For example, a team led by Dr. Edward Browell of NASA's Langley Research Center used a laser-based technique similar to radar to measure ozone distribution and observed depletions of up to 17 percent at some altitudes.

A group led by Dr. Mark Schoeberl of Goddard Space Flight Center inferred average photochemical ozone losses of 0.44 percent per day over the mission at altitudes above approximately 12 miles.

Chemical analyses showed increased levels of active chlorine and lower-than-expected levels of nitrogen oxides in the atmosphere. In their prologue, Richard Turco of UCLA, Alan Plumb of MIT and Estelle Condon of NASA's Ames Research Center, wrote that these measurements indicate that chemically "the Arctic stratosphere is primed for an ozone hole." Meteorological conditions, however, were found to be unsuitable for the development of an Arctic ozone hole similar to the one observed over the Antarctic.

An "ozone hole" similar to the one that appears annually over the South Pole is unlikely to occur in the north because of substantially different weather patterns there. In the Antarctic,

Please see **OZONE,** Page 4



JSC Photo by Sheri Dunnette

**STS-31 Mission Specialists Bruce McCandless, left, and Kathy Sullivan make a practice space walk in the Weightless Environment Training Facility. No extravehicular activity is planned for the Hubble Space Telescope deployment, but the duo has trained for contingencies.**

## Countdown test success clears way for launch

The STS-31 crew of *Discovery* successfully completed the Terminal Countdown Demonstration Test (TCDT) at Kennedy Space Center this week and began final preparations for a planned April 12 launch.

A significant leak was detected between main engine number 2's low-pressure fuel turbopump and *Discovery's* main propulsion system Tuesday.

**STS-31**
**Hubble Space Telescope**

The 12-inch diameter joint utilizes a Teflon-coated metal seal, which was to be replaced after launch crews finished loading hypergolic propellants into *Discovery's* on-board storage tanks Wednesday and Thursday. Loading the fuel for the orbital maneuvering system (OMS) and reaction control system (RCS) requires the pad to be cleared of all non-essential personnel.

A mini helium signature leak check on the liquid hydrogen system will be performed to validate the system. An analysis of the data from the helium signature leak check is continuing to determine if that is the only leak.

Commander Loren Shriver, Pilot Charlie Bolden and Mission Specialists Steve Hawley, Bruce McCandless and Kathy Sullivan returned to JSC on Tuesday afternoon. The crew was to meet the news media for the routine launch minus-30 briefing and interviews yesterday, and begin its final simulations.

The crew's primary task on the upcoming mission will be to deploy the Hubble Space Telescope, a 43-foot-long, 25,000-pound satellite that will be able to view objects farther away and in sharper detail than any telescope ever constructed. The telescope will orbit 370 statute miles above the Earth at an inclination of 28.5 degrees for 15 years.

Hubble's 94.5-inch-diameter, almost perfectly smooth mirror will be able to detect light sources 25 times fainter than ground-based telescopes, study visible, ultraviolet and infrared light, and produce detail 10 times finer than ever before.

## NASA sharing in global environment study

The Earth's environment changes continually, shifting as quickly as a rainy day turns sunny or as slowly as a continent drifts.

NASA has been studying the Earth and its changing face since the agency's inception, observing the atmosphere, oceans, land, ice and snow, and their influence on climate and weather.

This year the United States and its international partners are mounting a comprehensive global-scale examination of the planet to study the interaction of all the environmental factors—air, water, land, biota—that make up the Earth system. The goal is to increase our scientific understanding of the Earth and develop accurate predictive models that can inform policy decision makers, allowing us to protect the planet's and humanity's future.

At the Paris Economic Summit in 1989, President Bush asked the attending industrialized nations to join with the United States in a comprehensive study of the Earth as a system. Using complementary space- and ground-based research, the U.S. Global Change Research Program will provide the knowledge that will allow informed decisions to be made on global warming, ozone depletion and other elements of global change.

NASA is a major participant in U.S. Global Change Research Program through its Mission to Planet Earth, a space-based research program encompassing virtually all of the agency's Earth sciences and application activities. The centerpiece of Mission to Planet Earth is the Earth Observing System, a series of satellites carrying instruments that will make critical observations. Even before EOS is launched, NASA will launch 19 Earth science missions to study selected aspects of the environment. The EOS Data and Information System is an integral part of EOS, coming on line in the early 1990s to evaluate existing data and allow for corrections of the system before EOS itself begins returning information. Once the satellites are operating, EOS data will be made readily available to scientists around the world.

EOS, on which NASA began definition studies in 1982, will consist of five instrument-laden platforms in low-Earth orbit. Two will be launched by NASA (the first in fiscal 1998), two by the European Space Agency (the first in 1997) and one by Japan (1998). The platforms' instruments will make comprehensive observations of the Earth's atmosphere, oceans and land. Instruments proposed to fly on the platforms include imaging spectrometers that will measure the Earth's physical and biological processes on scales of a square kilometer or less; an instrument to observe the Earth's radiation budget; instruments to determine atmospheric and oceanic circulations; and instruments to determine the physics and chemistry of the atmosphere. EOS data will be essential in developing models that can accurately predict global change.

Earth Probes, low cost missions designed for small launch vehicles,

Please see **NASA**, Page 4

## Quarter-scale shuttle model arrives

### *JSC to run payload tests on original structural test article*

**By James Hartsfield**

JSC is now a permanent home to a one-fourth structural scale model orbiter designed and built by Rockwell in 1974.

The highly detailed one-quarter size orbiter was the first structural dynamic test article of the shuttle ever built. It was used from 1974 through 1978 to investigate how well the dynamic loads of launch and landing could be predicted. Since 1978, the model had been in storage at Rockwell in Downey, Calif.

But that was until Tuesday, when the model arrived at JSC via the final delivery by NASA's Super Guppy, the agency's 25-foot diameter cargo aircraft derived from a YC-97J tanker vehicle. The model's new home is now the Bldg. 49 Vibration and Acoustic Test Facility where it will be used by personnel from the Structures and Mechanics Division to predict more accurately the forces payloads will experience during launch and landing.

"We are trying to improve our predictions of the payload bay dynamics," said Dave Hamilton, chief of the Loads and Structural Dynamics Since we started flying, our main way of doing this has been through measured flight data."

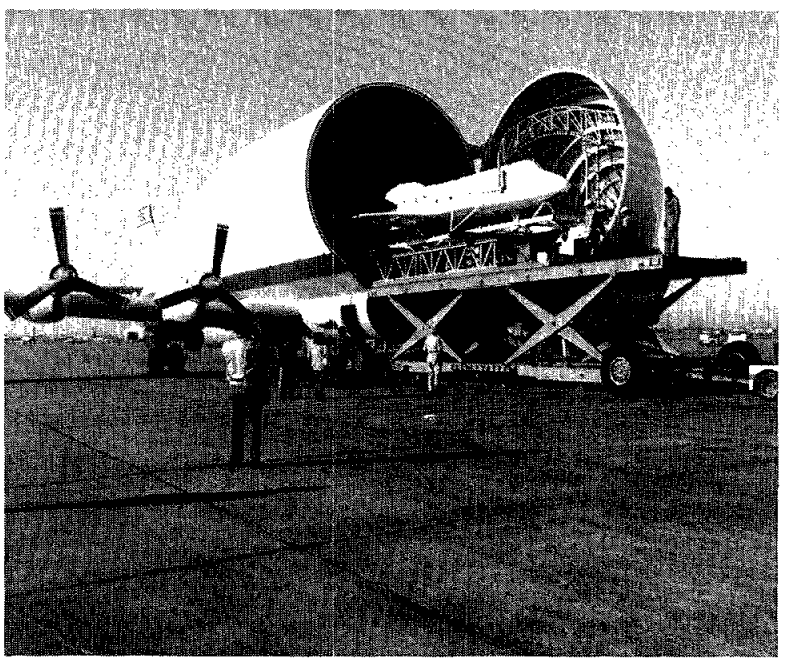
But the actual measurements from flight have sometimes shown that the predicted forces were greater than those actually experienced. "We're trying to remove conservatism from our predictions," Hamilton explained. "The flight data have identified some deficiencies in our ability to accurately predict the loads on payloads during launch and landing. We are having more and more new payloads that will fly and we want to have the best predictions we can for them." The improved predictions could result in saving weight on future payload designs, and the testing is being sponsored by the Space Shuttle Operations and Integration Office.

The Super Guppy's trip was the final chapter in a story that has continued for two decades. The cargo aircraft has delivered models of Apollo command and service modules; lunar modules; Skylab; and a host of other hardware to the Vibration and Acoustic Test Facility over the years, said Bill Adams, test manager for the area.

And it made the current delivery far more cost-efficient and easier than it could have been, added Hamilton. "It was ideal. Without it, it would have been a very wide load to ship cross-country, and we might have had to take off the wings," he said. "That would've been a major job and a very big impact on us." The plane's final flight will be from Ellington Field back to El Paso, where it will be retired.

The model's dimensions are one-quarter scale, but it's weight, at about

Please see **MODEL,** Page 4



JSC Photo by Bill Blunck

**A one-fourth structural scale model of a space shuttle orbiter arrives at Ellington Field on Tuesday. The model will be used for tests that will improve predictions of the forces payloads undergo during launch and landing.**

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 1991): $3.50 each.

Sea World (San Antonio, year long): adults, $17.25; children (3-11) $14.75.

NASA Night at Astroworld (April 6, 6 p.m.—midnight; park is closed to the public): the first 5,000 tickets $7.25, after 5,000 tickets are $9.20.

Easter Egg Hunt (10 a.m., March 31, Egg Hunt, Magic Balloons and Photographs with Easter Bunnies): children, $4; adults, $1.50.

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 and 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 p.m.-9:30 p.m. Monday-Friday.

**Defensive driving**—Course is offered from 8 a.m.-5 p.m., April 21 and May 19; cost is $15.

**Weight Safety**—Required course for those wishing to use the Rec Center weight room. The next classes will be from 8-9:30 April 4 and April 18.

**Ballroom dance**—Beginning, intermediate and advanced ballroom dancing. Classes begin May 3 and meet every Thursday for eight weeks. Beginning and advanced classes meet 7-8:15 p.m. Intermediate class meets 8:15-9:30 p.m. Cost is $20 per couple.

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

**SCUBA**—Pool and classroom sessions, plus open water dive. Class starts March 26 and meets for four weeks.

**Tennis**—Beginning tennis lessons, meets Monday from 5:15-6:45 p.m. for six weeks, beginning March 26. Advanced beginner class will be offered Wednesdays beginning March 28.

**Almost Anything Goes**—Six teams of three men, three women are needed for JSC Picnic. Registration deadline is April 27. Cost is $10 per team, includes T-shirt.

**Easter Softball Tournament**—Men's C tournament will be April 7-8; limit 16 teams. Cost is $95 per team.

## 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**

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# Dates & Data

## Today

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

## Monday

**Cafeteria menu**—Special: hamburger steak. Entrees: beef Burgundy over noodles, fried chicken. Soup: cream of chicken. Vegetables: buttered corn, carrots, green beans.

## Tuesday

**BAPCO meeting**—The Bay Area PC Organization (BAPCO) will meet at 7:30 p.m. March 27 at the League City Bank and Trust. Contact Earl Rubenstein, x34807 or Ron Waldbillig, 337-5074, for information.

**Cafeteria menu**—Special: turkey and dressing. Entrees: baked meatloaf, liver and onions, barbecue spare ribs. Soup: beef noodle. Vegetables: Spanish rice, broccoli, buttered squash.

## Wednesday

**IEEE video conference**—"Expert Systems: Integration with Databases and Real-Time Systems" will be discussed from 11 a.m.-2 p.m. March 28 in the Gilruth Recreation Center. Contact Andy Lindberg, x31474, before March 22 to register.

**Astronomy seminar**—An open discussion meeting of the JSC Astronomy group will be held from noon to 1 p.m., March 28, in the Bldg. 31 conference room. Contact Al Jackson at x33709 for information.

**Cafeteria menu**—Special: Spanish macaroni. Entrees: broiled fish, tamales with chili. Soup: seafood gumbo. Vegetables: ranch beans, beets, parsley potatoes.

## Thursday

**Aviation history**—Dr. Roger Bilstein, aerospace historian, University of Houston-Clear Lake, will speak on "The Impact of Flight on American Culture" at 4:30 p.m., March 29, in the Forest Room of the UH-CL Bayou Bldg. A reception in honor of the speaker will follow the presentation. For additional information, call 283-3015.

**Cafeteria menu**—Special: chicken fried steak. Entrees: beef pot roast, shrimp chop suey, pork chops. Soup: navy bean soup. Vegetables: carrots, cabbage, green beans.

## March 30

**Threshold Group meeting**—The Threshold Group will have a social meeting at 4:30 p.m., March 30, at the Gilruth Rec Center. An overview about Threshold and its current activities will be presented. Any JSC civil servant may attend; contact James Sturm at x33085 for information.

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

## April 1

**UHCL Showcase '90**—The University of Houston-Clear Lake (UHCL)'s annual open house, 'Showcase '90" will be held from 1-4 p.m., April 1, in Atrium II of the Bayou Bldg. Academic advisers will be available to talk with both graduate and undergraduate students. Contact the admissions office, UHCL, at 488-9240, for more information.

## April 2

**AIAA conference**—The Office of Aeronautics and Space Technology (OAST) and the 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 Rosie Patterson at (202) 646-7453.

## April 3

**Vision-21 symposium** — The Vision-21 Symposium on Space Travel for the Next Millennium is scheduled for April 3-4 at NASA's Lewis Research Center. The symposium will look beyond conventional next generation thinking about future directions of science and technology in astronautics and space exploration. Contact Karen Molnar, MS49-6, Vision 21 Symposium, Lewis Research Center, Cleveland, Ohio 44135, 216-826-6795, for information.

## April 7

**PSI Seminar**—The NASA/Clear Lake area chapter of Professional Secretaries International (PSI) is hosting a seminar entitled "The Office Team of the Nineties" by Peggy Morrow, from 9 a.m.-1 p.m., April 7, at the San Jacinto South Campus Student Center. Topics include surviving office stress, acquiring skills, avoiding procrastination, and resolving work conflicts. The cost is $25 for non-PSI members, $20 for members, and $15 for students, and includes the seminar, brunch, and door prizes; contact Cindy Thomasen, x30228, for information.

## April 9

**Health Related Fitness Program**—The first of three JSC health related fitness programs to be held in 1990 will be from 11 a.m.-4 p.m., Monday, Wednesday and Friday for 10 weeks April 9-June 29. The second course will be at 6:30 a.m., Monday, Wednesday and Friday, July 7-Sept. 21. The third will be offered at 11 a.m. and 4 p.m., Monday, Wednesday and Friday, Sept. 24-Dec. 14. Applications to participate in the program and a comprehensive physical examination are required six weeks prior to enrollment. Call x30301 or x30302 for information.

## April 16

**Orbital debris conference**—NASA, the American Institute of Aeronautics and Astronautics and the Department of Defense will sponsor an Orbital Debris Conference, "Technical Issues and Future Directions," April 16-19 in Baltimore, Md. The conference will review accomplishments to date, work in progress and plans for the next five years for all of the sponsors as well as the European Space Agency and Japan's NASDA and ISAS.

JSC

# 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: Egret Bay condo, 2-2, FPL, all appli., incl. W/D, lg. walk-in closet, ex. cond., 2nd floor, 2 car CP, $40,000. 480-7774.

Sale/Lease: 10 acres, 1/2 mi. W. of Hwy. 146, barn, ponds, util. Trey, 280-4381 or 484-7834.

Rent: Mobile home lot on Hwy. 3, $70/mo. 282-2802 or 332-0365.

Lease: 1-1 Pebble Brook condo, upstairs, FPL, W/D, $350/mo. 681-4732.

Rent: Lake Travis cabin, priv. dock, CA/H, fully equip., sleeps 8, $325/$425 wkly., $75/$85 daily. 326-5652.

Sale: 9.64 acres, Santa Fe, 496' x 890', $55,000. Fred, (409) 474-6311 or (409) 925-4743.

Lease: Countryside So., 4-2-2, FPL, gar. opener, fans, good cond., $700 plus dep. 486-0966.

Sale: Bay house on Caranchua Bay, 12 mi. W. of Palacios, furn., 5 dbl. beds, $40,000. (409) 543-2052.

Rent: Ski Heavenly Valley, Lake Tahoe, 2 BR condo, $250 for wk. 3/26-4/2. Tom, x38298 or 488-4089.

Lease: 3-2-2 2-story, CC schools, $595/mo. plus dep. 481-1828.

Sale: Galv. 3-3-6, deck, spa. 334-1909.

Rent: Lake Livingston, 3-2, CA/H, FPL, cov. deck, new cond., furn., wknd. or wk. 482-1582.

Sale: Meadowgreen, 3-2-2, FPL, approx. 2,000 sq. ft., 8.5 assum. FHA loan, $25,000 equity, no app. or closing, $116,000. 480-3909.

Lease: Heritage Pk., 3-2-2, lg. kitch., mini-blinds, fan, FPL, $695/mo. 482-6609.

Sale: 90 plus acres in Flatonia/Schulenburg, log home, rustic forman's house w/barns and corral, $225,000. Rick, 996-8961 or 283-1988.

Sale/Rent: Galv. timeshare, furn. condo, 2-2, sleeps 6, $10,500 or $500/wk. Steve, 282-6930.

Trade: 4-3 W. of Austin, prefer 5-yr.-old open plan, 20 min. from JSC. 471-8795 or 333-6083.

Sale: 2 lake lots on Toledo Bend lake, water, elec., $10,000; 2 lots in La Porte, 75' x 220', $5,000/ea. 944-5624.

Lease: Webs./Ellington, 2-1, W/D avail., $425/mo. Dave, x38156 or 486-5181 or Eric, x38420.

Sale/Lease: Nassau Bay townhouse, 4-2-2, over 2,000 sq. ft., 2-story den, $109,900 or $1,095/mo. Jerry, x38922 or 488-5307.

Sale: 60 acres, 3 mi. from Karnes City; 2-story house on 1.5 lots. 783-9164.

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

## Cars & Trucks

'81 Olds Cutlass Cruiser, new trans., ex. cond., $2,000, OBO. David, 554-5514 or 282-3827.

'85 Toyota MRZ, loaded, 5-spd., ex. cond., 54K mi., $6,500, OBO. Cindy, 779-4515 or Darwin, x32142.

'70 Chev. Blazer, 350, auto., AC, 4x4, ex. cond., $2,600. Tim, 483-8843 or 332-6153.

'65 Olds Starfire sport coupe, 106K mi., orig. owner, $2,800, OBO. Tom, x38298 or 488-4089.

'84 Honda Civic, 4-dr. sedan, auto., AC, AM/FM/cass., ex. cond., $3,000. Vic, 334-2335 or 282-3216.

'77 Suburban, new motor, trans. Pat, 332-1262.

'75 Monarch Ghia, 4-dr., 302, AC, auto., PB, PS, ex. cond., $1,200. James, x38176 or 331-2288.

'72 Cougar XR7, 351c, PS PW, ex. cond., $1,500. James, x38176 or 331-2288.

'82 Olds Delta 88, 114K, good cond., $1,500, OBO. Terry, x33814 or 486-5126.

'80 Corvette, $9,000, OBO. Warren, 333-4415.

'84 Dodge Ram Charger, 318c, auto., air, S.E. pkg., 57K mi., $5,350. 333-2395 or x33525.

'87 Blazer, 5-spd., AC, all pwr., ex. cond., $7,900. 333-7180.

'85 Mitsubishi Cordia L, hatchbk., 5-spd., AC, AM/FM stereo, 83K mi., ex. cond., $2,990. x36091 or 333-5326.

'87 Volvo, 240 DL, 5-spd., AC, ex. cond., 37K mi., $12,000. Derrick, x36059.

'87 Chevy Blazer, 5-spd., loaded, $7,900. 333-7180.

'84 GMC Sierra Classic PU, loaded, 68K mi., $4,850, OBO. Don, x38039 or 333-3313.

'85 Pontiac Sunbird LE, 5-spd., AM/FM cass., $1,700. Mike, x34383.

'81 Honda Accord, 4-dr., AC, 5-spd., 79K mi., $1,500, OBO. David, x32751 or 326-1069.

'84 Nissan Sentra, 5-spd., 2-dr., AC, good cond., $2,300, OBO. 333-7206.

## Cycles

Honda 650 turbo, low mi., new tires/batt. 334-1909.

Raleigh bicycle, women's 10-spd., good cond., $70. Gail Russell, x39838.

'81 Kawasaki, 440 LTD, 6K mi., new tires, belt, ex. cond., $800. x35916 or 326-2344.

'85 Honda Elite scooter, low mi., ex. cond., $500; '85 Honda Night Hawk, $1,000. Amy or Patrick, 488-1988.

'84 Honda V-45 Magna, 12K mi., $1,500. x32280 or 326-5100.

## Boats & Planes

OMC control unit w/16' cables, $125. 332-0365 or 282-2802.

'83 25' Catalina, 7.5hp Johnson, 6 sails incl. Spinnaker, VHF, AM/FM cass., EZ loader dbl. tandem trlr., $13,500, OBO; EZ loader dbl. tandem trlr., $1,500. 474-5414.

13' AMF board sailboat, $200. x30838 or 333-2769.

16' Ebbtide/Mustang skiboat, walk thru WS, 110hp 1/4 Evin., pwr. trim and trlr. Ed Shumilak, x37686.

Mike Myers 5'8" twinfin surfboard, ex. cond., $150. Richard, 483-0415 or 480-0524.

Surfboard, Maxwell 6'4" thruster, w/noseguard leash and astrodeck, $75. Billy, x31339 or 534-4780.

'79 Renegade 16' ski boat, 140hp Evin., SST prop, trlr., ex. cond., $3,750, OBO. 486-7846 or 333-6868.

'88 Windsurfer Tironsea 370, 6.0 m2 raf sail, 2-pc. mast, boom, ex. cond., $375, OBO. 486-5734.

'87 28' Celebrity Bowrider, 165hp I/O, Sportsman galv. trlr., ex. cond. 333-1640.

## Audiovisual & Computers

TI-994A computer w/assorted software cart. and access., $150. Ed, x36969 or 332-0442.

Star NX-1000 multi-font NLQ printer (IBM compat.) w/cable interface and extra ribbon, $230, OBO. Lonnie, 282-2731 or 482-0547.

TEAC - A3300-S reel-reel stereo tape deck, 7", 10" reel cap., ex. cond., $200. x33282 or 482-8352.

Hitachi D-W440 dual cass. deck, $50; Morrow CPM computer, dual disk, 64K, terminal, software, $200. x30077 or 480-2783.

## Household

Waterbed, dk. pine, bkcs. hdbd., padded rails, 6 drwrs., $100, OBO. Nancy, 282-4315 or 331-2975.

Round 42" dinette w/4 roller chairs, $75. 483-0554 or 486-4369.

Crushed velvet off white sofa/love seat, $650; 2 bar stools, $30; butcher blk. dinette, 6 chairs, $85; student desk, $35; port. bar, $40; dinette, 4 chairs, $55; buffet, $40; 2 floor lamps, $20/ea.; baby swing, $5; table lamp, $20; 2 love seats, $30/ea. 333-2916.

King sz. aquatonic restonic wtrbd., chiropractor designed, $600, OBO. Terry, x33814 or 486-5126.

Queen sz. sleeper sofa, lav. and gray plaid, $100. Kathy, x32021 or 326-3801.

King sz. wtrbd., 8 drwrs., bkbd., $125. Gil, x34074.

RCA 25" color console TV, 5 yrs. old, ex. cond., remote, cable ready, Quartz tune, $250. Bill, x39020 or 991-0361.

Couch, earth tones, good cond., $30; color TV, Zenith 19", needs pic. tube, $25. x35916 or 326-2344.

King sz. wtrbd., bookshelf hdbd., $100. Dave, x32592 or 482-6673.

King sz. wtrbd., full motion, hdbd., foot seat, good cond., $175. x33282 or 482-8352.

## Musical Instruments

Alpha 1 elec. guitar, amp w/reverb, $200/both. Stacey, x32649 or 480-9793.

## Lost & Found

Lost: 6-spd. Raleigh bike from Mission Control. Jon Axford, x37671.

Lost: Sm. white dog, maltese, lost March 3 from Nasa Rd. 1, El Camino area. 280-2671 or 996-7422.

## Photographic

Omega B66 B&W enlarger, $50, OBO. Ann, x31336.

## Pets & Livestock

Rottweiler male, blk./mahog., 5 yrs., papers, $300, OBO. Nancy, 282-4315 or 331-2975.

Baby cockatiels, 5 wks. old. Linda, 484-7834.

Trained AKC black lab, 60 lbs., one season duck/goose hunting, $1,800. 431-2296.

Free, 5 kittens, 6 wks. 943-2767.

## Personal

UH/CL is offering noncredit even. classes in French, German, Russian, Spanish, wk. of April 16. 283-3033.

## Wanted

Couple of free single speed bikes to be used on site, abandoned, broken or unused will do. Mike, x33056.

Fem. roommate to share house in LC, nonsmoker, $200/mo. plus 1/3 bills. Karen, x36178 or 554-2971.

JSC Child Care Fac. needs 4 refrig., 3 micro., warming dishes, hot water warming trays, toasters, can openers, plates, serv. cart/trays, donate or reas. price. Mary Allen, x33087.

Women for NASA Thurs. night softball league. Jon, 282-3489.

Want toy trains, elec. windup or lead type; Starwars spaceships, toys, fig., books. Ron, 482-1385.

Want roommate for Univ. Green townhouse, 3 BR, W/D, $300, bills pd., non-smoker. Dawn, 333-6329 or 280-0642.

Powered Flight, class./orig. rock band, seeks exp. agent w/contacts. Tom, x33651 or 532-2209.

Want someone to share waterfront house on CL. Kirk, 488-9080 ext. 3371 or 334-1441.

## Miscellaneous

Radio control airplane, PT-40, .40 RC eng., $125. Ann, x31336.

Antiques: Wheel chair, quilts/tops, iron bed, sewing mach., walking plow, 1847 Wm. Rogers Silverplate, 8 place, 56 pcs plus 7 extra. 783-9164.

Tour Model III irons 1-9 PW and SW, $18.20/club, metal woods, 1,3,5, $30/wood. David, 554-5514.

Passport radar detector, $200. Phil, 282-3600.

5 Jeep CJ steel rims, 15 in., $50. Brian, 333-7315 or 480-5430.

Amana microwave, $100; Sears drafting table, chair, $50; 68" x 48" mirror, $50; Bradford stereo, spkrs., $25. Steve, x35450 or 480-1658.

Wards Supreme sewing mach., $50; telephone w/rever. blkbd./pegbd., $50; misc. elec. gear w/voltmeter, $25; dehumidifier, $20; 35mm camera/case, $20. Steve, x35450 or 480-1658.

Graco high chair, $30; Cosco baby walker, $25. Youm Nguyen, 483-2142.

Sunbeam port. propane gas grill; 3 shelves; owners manual, ex. cond., $65. x31911 or 326-4175.

Fisher Price high chair (EC), $30. 532-4006.

46 pc. set Franciscan Hacienda green earthenware, $200; 24 pc. match. glassware, dessert set, $50. 474-3517.

Dilly galv. trlr., $425; 2 swivel boat seats, $40/both; OMC 6 gal. gas tank, $20. Andy, 333-6671 or 332-9105.

Lg. wood bar, 8', w/formica top and upholstered arm rests, $160. Larry, x33168 or 488-7460.

Prom dresses, burgandy silk, sz. 7, $100; lt. blue, sz. 5, $75; rose (tea length), sz. 7, $100; red, sz. 5, $200; Royal blue w/attached petticoat, sz. 7, $150. Michelle, 333-7615.

Baby things, port. crib, swing, bassinet. 480-3368.

Rims, set of 4, blk. wire mesh, 5-100's, 14 in., $325. Rick, 996-8961 or 283-1988.

Flight Master hard-side golf club carrier, ex. cond; 3 lock latches w/keys, $25. Bob Merrifield, 333-2437.

Pink/silver lame prom dress, sz. 7, $200. Carol, 480-0223.

Ruger mini-14 stainless steel, flash guard, ex. cond., $425, OBO. Boyd, 488-8806.

Ladies Bulova watch, $50; Kodak inst. 110 camera w/builtin flash, $5. Stacey, x32649 or 480-9793.

'90 upper deck baseball cards, $45; 20 Nolan Ryan upper deck baseball cards, $20. 482-7005.

Super twin wtrbd., good cond., htr., bumper pads, $75; weights and bench, $75. Amy or Patrick, 488-1988.

# SPHERICAL SPIN-BACK

## With help from area sailmakers, JSC engineers turn Kevlar into inflatable Moon base prototype

**By James Hartsfield**

JSC engineers in the Advanced Programs Office know that you can find great things in your own backyard—they took a look around the marinas of Clear Lake and found the makings of an inflatable Moon base prototype.

The model lunar habitat—a 7-foot diameter, slightly chunky sphere—doesn't look spectacular, but it didn't cost much and has helped answer a lot of early questions, said Project Engineer Mike Roberts. It's made of Kevlar and was built by U.K. Sailmakers in Clear Lake, a natural choice because Kevlar, a past space program spin-off, is now commonly used in making sails.

"It was a kind of reverse spin-off, or maybe a spin-back," said John Frassanito of Frassanito and Associates, consultants with NASA on the project.

The prototype was the first test of its kind in using Kevlar, a material that is several times stronger than steel, to construct a large inflatable chamber. Kevlar has been used by the Air Force for an inflatable emergency depth chamber, but the lunar habitat is far larger and spherical, a shape that presented challenges.

The project was conceived by Roberts. An unsolicited proposal from Frassanito's company to aid in designing and building the habitat pulled things into place.

"We'd gotten to a point where we felt like we needed a real demonstration—something physical to show, something besides viewgraphs," Roberts said. "This was a great low-cost way to do it." In the end, the entire project cost only about $11,000, he added.

The first prototype habitat was ready in March 1989, but the team found leaks around the seams difficult to stop. The Kevlar also was wrinkled, causing weakened areas, Roberts said.

"You have to ask a flat material to conform to a sphere, and that was the problem," Frassanito added.

The first prototype was tested in July 1989, but before it was inflated to the full 8.6 pounds per square inch (psi) pressure, it popped. "It really changed our ideas. We had to come up with a way to eliminate the wrinkles, stop any leaks, and we really found out that the pressures exerted at 8.6 psi are extreme. Kevlar doesn't stretch much," Roberts said.

> *'We'd gotten to a point where we felt like we needed a real demonstration—something physical to show, something besides viewgraphs. This was a great low-cost way to do it.'*
>
> —Project Engineer Mike Roberts

By October, a second version, using reinforcing tape to smooth wrinkled areas and redesigned seams, was complete. This time, the structure held.

"Fully inflated, the exterior of it was as hard as the floor," Roberts said. "People have an inherent trust of metal, but that's not so with inflatables. And we built the prototype to show the strength it can have."

In addition, there is very little experience in dealing with inflatable structures, while structures made of aluminum are fairly well understood, Frassanito said.

The advantages an inflatable lunar habitat may have are in weight and size for transporting to the Moon. "Our objective is to come up with a structure that could be expanded by up to 15 times once it's on the surface," Roberts said.

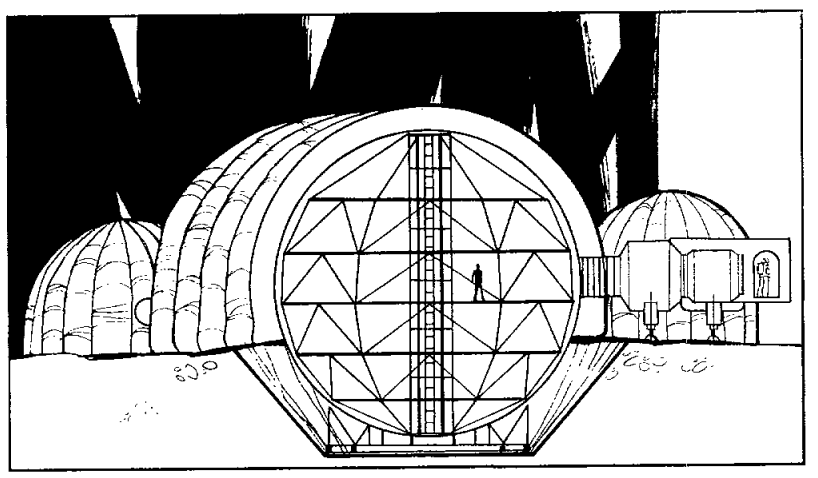
Roberts and Frassanito have been invited to take their prototype to the European Space Agency's conference on Space Habitability in the Netherlands this month and present a co-authored paper on the project. Roberts will not make the trip, and Frassanito will present the paper on behalf of the team. JSC employees may get a chance to see the prototype later this year at the annual Engineering Directorate fair.

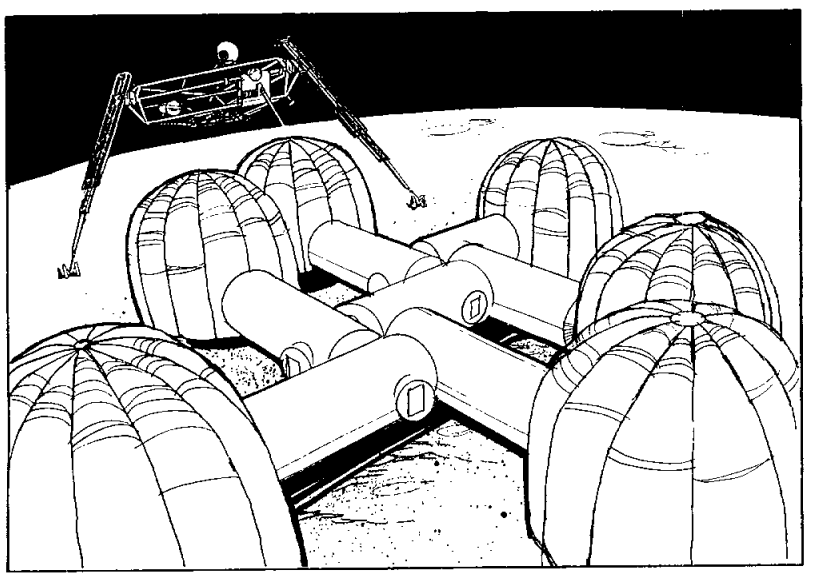
Also, a third version of the lunar habitat may be in the works, perhaps in a larger size trying out different shapes and reinforcements, Roberts said.

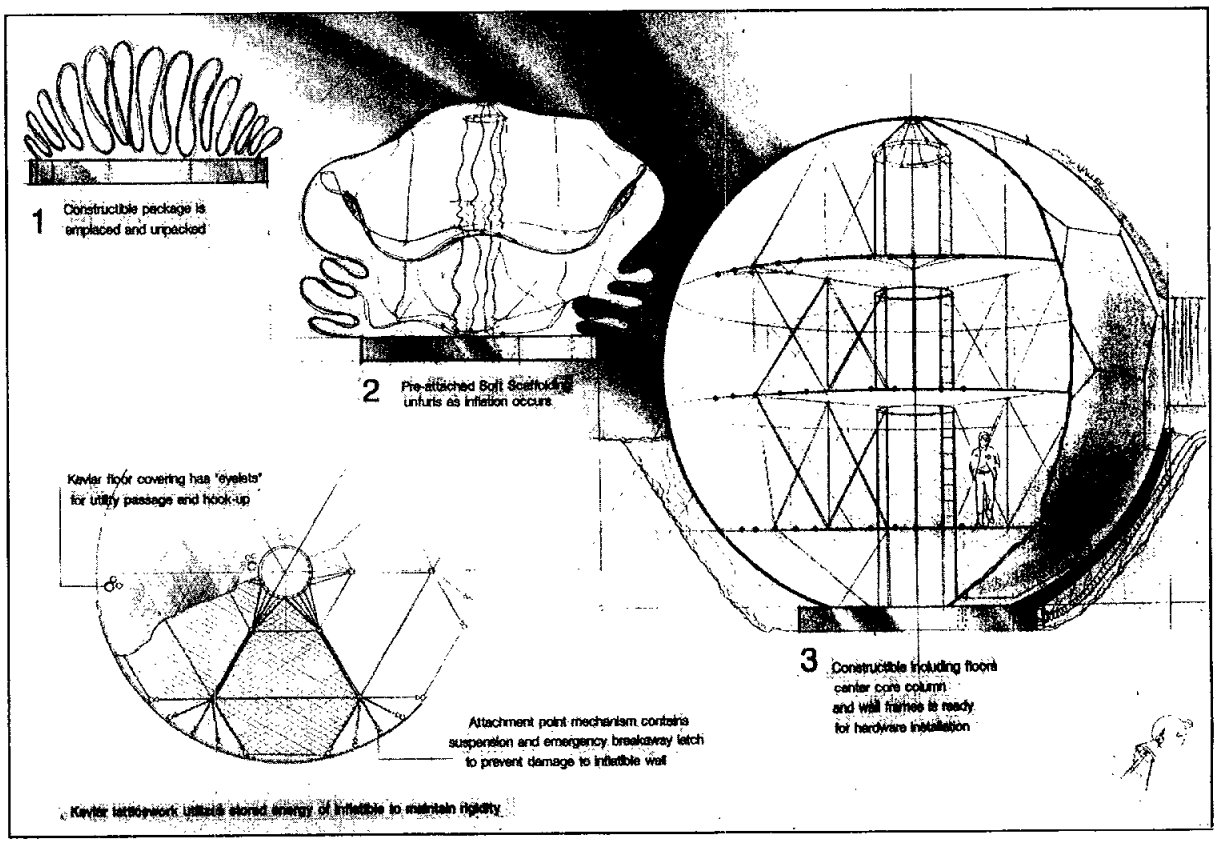
But all of those involved with the project agree there is still a lot to be learned.

"We're not representing this project as any sort of final work; we're not finding all the answers," Frassanito said. "But it can put you on the right track. It's a way to add credibility and depth to drawings that would otherwise be a cartoon."

"We got to use off-the-shelf material and that saved a lot of time and money," added Roberts. "It's a great way to do your preliminary engineering work. It's an inexpensive way to get hands-on experience. It's good to make your mistakes on the cheap stuff."





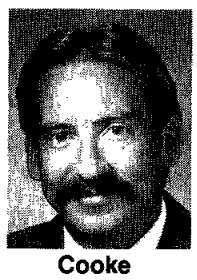



NASA Illustrations

**Top: Working on the inflatable lunar habitat prototype sphere are, from left, John Frassanito of Frassanito and Associates; Terry Flynn of U.K. Sailmakers; and Mike Roberts of JSC's Advanced Programs Office. Clockwise from above left: A very large inflatable could be used to house entire communities; a three-part diagram shows how a 30-foot sphere would inflate and use tensile Kevlar decks, suspended to distribute loads evenly; and clusters of interconnected inflatable would provide the capability to expand and accommodate many inhabitants.**

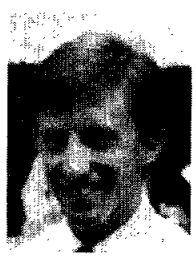
# Craig gets temporary Headquarters duties


Craig


Cooke


Duke


Schneider


Walsh


Muratore


Willhoite

Mark Craig, manager of the Lunar and Mars Exploration Program Office, has been temporarily detailed to NASA Headquarters.

Craig will be special assistant to Arnold Aldrich, the associate administrator for the Office of Aeronautics, Exploration and Technology, assisting in the development of NASA's human exploration program for four to six months.

Doug Cooke, deputy manager of the Lunar and Mars Exploration Program Office, will serve as acting manager in Craig's absence. Norm Chaffee, manager of the Lunar and Mars System Engineering and Integration Office, will serve as Cooke's deputy.

## Duke named chief Lunar-Mars scientist

Dr. Mike Duke, chief of the Solar System Exploration Division in the Space and Life Sciences Directorate, will join the Lunar and Mars Exploration Office as the program's chief scientist.

Duke is filling the position in an acting capacity pending Headquarters approval of his permanent reassignment.

Dr. Don Robbins, deputy director of Space and Life Sciences, will be acting chief of the Solar System Exploration Division until a permanent replacement can be selected.

## FAOs hang STS-36 plaque

Gail Schneider and John Walsh hung the STS-36 mission plaque on behalf of Flight Activity Officer (FAO) team.

Lead Flight Director Larry Bourgeois said the FAO team earned the honor for its outstanding performance during the mission. The plaque traditionally is hung on the wall of the Mission Control Center's Flight Control Room shortly after a shuttle landing by the flight control team designated as having contributed the most to the flight.

JSC
# People

## Muratore named manager

John Muratore has been promoted to manager of the Reconfiguration Management Office in the Mission Operations Directorate. The promotion was effective Dec. 31, 1989.

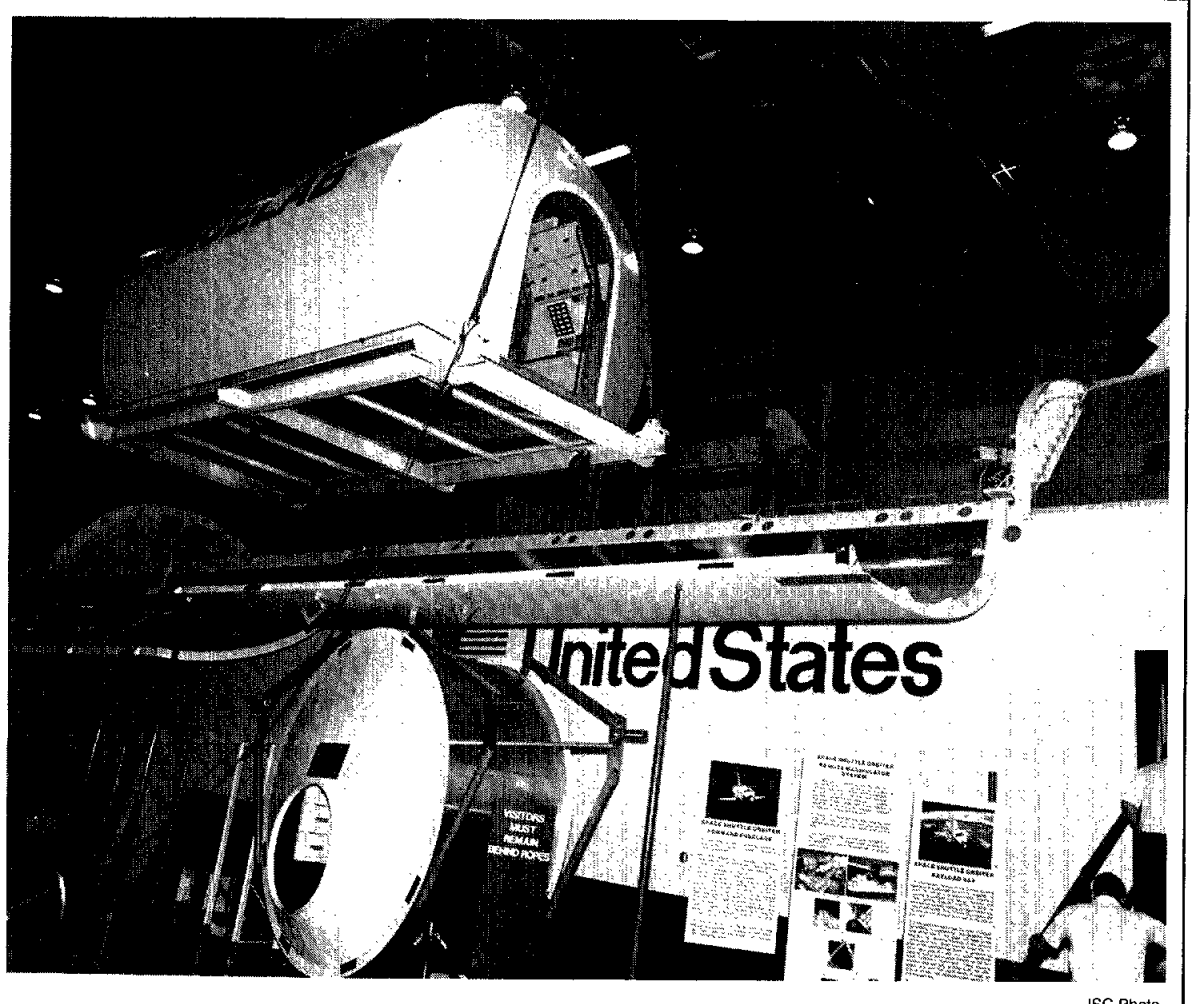
His predecessor, S. Nat Hardee, is now managing the Space Shuttle Avionics Office.

Muratore, who had been MOD assistant for data systems engineering, joined JSC in 1983, and originally served as an instrumentation and communications flight controller.

## Willhoite wins award

Judy Willhoite, secretary to the Special Projects Branch, Crew and Thermal Systems Division, recently received the Marilyn J. Bockting Secretarial Excellence Award.

Willhoite received the $500 stipend in recognition of her excellent performance and professional attitude while providing secretarial support to the 23 engineering and technical personnel, two co-op students, and numerous contractor personnel assigned to her branch.




JSC Photo

**SPACELAB DELIVERY—A full-scale Spacelab mock-up was installed in the payload bay of the Full Fuselage Trainer (FFT) in Bldg. 9A last month. The current FFT configuration, including an airlock adapter interfacing with a transfer tunnel attached to the Spacelab mock-up, allows the crew of STS-40 to step through Spacelab training procedures in preparation for its August flight.**

# Secretarial seminar focuses on careers

A day-long seminar geared toward JSC secretaries and support personnel entitled "The Confident Woman-Strategies to Enhance Your Image and Career" will be held from 8:30 a.m. to 4:30 p.m. April 5 at the Gilruth Recreation Center, Rm. 206.

The seminar will be repeated again the next day.

Seminar leaders Peggy Morrow and Daisy Saunders will focus on how attendees can project a powerful internal and external image, communicate and present ideas with greater images, and manage conflict and criticism in a professional manner.

The event is open to JSC and contractor personnel on a first-come, first-served basis, since the room seating capacity is 80. JSC personnel attending should give their names at the door so they will receive appropriate training credit. Contact Estella Gillette, x33077, for additional information.

# Child Care Center nears completion; slots open

Work progresses daily to completely ready the modular sections of JSC's Child Care Facility for a scheduled April 30 opening.

The sections, delivered last month to the permanent building site south of the Gilruth Recreation Center, are being outfitted for final use by volunteer members of the JSC Child Care Center Corp.

Volunteers are busy constructing ramps, fences, skirting and a playground for the center, as well as decorating and customizing the interior. For more information on volunteer efforts still needed, contact Lori Beauregard, x36600.

Day Care Center slots still available include one opening in the pre-toddler (ages six to 14 months) group; four slots in the early preschool (23 to 36 months) group; and four slots in the preschool (36 months to five and a half years) group. Civil service or on-site contractor employees with a child in those age groups interested in filling one of these slots should contact Beauregard as well.

# NASA missions to increase knowledge of ecosystem

**(Continued from Page 1)**

are instruments and satellites that will complement EOS' broad environmental picture with highly focused studies that provide early data.

To continue global ozone mapping, Total Ozone Mapping Spectrometers will be flown aboard U.S. and foreign spacecraft during the next few years. Other Earth Probes will study tropical rainfall, ocean productivity and the interactions of the Earth's crust and interior.

In addition to free-flying missions, a series of Spacelab missions designated the Atmospheric Laboratory for Applications and Science, is planned for the space shuttle. These missions, which will involve scientists from the United States, Belgium, France, West Germany, Japan and Switzerland, will investigate atmospheric science and the interactions of the far upper atmosphere with space plasma. The shuttle also will carry the Shuttle Solar Backscatter Ultraviolet experiment at regular intervals to calibrate ozone measurements made by Nimbus-7 and other satellites. The Shuttle Imaging Radar, developed by the United States, Germany and Italy, will measure surface geology and vegetation.

EOS instruments also are planned to fly on Space Station *Freedom* to follow the daily cycle of certain key Earth processes at low latitudes. Instruments include a lightning mapper to determine energy and chemical input to the atmosphere; an instrument to measure the radiation budget of the Earth's tropics; and an instrument to determine the aerosol loading of the atmosphere.

The Upper Atmosphere Research Satellite, to be launched in 1991, will provide the first comprehensive measurements of dynamic, radiative and chemical processes in the atmosphere and their interactions. The data will help determine the extent and durability of the stratospheric ozone layer. The instruments are from the U.S., United Kingdom, Canada and France.

TOPEX/POSEIDON is a U.S.—French ocean topography experiment to be launched aboard an Ariane rocket in 1992. The mission will provide the first detailed measurements of the oceans' global circulation patterns.

The NASA Scatterometer will provide global measurements of sea surface winds. The Scatterometer, to be launched in 1995 aboard the Japanese Advanced Earth Observing Satellite, will enable better understanding of the coupling of the oceans and the atmosphere.

*Arctic ozone depletion documented*

# Ozone hole not expected to develop

**(Continued from Page 1)**

the photochemical breakdown of ozone is aided by a strong vortex of stratospheric winds that circle a continent-sized area and effectively isolate air over the pole. Within the vortex, cold temperatures enhance the formation of polar stratospheric clouds (PSCs), which are catalysts in the transformation of non-reactive chlorine compounds into reactive chlorine. The Antarctic vortex often remains intact for most of the spring, but the Arctic vortex usually breaks up before the spring sunrise can begin the chlorine-ozone reactions.

More than a third of the AASE papers focus on PSCs, key components of the chemistry of ozone depletion. Site and satellite measurements defined the microscopic structures of PSCs, with the results indicating that nitric acid vapor is a key element in PSCs' formation and therefore, that denitrification of the stratosphere indicates a potential for ozone depletion. Turco, Plumb and Condon, however, cautioned that the exact process of PSC formation is not fully understood.

The papers resulting from the AASE address a wide range of ozone-related issues, from meteorology and polar stratospheric clouds to trace chemistry and ozone depletion. The January 1989 expedition, based in Stavanger, Norway, flew a variety of instruments to measure meteorological conditions and atmospheric physics and chemistry on 28 flights of NASA's ER-2 and DC-8 research aircraft.

The findings of the expedition, coordinated by NASA and co-sponsored by the National Oceanic and Atmospheric Administration, the National Science Foundation and the Chemical Manufacturers Association, will be published in the April issue of Geophysical Research Letters, a publication of the American Geophysical Union.

Scientists from the National Center for Atmospheric Research, Harvard University, University of Denver, NASA and NOAA took part, with international participation from Norway, United Kingdom, the Federal Republic of Germany, Denmark and Sweden.

**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

Assoc. Editor .....Linda Copley

## Manifest reprint delayed

The printing of a revised manifest chart, originally scheduled for publication in the Roundup this week, has been delayed. The chart will be printed as soon as complete information on the changes is available.

## Model arrives at JSC

**(Continued from Page 1)**

3,000 pounds, is one sixty-fourth scale. Most important, however, "it matches the dynamic characteristics of the orbiter," Hamilton said.

A matching set of solid rocket boosters and external tank will arrive at JSC in April. The entire stack will undergo testing in 1991. Modal testing of the orbiter alone will begin this June. Mike Grygier of the Vibration and Acoustics Section will be in charge.

Although the model's beauty to an engineer is far more than skin deep, it is still a sight to behold for anyone, probably the next best sight to viewing the actual spacecraft, Hamilton said. "It is really a work of art. Most people at JSC have never seen it, and it is impressive," he said. "Although other testing of the model is likely in the future, we also hope to have a display capability in Bldg. 49."