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

Endeavour assembly

Progress continues on the construction and assembly of OV-105 in California. Story on Page 3.

Astronaut to academic

"Pinky" Nelson to leave NASA on June 30 for the University of Washington in Seattle. Story on Page 4.

Space News Roundup

Vol. 28 | June 16, 1989 | No. 24

NASA and JSC honors awardees

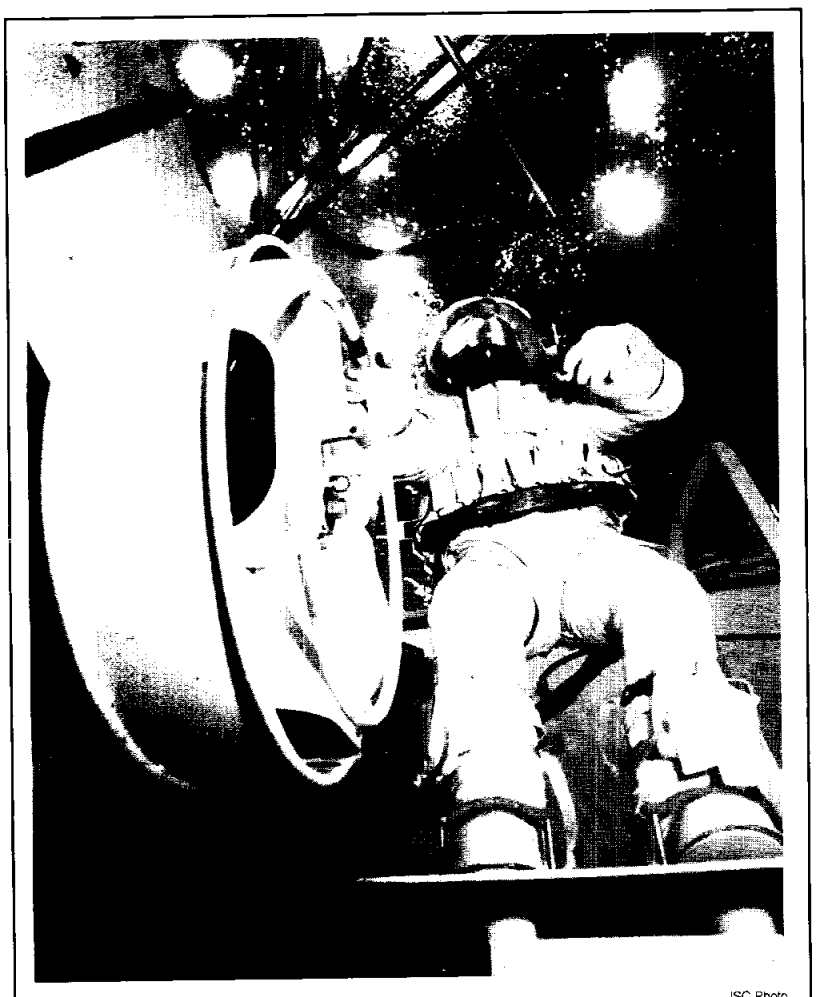
Center Director Aaron Cohen, Deputy Director Paul Weitz, and Excutive Assistant Dan Nebrig honored over a hundred of JSC's finest at the NASA and JSC Honor Awards Ceremony in Teague auditorium Wednesday morning, June 14.

First on the agenda were the NASA Group Achievement Awards, presented to the leaders of 11 groups, including: the Accident Investigation Team at White Sands; the Astronaut Office Science Support Group; the Extravehicular Activity (EVA) Retriever Development Team; the Mission Operations Directorate/Mission Support Directorate Resource Access Control Facility Team; and the MK. III 8.3 PSI Space Suit Development and Evaluation Team.

Also receiving group awards were the Orbital Debris Team; the Payload Support System Ground Support Development and Evaluation Team; the Second Shuttle Carrier Aircraft Procurement Committee; the Shuttle Training Aircraft Training Team; the Space Biomedical Research Institute Flight Projects Office Detailed Supplementary Objectives Group; and the Space Transportation Automated Reconfiguration Measurement and Stimuli (STAR/MAST) II User Acceptance Test Team.

NASA Exceptional Service Medals were awarded to David F. Bruce, Richard E. Coblentz, Stephen J. Feaster, and Joseph Fries, White Sands.

Please see **AWARDS,** Page 4



JSC Photo

WET SUIT—Astronaut Jerry Ross works in the Weightless Environment Training Facility (WET-F) in the JSC developed Mark-3 spacesuit, a "hard suit" pressurized to 8 pounds per square inch. The Mark 3 and an Ames-developed "hard suit," the AX5, underwent evaluations recently in the WET-F and aboard the KC-135. The Mark 3 is currently on display at the Paris Air Show.

New manifest released

Hubble postponed until March '90

An updated mixed fleet manifest was issued this week projecting current planning for primary payloads for Space Shuttle missions and expendable launch vehicles through fiscal year 1995.

The new manifest shows four flights remaining in 1989, nine in 1990, eight in 1991, 12 in 1992 including four flights of the new orbiter *Endeavour,* 14 in 1993, 13 in 1994 and 10 in 1995 through September 1995.

In addition to the changes in the Shuttle flight sequence through STS-37 announced on May 12, this latest schedule continues to reflect NASA's commitment to the various science disciplines. It also reflects the agency's first use of the largest expendable rocket—the Titan IV.

The planetary schedule is maintained with the deploy of the Galileo probe to Jupiter from *Atlantis* on October 12 on mission STS-34. The Ulysses probe to the Sun remains scheduled for October 1990.

Launch of the first of the great observatories, the Hubble Space Telescope, has slipped from December to March 1990 in order to protect retrieval of the Long Duration Exposure Facility (LDEF) deployed on mission STS 41C in April 1984.

Recognizing the significance of recovering LDEF, the STS-32 mission is now planned for December 18 aboard *Columbia.* The free-flying satellite carrying 57 science, technology and applications experiments is in danger of reentering the Earth's atmosphere if not recovered by early 1990. In addition to retrieving LDEF, the Syncom IV-05 satellite will be deployed for the Navy.

Following Galileo will be STS-33, a Department of Defense flight aboard *Discovery.* Another DOD flight—STS-36—will lead off 1990 in February aboard *Atlantis.*

In support of Earth sciences, six additional Shuttle Solar Backscatter Ultraviolet (SSBUV) missions have been added to the line-up and the four previously-manifested SSBUV missions have been accelerated. This instrumentation maintains an accurate measurement of global ozone.

Other major science mission changes include the Astro-1 mission in April 1990, the Gamma Ray Observatory flight now in June 1990 and the Spacelab Life Sciences flight in August 1990.

The new manifest includes the first three assembly missions for the Space Station *Freedom.* All three flights are baselined in 1995.

Also planned are two Flight Telerobotic Servicer (FTS) demonstration test flights. FTS is a system being developed for the space station to assist in assembly, service and inspection of the manned base and its attached payloads.

In the international program area, a third European Retrievable Carrier (EURECA-3L) deployment is now slated for launch in May 1995. Eureca is a platform to be placed in orbit for six months, offering conventional services to experimenters.

Two additional Spacehab module flights have been booked, bringing the total number of planned flights to

Please see **MANIFEST,** Page 4

Columbia move to VAB delayed

In the Orbiter Processing Facility, the high pressure fuel turbopump on *Columbia's* center main engine was changed out after difficulties with ground support equipment delayed the removal and replacement process.

The slower than expected pump changeout will delay *Columbia's* move from the OPF to the Vehicle Assembly Building (VAB) for mating with its external tank/solid rocket booster stack by about a week.

During post-installation testing of the new fuel pump, a seal was found to be leaking and that, also, was changed out. After additional checkout, technicians reinstalled heat shields around the engine.

In other work this week, technicians are installing thermal blankets in the orbiter's mid-body area. The tile work continues and cleaning is underway in the the payload bay. The landing gear was cycled in preparation for functional tests conducted Wednesday. Late this week, a test of the orbiter's brakes was scheduled.

STS-28

An assessment has been completed on *Columbia's* readiness for the move to the Vehicle Assembly Building, and a decision has been made to rollover no earlier than the night of June 29th.

Shuttle managers will meet at the Kennedy Space Center June 26 to discuss the readiness of *Columbia* to meet its rollover date to the VAB in preparation for its Department of Defense mission—*Columbia's* first flight since January 1986. The projected launch date remains scheduled for no earlier than July 31 since several days of contingency time was built into the STS-28 processing flow.

In the VAB, final checkout continues on the stacked boosters and the mated external tank to be used for *Columbia's* launch this summer. Also, the first solid rocket booster for the *Atlantis*/Galileo mission, the left aft segment, was stacked on the mobile launcher platform Wednesday morning.

The crew for STS-28, Commander Brewster Shaw, Pilot Dick Richards, and mission specialists Dave Leestma, Jim Adamson and Mark Brown, will continue training for the

Please see ***COLUMBIA,*** Page 4

JSC Satellite Services System Workshop scheduled June 21-3

By Kari Fluegel

Representatives from industry, academia and government will gather at JSC next week for a three-day workshop to exchange information and discuss ideas for the on-orbit servicing of satellites.

The Satellite Services System workshop, supported by the Advanced Programs Development Division of the NASA's Office of Space Flight, will focus on four issues: servicer/satellite design, servicing operations, tools and equipment, and future opportunities.

The workshop is a joint effort by government and industry. It is unclassified and open to the public. All sessions will be in Teague Auditorium.

The workshop begins June 21 with a welcome by JSC Director Aaron Cohen at 9 a.m., followed by a keynote address by Darrell Branscome, director ot the Advanced Programs Development Division

A presentation by astronauts Capt. Bruce McCandless II and Jerome Apt about the space shuttle experience is scheduled for 9:30 a.m.

Please see **WORKSHOP,** Page 4

Lunar logic verses legend

Apollo anniversary briefing faces fact and fiction

By Pam Alloway

The moon that once seemed so far away was within their grasp. Yet bringing samples back to earth from that faraway place posed a unique problem to scientists who worked on the preliminary plans for the Apollo missions.

And a unique problem called for unique approaches, said Apollo 17 astronaut Harrison Schmitt.

Schmitt will discuss what scientists knew about the moon before Apollo and geological preparations for the historic event from 11 a.m. to 2 p.m. July 17 in the first of a week-long series of briefings by Apollo-era veterans to be held in Teague as part of planned 20th lunar landing anniversary events. The presentations will be open to the public, free of charge.

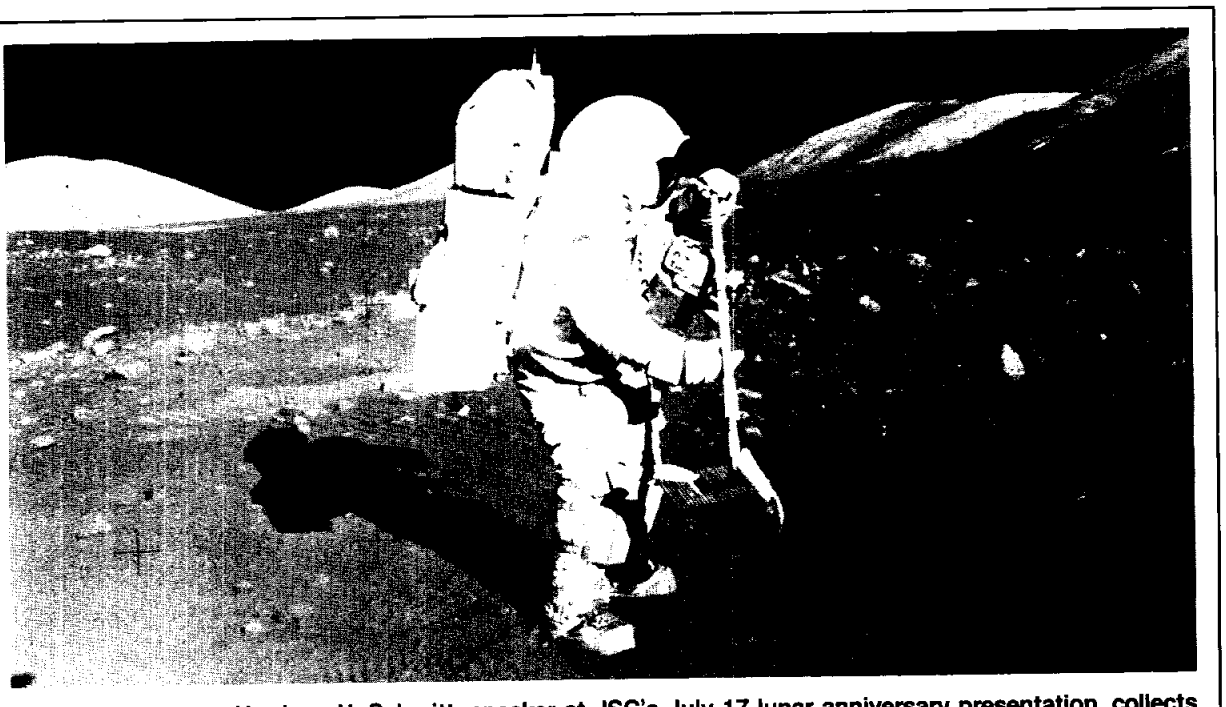
The July 17 "Moon Before Apollo" program also will feature geologist Harold Masursky from the U.S. Geological Survey's Flagstaff, Ariz. office. Masursky will focus on the selection of Apollo landing sites.

"It was a combination of imagination and logic," Schmitt said. Schmitt, who worked for the U.S. Geological Survey before joining NASA, participated in a project involving Apollo astronauts' geological training.

"We were all field geologists," Schmitt said. "We just told ourselves, 'If I was a field geolgist and on the moon for only a few hours, and knew I would never return, what would I look for?' "

During Schmitt's one-year tenure with the U.S. Geological Survey, he assisted in the mapping of the moon from telescopic photographs and worked on the Lunar Field Geological Methods Project. Project participants developed methods of photographing, sampling and describing the lunar surface. That was not an easy

Please see **MOON,** Page 4



Scientist-astronaut Harrison H. Schmitt, speaker at JSC's July 17 lunar anniversary presentation, collects lunar rake samples at Station 1 during the first Apollo 17 extravehicular activity (EVA-1) at the Taurus-Littrow landing site in December, 1972. The Lunar Rake, an Apollo Lunar Geology Hand Tool, was used to collect discrete samples of rocks and rock chips ranging in size from one-half to one inch.

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): $3.50 each.

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

Sea-Arama Marineworld (Galveston): adults, $8.75; children $5.50.

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

Palm Beach at Moody Gardens: adults $2.75; children $1.50.

Astroworld (valid 1989): adults, $14.12; children under 4, $11.99; season pass, $32.36; Waterworld (valid 1989): $8.15.

Houston Balalaika Concert (June 10, Cullen Theatre of Wortham Center, features NEVA Russian Dance Ensemble): $14.

River Raft Trip (July 15): $30.

Overnight River Raft Trip (July 15-16, tickets go on sale June 12): $72.

Las Vegas Trip (August 17-20): credit, $280; cash, $275.

Splashdown Party at the Gilruth Recreation Center, July 20, 1989, 4:30-8:30 p.m.; $3. Tickets may be purchased from coordinators listed on JSC Announcement 89-112.

JSC

Gilruth Center News

Defensive driving—8 a.m.-5 p.m., June 17 or July 7: $22.

Weight safety—Required for use of the Rec Center weight room. Classes will be 8-9:30 p.m., June 29; cost is $4.

Aerobics and exercise—Both classes are ongoing: cost is $24.

Tennis lessons—Beginning tennis, Mondays 5:15-6:45 p.m. Six week course begins June 26; $32 per person.

Scuba lessons—Class begins July 10; cost is $45, plus additional fees.

Moonwalk tournament—Men's open-c softball tournament is July 8 and 9. Cost is $95. Entry deadline is July 6 at 5:30.

JSC

Dates & Data

Today

ACM to meet—The Clear Lake Chapter of the Association for Computing Machinery (ACM) will meet at 11:30 a.m. June 16 at the Cleburne Cafeteria, 803 NASA Road 1. Contact George Widerquist, 480-1994.

CLCTS awards banquet—The annual Clear Lake Council Technical Societies' Awards Banquet will be at 6:30 p.m. June 16 at the Center. Contact Marcia Taylor at x30195.

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

Monday

Juneteenth picnic—The annual Juneteenth Picnic sponsored by the JSC Black Cultural Association will be held from 4 p.m. to 8 p.m. June 19 at the Gilruth Center. The Ron McNair Scholarship will be presented at the picnic. Tickets are $6, and proceeds will benefit the scholarship fund. Contact Bob Jenkins, Juneteenth chairperson, x38065, for tickets.

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

Tuesday

AFCEA to meet—The Houston Space Chapter of the Armed Forces Communications and Electronics Association (AFCEA) will have their monthly luncheon at 11:30 p.m. June 20 at the Gilruth Center. Contact Debbie Williams, 282-4952.

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

Wednesday

Edward Gibson autographing—Former Skylab 3 Astronaut Edward Gibson will be signing copies of his novel *Reach* from 4 p.m. to 5:30 p.m. June 21 at Jeremy's Bookshelf, located at 2441 Bay Area Blvd. Contact Sally Jordan, 486-8028, for information.

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

Thursday

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

June 23

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

June 24

Amateur radio club field day—The American Radio Relay League (ARRL) will sponsor a field day June 24 and 25 at the Gilruth Center. This year's event is run as a contest with the object to make as many emergency "contacts" as possible in 24 hours. Contact John C. Gafford, 554-7776, for more information.

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/Lease: League City/Bayridge, 3-2-2, CA/H, FPL, fenced yard, on cul-de-sac, FHA assumption, low equity. Al, 480-2067 or 863-7826.

60 acres, 3 mi. from Karnes City, TX, on Hwy. 80, 50 mi. from San Antonio. 783-9164.

Sale: Wedgewood Village subdivision, Friendswood, 2 residential lots, each approx. 70' x 185', neighboring homes $90's-100's, 1 mi. from Clearbrook High School, owner fin. w/ 10% down. 482-5226.

Sale: Taylor Lake Estates, new 5-3.5-3 house, study, gameroom on lg. lot, $278,500. Don, x38039 or 333-3313.

REnt: Lake Livingston, waterfront, 3-2, fully furn., new cond., covered decks, pier, sleeps 6, ex. fishing/swimming/skiing. 482-1582.

Sale: Middlebrook, 3-2-2, well-maintained, many updates, new paper, paint, accum. low equity, $79,700. x32805 or 486-1888.

Sale: Big Bend area, get away and hunting land, 160 acres, $140/acre, CFD 20$ down, 9% for 5 yrs. 337-4051..

Sale: '85 Mallard, 35' motor home, loaded, low mi., $40,000. 337-4051.

Lease: 2-2-2 townhouse in SW Houston, microwave, W/D, FPL, dishwasher, sec. alarm, ceiling fans, elec. gar. door opener, perfect for two singles. Tom, x31418 or 781-7798.

Rent: Alvin, Western Heights, 3-2-3, 1 acre, $650/mo. 977-0223.

Sale: Alvin/Pearland, brick 3-2-2 w/workshop area, quiet cul-de-sac, 1,800 sq. ft., FPL, CA/H, 3/4 acre, trees, fenced dog kennel, patio, lg. living area w/beamed cath. ceiling, $53K. 977-0223.

Sale: Friendswood/Sun Meadow Estates, wooded lot in estab. neighborhood, cul-de-sac, bordered by stream and golf course on 2 sides, approx. 245' deep and up to 86' wide, util. on site, $31,500. Doug, x32860 or 486-7412.

Sale: Heritage Park, 3-2-2 home, freshly painted ext., spa, lg. deck, FPL, stainmaster carpet, 10% assum., near pool, tennis courts and elem. school, $69,500. x36619 or 996-0289.

Sale: 1 1/2 lots, Lake Livingston, Governor's Point subdivision, 1/2 acre, heavily wooded, $6,000. Adams, x34351 or 337-3973.

Sale: Pebblebrook condo, 1 BR, W/D, new carpet, paint, drapes, 9 7/8%, $27,000. 480-3613.

Sale: Lake Livingston house, approx. 300 ft. from water, 2-1-2D, decking, front and back pvt. boat launch, 333-4587.

Rent: Beachfront cabin, Crystal Beach, weekend, sleeps 8, all appli., like new, 4225. Joel, 333-5310.

Sale/Lease: Austin/UT condo, 1-1, near law school, assum. loan, lease, $395/mo. J. Craig, 282-1911 or 420-2936.

Rent: Mobile home lot, Oklahoma and Kinne, Bacliff, $85/mo., $50 dep. 488-1758.

Lease: Bay Glen, 4-2-2, brand new, microwave, whirlpool tub, ceiling fan, fence, no pets, non-smoking, $1K/mo. 480-4160.

Lease: 1-BR condo, clean, W/D, ceiling fan, miniblinds, 2 balconies, overlooks pool, covered parking, no pets, $350/mo. plus dep. Karen, x34705 or 332-2416.

Sale: 50 acres, Halletsville rice land, unimproved, very flat, $800 per acre. 996-8410.

Sale: 1-BR condo, Pebblebrook, very nice, new A/C unit, new dishwasher, W/D, vaulted ceiling w/fan, pool, tennis, private entrance, loan bal. $23,600 owner fin. 280-1989 or (409) 925-8593.

Sale: Heritage Park, 4-2-2, walk-ins, sep. master suite, clean, patio cover, fenced, stove, refrig., assum. VA loan. 334-1909 for appt.

Sale: Ramada townhome, new carpet, paint, ceiling, fans, W/D, custom blinds, fenced yard, 1,200 sq. ft. Mike, 282-3156 or 480-8470.

Rent: Kauai 2-BR, 1.5-BA condo w/view of the Pacific, high atop Cliffs of Princeville on Island's North Shore, $500-$700 depending on season. Call between 4 p.m. and 8 p.m. (714) 768-3840.

Lease: Bacliff Villas, 3-1-1A, fenced, hi eff., carpet, no pets, dep. 488-1301.

Cars & Trucks

'86 Nissan Sentra, 4DR, 45K mi., P/S, P/B, A/C, AM/FM stereo, ex. cond., $4,800. 480-9446.

'83 Malibu station wagon, good body, int., P/S, P/B, air, V-6 auto., new tires, $2,750. 474-9473.

'78 Corvette, silver anniv. edition, new 2-tone silver paint w/white int., T-tops, auto., all power, 14K mi. on new Vette eng., showrom cond., $9,250. Richard, x30271 or 474-9334.

'74 Olds Cutlass Salon, 2 DR, new batt., tie-rid ends, runs fine, needs paint, good starter car for junior or trans. for yourself, $400, OBO. Kent, x31453 or 332-2451.

'82 Buick Regal, 90K mi., air, radio, $1,800 firm. 332-5020.

'78 Olds 88, runs, $700, OBO. 585-8378.

'82 Camaro, V-8, 63K mi., auto., A/C, power windows and locks, AM/FM, tilt, $3,995, OBO. x36026 or 334-3896.

'76 Chevy Vega wagon, int./body in good cond., 75K mi., eng. needs work, $325, OBO. 483-1543 or 332-0601.

'79 Toyota Celica GT, PS/PB, AM/FM, 5-spd., ex. work car, $1,400. Rosie, 282-4306.

'67 Chevrolet C-10, 327 eng., long bed, blue 1/2 ton, 3-spd., $975. Ralph, 484-3717.

'65 Chevelle, 4DR, cinnamon, 350 4-bolt main eng., A/C, PS, good car, $1,500. Ralph, 484-3717.

'77 Thunderbird, good ole work car, needs tires, has over 100K, still runs strong, A/C, P/S, AM/FM, $1,000, OBO. 333-6467 or 482-4365.

'85 Mercedes 190E, 2.3, all options, gold w/palamino leather int., ex. cond., tinted windows, sunroof, 88K mi., gar.-kept, $15,000. 486-4466.

'78 Ford, econoline 150 custom van, ext. length, four Captain's chairs, table, sink, refrig., bed, curtains, AM/FM, cruise control, A/C, tilt wheel, towing pkg., only 63K mi., $4,500. 486-4466.

'81 Buick Riviera, body in good shape, needs eng. work. Margo, x35305.

'82 Honda Accord, 4DR, auto., A/C, ex. cond., $3,850. x30092 or 481-3637.

'87 Honda Accord LX, 4DR, auto., A/C, P/WDW, locks, cruise, grey, $9,850. x30092 or 481-3637.

'76 Dodge power RAM 4x4, very good cond., new clutch, new brakes, power winch, $3,000. George, 944-9761.

'84 Pontiac Sunbird LE, auto., sunroof, PS, anti-lock brakes, AC, AM/FM/cass., new clutch, $2,500 firm. x30828.

V.W. Safari (Thing) convertible, good lcond., $2,150. x31226 or 534-3710.

'74 SAAB LE, 2DR, needs eng. work, $350, OBO. 282-4307 or 649-0141.

Boats & Planes

'85 Bass Tracker III, 16' boat, 35hp mercury, trolling motor, flasher depth finder, linewell, trailer, $2,500. Matt, x34285 or 486-7260.

'75 Bayliner, 21' w/cuddy, new V-6 Crusader, 165hp, sleeps 4 comfortably, sink, toilet, ice box, holds 54 gal. of fuel, will trade for camper trailer or $4,900 cash. George, 944-9761.

15' tri-hull and galv. trailer, good cond., $600, OBO. James, 483-1765.

Tri-Q experimental aircraft, 2 place, 140mph, 75hp, 300 HR T.T. based at Houston Gulf Airport, cost 20K plus, will take $12,500 or trade for fishing boat, motor home, car, etc. Wood, x37007.

'79 Renegade 16' ski boat, low profile, silver and red hull, 115hp Evinrude OB motor w/SST prop, 50mph plus top speed, new seats/floor, customized trailer w/new fenders, ex. cond., $4,195, OBO. 333-6868 or 986-7846.

14' sailboat w/trailer, sloop rig w/sails, very wide beam, easy to sail, very lg. cockpit, $500 cash. Alma, x36556 or Mike, 559-2450.

Cycles

'79 Yamaha XS 750 Special, 1 owner windjammer, AM/FM/cass., new tires, lots of extras, must see, $1,100, OBO. Rich, x34818 or 480-8335.

'86 Honda Elite 150 scooter, one owner, good cond., only 1,500 mi., $800. David, x37056 or 486-9751.

'78 Suzuki GS550, new exhausts, w/backrest/luggage rack, cover, manual, needs batt. and tune-up, good starter bike or trans., $250, OBO. Kent, x31453 or 332-2451.

'82 Yamaha Virago 750, less than 5K mi., $800, nego. D. Bass, x31767 or 538-1624.

'80 Suzuki 450, ex. cond., $600. 482-9601.

'77 Kawasaki KZ400 twin, w/helmets, windshield, and luggage rack, runs fine, $400. 333-7573.

'66 Triumph Trophy, 500cc, restored w/new paint, rebuilt eng., $1,350, OBO. 996-8110.

'76 Yamaha 125 Enduro, not started for a year, incl. license and helmet, take as is for $175. Tom, x35488 or 482-9172.

'86 Honda Interceptor VFR, gear-driven cam V-4, like new, red, white, blue, gar. kept, 1,300 mi., $3,700. x31588 or 488-1326.

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

Audiovisual & Computers

Commodore 1525 graphics printer and (2) 1541 disk drives, w/books and cables. Al, 480-2067 or 863-7826.

Apple II GS, color monitor, 1.25 MB memory, 3.5 and 5.25 in drives, software and manuals; APW, multiscribe, deluxe paint, music studio and many more, $1,200. x38308 or 484-5927.

TI home computer, books, equip., software. Ken, x32760 or 488-3828.

Electro voice 16-channel P.A. mixer, three mo. old, used in home studio. 946-2801.

EVEREX tape backup drive system for IBM compatibles, Model BX-830, some tapes, does need system card and software. Stan, x39779.

Household

White twin size daybed w/brass trim, extra firm twin matt. and box springs incl., $150. 488-5307.

Solid wood bedroom set, incl. dresser, mirror, fullsize bed and matt./box springs, chest of drawers, nightstand, ex. cond. Matt, x34285 or 486-7260.

Oak end table, 3x3 w/one drawer and one shelf, $50. Carri, x31985 or 532-1385.

Couch, loveseat, recliner, good cond., $350, OBO. 996-7843.

Sealy boxspring, twin, ex. cond., $35. 532-1673.

Beautiful tree trunk table. 326-2187.

Antique set of 2 end tables, maple wood, perfect for living room/den, ex. cond., $55; antique dark redwood coffee table w/glass, ex. cond., $35. Dot, x35274.

Freezer, chest type, late model, runs good, $165. Joel, 333-5310.

Sale: Zenith console T.V. w/23-in. screen, good cond., $90. 534-3167.

Antique armoire, piller and scroll trend w/beveled mirror, $575; antique dresser, $225, reduced price if purchased as set. 996-7750.

G.E. dryer, $100; Frigidaire washer, 1 yr. old, $200. Charles, x31153 or 481-2940.

French Provincial, single bed, vanity, end table, chest of drawers, desk w/ hutch, ex. cond., perfect for young teenager or little girl's room, $375. B. Reina, x31588 or 488-1326.

Refrig., working cond., not frost free, $75. Kay, x31416 or 996-1295.

Sofa, loveseat, and chair in brown plaid, $100 for set. 482-2138.

Five barstools, brown leather seat and back w/black legs, ex. cond., $40/ea. 482-1505.

Eureka vacuum cleaner, 6.0 amp, 1hp cannister w/attach., $40. Linda, x39658.

Pets & Livestock

German Shepherds, AKC reg., 3 fem., born Easter morn., 1 blk., 2 blk. and tan w/silver, $150. 333-6467 or 482-4365.

Free kittens to good home, cute, warm fuzzies, 8-10 wks. old, blk. and grey, tigers, 1 M, 1 F and black, 1 F, semi-long hair, beautiful lg. male tiger cat, brn. and blk. long-hair, white-lined eyes. Amanda, 280-9956 or 480-1225.

Free cats to good home, lg. B&W long-hair male, smart, laid back, loveable, vac., neutered, and sm. blk. short-hair fem., likes and needs affection, vac., spayed soon, prefer not to sep. Amanda, 280-9956 or 480-1225.

Free to a good home, Calico cat, spayed and declawed, ex. adult pet. Brian, x32884 or 996-1507.

Baby lovebirds, $25/ea., will also sell breeding pair. 331-9441.

AKC Toy Fox Terrier, 1 yr. old fem., very small, $150. 331-9441.

Free kittens to good home, had first shots. 282-4307 or 649-0141.

Wanted

Want piano and organ sheet music. Lois, 282-4558.

College students want to rent a 3 plus BR house in the Rice/Medical Center/West Univ. area starting in Aug. Martha, x35111 or 488-4026.

Want dry auto. storage, JSC vicinity. x33525.

Want pedal type paddle boat. Steve, x36725.

Riders needed for van pool to NASA, start from West Loop Park and Ride lot, parking lot is between east and westbound South Braeswood, east of northbound South Post Oak. Richard, x37557.

Want Volvo 15 in. turbo wheel, 5 spokes, good cond. Vincent, x30874 or 333-1316.

Want carpool from Missouri City or Sugar Land area. Mike, x31693.

Want high back camper shell for '86 dk. blue/silver Ford ranger Super Cab. 480-7169.

Want your unwanted or undesired items, anything of value, from vehicles to appli., electronics to video games, furn. to books. 339-1337.

Want one four-or five-drawer file cabinet. 326-2187.

Want filing cabinet, 3/4 drawer, letter or legal size, reasonable price. 480-7257.

Want female softball players for mixed NASA league, must be able to play Thurs. nights. Mark. x32622.

Personal

Patio sale at Timber Cove, 207 Driftwood, June 10 and 11, 8-5, household items, clothes, antiques, auto parts, toys, etc. 326-1884.

Musical Instruments

Yamaha trombone, used one yr., ex. cond., $195. x36369

Artley wood clarinet, ex. cond., good for beginner, $350, OBO. Irma, x31593 or 480-6292.

Kawai elec. organ, dual keyboard, rolltop civer, solid oak, ex. cond., $1,500. 332-9585.

Miscellaneous

Wheelchair, wooden back, seat, handles, foot rest, good cond.; 2 seed sowers; sewing machine, (pedal), wooden; iron bed; old trunk; chest of drawers; big iron vice; lightning rods; old record player; books; sm. spinning wheel; old doll; pot plants; old wall wooden telephone; Wonder Woman telephone; new, modular; 1847 Wm. Rogers silver plate set of 56 pieces, plus 7 extra pieces, serving for 8; quilts and quilt tops. 783-9164.

Barroom size pool table, 1 yr. old, $700; rowing machine, $40; ping pong table, $50. 475-0608.

Stereo console, $50; green plaid chair, $40, OBO. 488-4024.

Office credenza, $100; briefcase, $10; VHS movies, $10/ea., Elec. Horseman, Adventures of Robin Hood, Plainsman. Linda, x34044 or 280-0909.

Wedding ring set, .62 pt. Marquis diamond, yellow gold, ring guard w/diamonds, written appraisal avail., 4750. Dallas, x37265 orr 486-9520.

Marilyn Monroe poster, numbered and signed by artist in 1979, perfect cond., $20. 486-4747.

Smith Corona Coronet 12 elec. typewriter w/case and new cartridge, $40. 486-4747.

Gold watch, Baume and Mecier (14K) w/Sapphire, $1,000, OBO. Carri, x31985 or 532-1385.

Children's golf clubs w/bag, $25. Steve, x35272.

Lynx USA golf clubs, irons 2-SW, $150; woods, titanium shaft driver and 4W, $100. Steve, x35272.

Med. size fish aquarium on iron stand, $10; push reel mower, $20; new overhead fan motors, $30; pair of shields w/heads, for doors or walls, $25/pr. 488-5564.

French bench, rose, newly covered, $150; antique lg. wicker hamper, $15; 2-old school lights, $20/pr.; tall lamp, very nice, $25; antique iron witches pot, $60. 488-5564.

Home or office trampoline, like new, $50. Mary, x36369.

Singer sewing machine, hardly used, cabinet model, needs tension adj., new throat plate, $150. Margo, x35305.

Omni magazine collection, first issue to current issue, $150, OBO; '82 Ford Futura parting out, or tow away, BO; How-It-Works encyclopedia, set '88 edition, $75, OBO; circular saw, 7 1/2", $25; Ruger Model 10/22 rifle, $75. James, 483-1765.

Auxiliary fuel tank, custom fit for under bed, mount on Chevy longbed PU truck, $25; 140 watt car stereo power amplifier, $40. 334-2963.

Engagement ring, 18K gold, round diamond, solitaire, .68K, w/6 round diamonds, .18K, orig. cost $1,500, asking $1,300, OBO. Vincent, x30874 or 333-1316.

New windows, sliding patio doors, light fixtures and wood moldings. Don, x38039 or 333-3313.

One-gallon Hibiscus plants, reds and pinks, $2.50. 482-5226.

Ibanez (Destroyer II) guitar w/hardcase, $125; Kramer (Focus 1000) professional guitar, $450; Boss Distortion (DS-1), $40; Boss Chorus (CE-3), $55; Boss Flanger (BF-2), $60; Morley Power Wah Fuzz, $80. Charles, x31153 or 481-2940.

Pop-up camper, sleeps 6, heater, AC, good cond., $1K, OBO. Tim, 554-6321.

Want V.W. carburetor for single port V.W. eng. x31226 or 534-3710.

Prints, Patrick Nagel commemoratives, #7, #8, #11 through #15, $200 to $600. Mike, x32439 or 280-9005.

White cathedral length wedding veil, one of a kind w/blusher and Juliet cap, $150. Lisa Wilkins, x34530 or 644-5073.

Wedding dress, sz. 10, $150; 10-spd. Schwinn bike, new tubes, tires, $40. 486-8380.

Campbell Hausfield, 2hp air compressor, new, used twice, under warranty, $175. Russ. 488-5546.

Lawnmower, Sears Eager 1, good cond., rear bag, not self-propelled, $75. Carla, x30181.

Sears 66 cu. ft. compact refrig., like new, $60; PU bedside storage built-ins, fit Toyota TTT, $30. Richard, 481-1518.

McCulloch portable generator, 3500 watts, 120/240 VAC, like new; 15-gal. aux. gas tank, hurricane season special, $650. Richard, 481-1518.

Pool table, 4' x 8', 1-in. slate, top cond., all access. incl., $700. Tom, x35488 or 482-9172.

18' Hobie Cat galv. trailer, lots of extras, $2,150. x31226 or 534-3710.

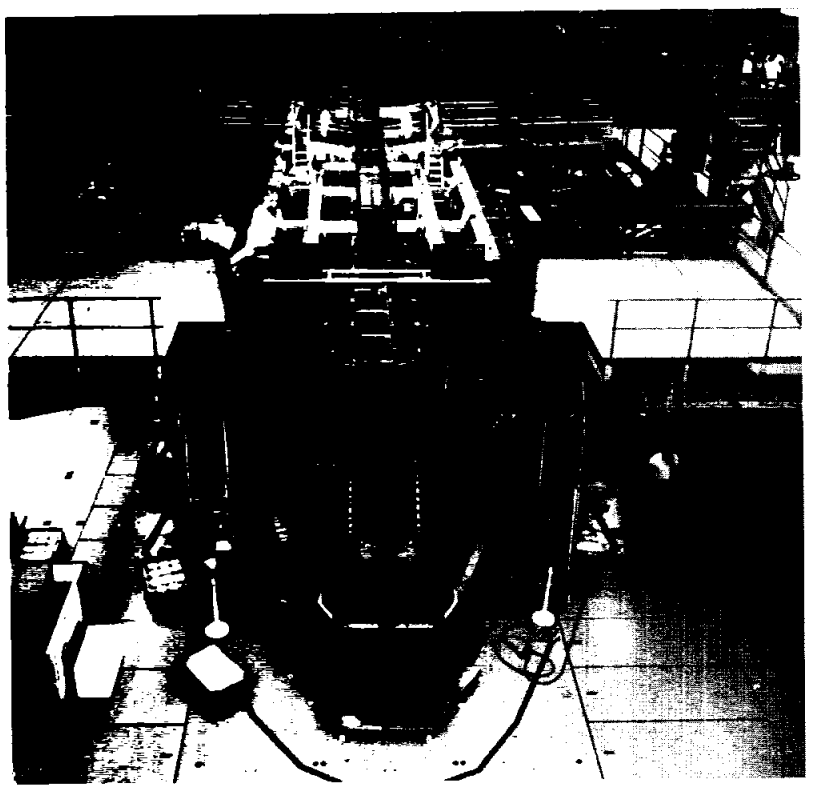
TI 99-4A computer w/expansion box, RS-232, phone coupler, etc.; tent, 10'x15'; men's 3-spd. bike; wheelbarrow; DP weight bench and weights. Tim, 554-6321.

Air Force dk. blue mess dress, 42R, complete, worn once, $150, OBO; long aquarium w/wooden stand, glass top, and all access., $200. 333-7573.

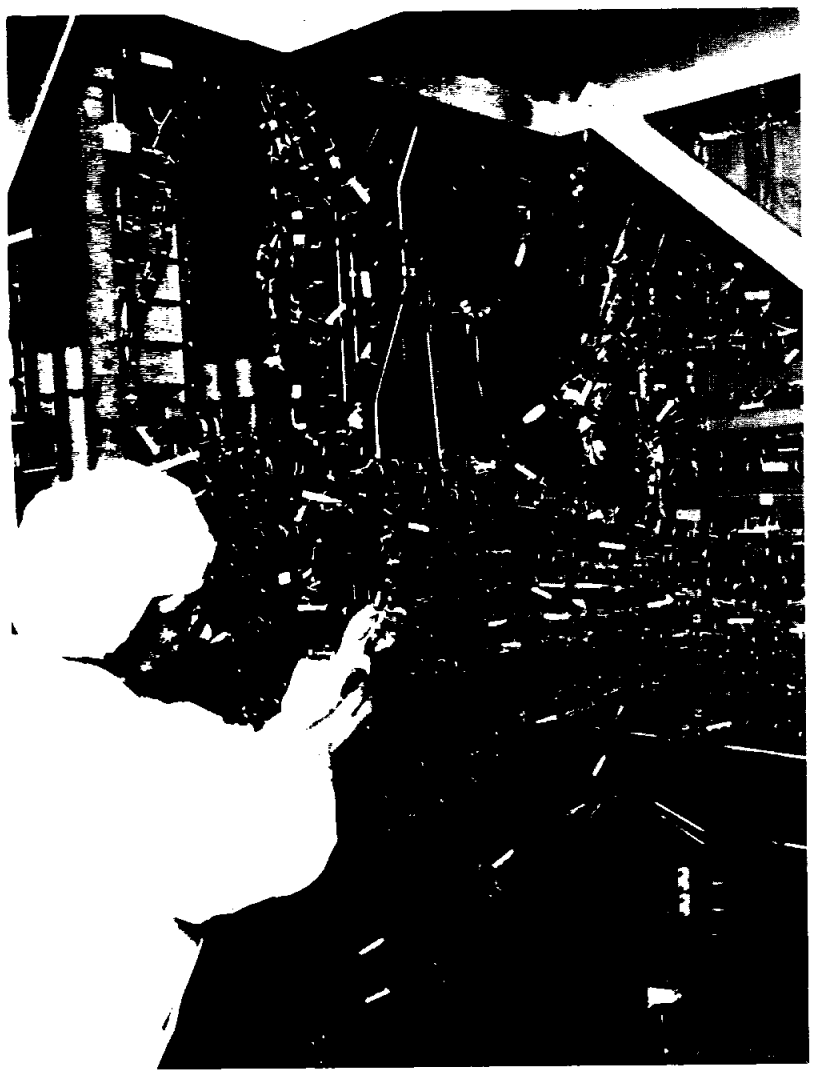
'71 Ford Torino "500", $1K, OBO; Edelbrock 4 bbl. intake manifold for 351 Cleveland 2 bbl. head, $75; TRS 80 computer w/cass. drive, $60; Continental A-65-8 eng. w/prop., no log, $800; Colt Python 357 mag 6" SBS, $650. 480-9375.

Wagner power roller, used 3-4 times, $50. Jeff, x34351 or 337-3973.

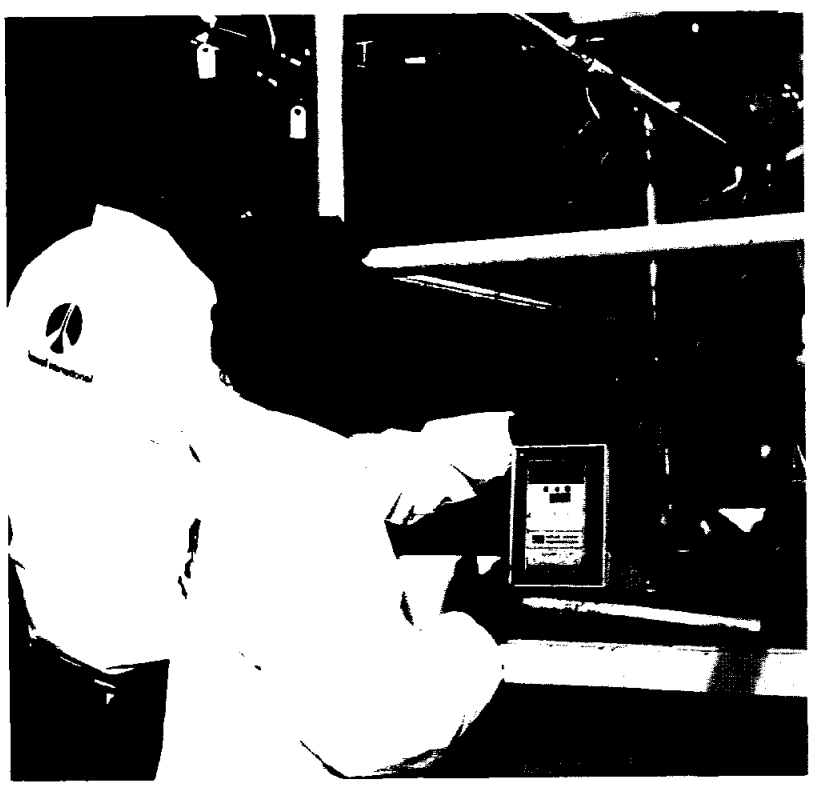
Endeavour assembly advances



Orbital vehicle 105, now known as *Endeavour,* takes shape at Rockwell International's shuttle construction facilities in California.



Workers install and check *Endeavour's* improved or, in some cases, completely redesigned electrical systems.



Rockwell's work force currently numbers 600 and will expand to 850 by time of completion in 1991.

By Kyle Herring

To NASA's technical community it's known as OV-105 for "orbital vehicle-105." To the nation and the world it will always be known as *Endeavour.*

Chosen by the nation's school-children in a contest, OV-105 was named after the Royal Navy vessel commanded by Captain James Cooke in the 18th Century.

The number of the vehicle is a tail number of series number given to the vehicle at the time of construction much like the numbers assigned to production airplanes.

In August of 1987 NASA was fully funded to build this fifth spacecraft, capable of being launched into space and returning to Earth and landing as a conventional aircraft on a runway.

Now, almost two years later, the work force at Rockwell International's Space Shuttle construction facilities in Palmdale and Downey, California, has reached 600 and will gradually expand to a maximum of about 850 by the time it is completed in 1991.

In spite of some minor, but perceived, delays in starting up the production lines for many parts of *Endeavour,* work is proceeding well and pretty much on schedule for its maiden flight into space in early 1992, according to Roger Hicks, manager of JSC's Orbiter Projects Palmdale Operations Office.

Because of the need for some subcontractors to restart assembly lines, "we knew that was going to be a pacing item," he said. The delivery schedules early in the construction process were expected to be slower than the previous orbiters for that reason, but the pace has quickened since then.

"Everything is on schedule. In fact, some of the early parts of construction are a little bit ahead of schedule," Hicks said.

Soon after Palmdale began gearing up to build OV-105, or *Endeavour,* major structural components already assembled as spares began arriving from Downey's fabrication facility to Palmdale for the assembly process.

According to Hicks, "several major modules have already been delivered," including the midfuselage, both wings, the lower forward fuselage; body flap and wing elevons. Most of these have already been joined togeter.

During the next year, as the work force increases, so will the work itself. The major deliveries include the upper forward fuselage; the crew module, in February 1990; and the aft fuselage in April of that year.

Soon after delivery and mating with the rest of the vehicle, Hicks says, *Endeavour,* will be powered up to begin testing of all electrical systems. If the schedule holds, the "Vehicle Powered" sign will be illuminated next July.

As work continues on pressure and leak checks, and installation of electrical systems, workers are preparing to check the electrical system work using a process similar to one developed by a company called DITMCO (Drive-In Theatre Maintenance Company.)

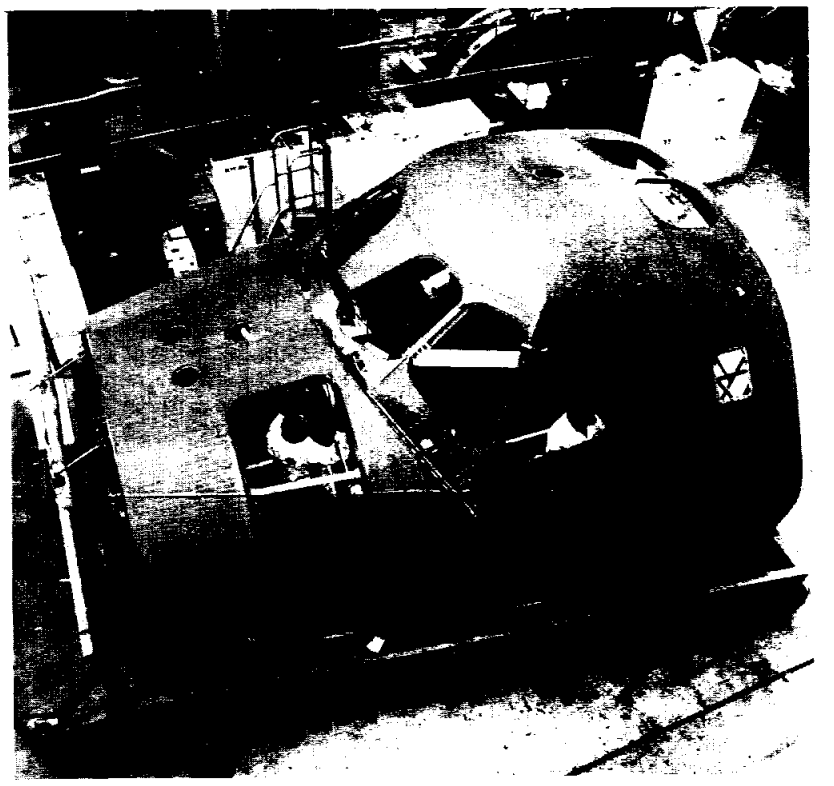
This group developed a system to automatically check the speaker system at drive-in theatres to save time in locating wiring problems in speakers possibly destroyed after being left on automobile windows by forgetful moviegoers.

Hicks says the major test of meeting the delivery date to the Kennedy Space Center in April 1991 will be availability of smaller components from subcontractors that stopped part production completely.

"The real key" to making that schedule, he said, is taking delivery of supply components such as fluid mechanical items and electrical components. "If those come in with out many delays, we can meet the delivery date."

According to the latest Shuttle flight manifest, *Endeavour's* maiden voyage will be in early 1992 to retrieve the European Retrievable Carrier (EURECA) platform deployed on an earlier flight and to deploy a satellite to study radioactivity.

Tile installation proceeds on *Endeavour.* The contract with Rockwell to build the replacement shuttle totals 1.3 billion.



The availability of smaller components from contractors is crucial to meeting *Endeavour's* April 1991 delivery date.

Major structural components already assembled as spares have arrived at Palmdale from Rockwell's fabrication facility at Downey.

Veteran astronaut heading for Seattle

"Pinky" Nelson to leave NASA for academia

George D. "Pinky" Nelson

By Jeff Carr

Three-time space flight veteran George D. "Pinky" Nelson will leave NASA on June 30 to accept academic and administrative posts at the University of Washington in Seattle. Nelson has been named assistant provost at the university as well as an associate professor of astronomy.

"I'm excited with the prospects of a new challenge at the University of Washington," Nelson said. "At the same time, I know that I'll miss NASA and JSC, especially the people. I don't think there is a more dedicated, motivated and skilled group around. Thanks to everyone for making the past 11 years so enjoyable."

Nelson joined NASA with the first Shuttle-era astronaut selection in January 1978. While awaiting a flight crew assignment, he flew as scientific equipment operator aboard the WB-57F high altitude research airplane; flew as chase plane photographer for Shuttle mission STS-1; and served as support crewman and capcom for missions STS-3 and STS-4.

He made his first flight as a mission specialist aboard the Space Shuttle *Challenger* on mission 41-C in April 1984. The 41-C crew successfully deployed the Long Duration Exposure Facility (LDEF) and retrieved, repaired and replaced into orbit the ailing Solar Maximum Satellite. Nelson flew the Manned Maneuvering Unit (MMU) and, with fellow crewman James "Ox" van Hoften, repaired and deployed the Solar Max during two spacewalks in the first space salvage operation in history.

Nelson flew again in January 1986 aboard *Columbia* on mission STS 61-C which featured the deployment of the SATCOM KU satellite, experiments in astrophysics and materials processing, and a night landing at Edwards Air Force Base.

In September 1988, Nelson made his third flight as a mission specialist aboard *Discovery* on the first post-*Challenger* mission, STS-26. *Discovery's* crew successfully deployed the Tracking and Data Relay Satellite (TDRS-C) and operated eleven mid-deck scientific experiments in returning the nation's Space Transportation System to flight.

"I hope to continue to promote the space program in my new career, because I believe that the exploration of space and the development of new technology is key to the future success of our civilization," Nelson said.

Nelson has a total of 411 hours in space aboard three different Shuttle orbiters, including a total of 10 hours spacewalking.

Workshop held

(Continued from Page 1)

A discussion of space station considerations will be held at 11 a.m. with Robert E. Bobola, project manager for development in the Space Station Projects Office at JSC; Randy Waibel of MacDonnell Douglas; and Don Peterson of General Electric Astro Space.

The first session will begin at 1 p.m. with a focus on satellite design. Session leaders include Ed Falkenhayn of the Goddard Space Flight Center and Robert Radtke of Tracor Applied Sciences. They will discuss Orbital Manueuvering Vehicle (OMV) usage, the Flight Telerobotic Servicer, Advanced X-Ray Astrophysics Facility servicing design concepts and servicing polar platforms.

Also Wednesday, participants may observe demonstrations of the Hubble Space Telescope, OMV pilot simulator and the Automatic Umbilical Connector/Manipulator Development Facility.

On Thursday, Session II: Servicing Operations will begin at 8:30 a.m., followed by a Session III: Tools and Equipment at 1 p.m.

Stephen Elrod of the Marshall Space Flight Center and Robert Trevino of JSC, will lead the servicing operations discussions, which will include servicing Eureka-type platforms, OMV backgrounmd and status, combining teleoperation with autonomous robot control for satellite servicing, and orbital fluid resupply development activities.

Neville Marzwell of the Jet Propulsion Laboratory, Richard Fullerton of JSC and Michael Withey of ILC Space Systems will lead the discussion on tools and equipment. Among the topics in Session III are task space coordination of multiple robotic arms manipulating the same payload in an orbital environment, the Astronautics Dexterous Anthropomorphic Manipulator System development of a teleoperated servicing system, magentic end effectors for space operations, and superfluid helium resupply coupling.

Session IV: Future Opportunities opens the day Friday at 8:30 a.m. with a focus on presentations from representatives from NASA, the military, commercial programs, Canada, Japan and Europe.

Session leaders will be Major Neal Ely of the United States Air Force and Steve Hoffman of Science Applications International Corporation.

Additional topics will be discussed in each of the four session.

JSC employee achievements earn national, industry, and community recognition

NASA AGARD representative

Starting this summer, Dr. Winston D. Goodrich, Special Assistant to the Director of the Aerodynamics Division at NASA Headquarters, will begin a three year assignment in Paris, France. Dr. Goodrich will serve as the Executive of the Fluid Dynamics Panel for the NATO Advisory Group on Aerospace Research and Development (AGARD).

AIAA Engineer of the Year

Clarence J. Wesselski, an employee of JSC's Structures and Mechanics Division, has received the American Institute of Aeronautics and Astronautics (AIAA) 1989 Engineer of the Year Award.

Wesselski received the award for his work in conceiving the basic design, serving as principal designer and leading the development test effort for the Space Shuttle Orbiter Crew Escape System Pole.

ABWA Woman of the Year

Evelyn J. Preston-Williams, a program analyst in JSC's Management Integration Office in the National Space Transportation System Program Office, was recently elected Woman of the Year by the Marquette Charter Chapter of the American Business Women's Association (ABWA).

Chairman of AIAA Space Science Committee named

Wendell Mendell of JSC's Solar System Exploration Division was named chairman of the American Institute of Aeronautics and Astronautics (AIAA) Technical Committee on Space Science and Astronomy at that organization's annual meeting May 4.

The Technical Committee provides a forum for airing issues important to the scientific community within the leading professional aerospace engineering society.

PMAG Public Service Award

Dr. R. Wayne Young, Deputy Director of Administration, received the Presidential Management Alumni Group (PMAG) 1989 Public Service Award.

Young received the Public Service Award for his exemplary career and commitment to the ideals of public service as well as his support for both individual interns and the Presidential Management Program itself.

Employment Program Manager honored

Lupita Armendariz, the Hispanic Employment Program Manager of JSC's Office of Equal Opportunity Programs, was recently presented a Certificate of Appreciation from the NASA Office of Equal Opportunity Programs in Washington, D.C.

People

Columbia preparations continue

(Continued from Page 1)

flight here at JSC until *Columbia* is rolled out to the launch pad. They will fly to KSC for the simulated terminal countdown demonstration test (TCDT) which is a practice countdown with the flight teams in Mission Control here and the Firing Room at KSC. The simulation will demonstrate the readiness of the flight team and crew for events on the actual launch day.

Meanwhile, in the planetary spacecraft checkout facility earlier this week, 1,300 pounds of nitrogen textroxide was loaded aboard the spacecraft's two oxidizer tanks. Next week, 800 pounds of hydrazine fuel will be loaded into another pair of tanks. The propellants will be used for control of the spacecraft enroute to Jupiter and for planetary mission operations.

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

"Moon Before Apollo" briefing set

(Continued from Page 1)

assignment in the era that preceded the historic Apollo missions but one with far-reaching ramifications.

"Some of the techniques I helped develop as a part of that project I ultimately used myself during Apollo 17," Schmitt said.

The U.S. Geological Survey team examined the methods the astronauts would need to work on the moon, what kinds of cameras they would need, and what type of tools and sampling techniques they would need to maximize scientific goals.

Armed with the necessary tools and NASA's objective, Schmitt and his colleagues headed into the field to gather information for the assignment.

"We concentrated on using the radio to transmit information instead of writing it down," Schmitt said. "We practiced how to quickly sample the most important samples of a certain area, and how to use photographs instead of time and description for documentation."

Scientists were not groping in the dark as they planned for the Apollo mission. Besides Earth-based telescopic observations, they had much information from the unmanned precursor missions - Ranger, Surveyor and Lunar Orbiter I and II.

The Ranger project encompassed nine flights beginning Aug. 23, 1961 and ending with the flight of Ranger IX on March 21, 1965. The Ranger spacecraft telecast to Earth 17,255 close-ups of the moon giving scientists their first look at features as small as 10 inches. Previously, scientists looking through the world's best telescopes could discern lunar objects no smaller than a half-mile in size.

The first Surveyors were designed as engineering test spacecraft to test soft landing techniques. Each of the spacecraft carried a single scanning television camera and their legs were equipped with instruments that returned information on the hardness of the moon's surface. Surveyor I soft-landed on the moon June 3, 1966 and telecast thousands of close-ups of the lunar surface.

Lunar Orbiter I, launched Aug. 10, 1966, and Orbiter II, launched Nov. 6, 1966, orbited the moon and returned close-up pictures and other information about the lunar surface.

"In one way we knew an awful lot, much of which was wrong," Schmitt said. "Our photo-geologic mapping was quite extensive and successful. The scale mapping we conducted was accurate - to that scale. Then, as we sent the unmanned missions we got increasingly better photographs and the mapping began to look at smaller details," he said.

"We knew the moon was low in iron and, generally, we thought we would not find water and that was true," Schmitt said. "There are still some people who think there could be water at the lunar poles but I think the chances of that are slim."

"We thought the rocks that would be brought back would be relatively young comparable to rocks on Earth. Then Neil and Buzz brought back samples that were four billion years old. And the surprises didn't stop there, they continued mission after mission."

A complete list of the briefings, held each day during that week from 11 a.m. to 2:00 p.m., includes:

July 17:"The Moon Before Apollo"

July 18:"Planning The Apollo Missions"

July 19:"Flying The Apollo Missions"

July 20:"Apollo Scientific Results"

July 21: "The Moon As Seen By Apollo Astronauts"

Manifest set through mid '90's

(Continued from Page 1)

six. Spacehab is a commercially-owned, pressurized module for conducting experiments in a Shuttle middeck environment.

The updated manifest also features six Shuttle "flight opportunities" beginning in 1992. Use of these flight opportunities by payloads which slip from their planned launch will minimize manifest revisions and promote schedule stability in payload programs.

NASA continues to employ expendable launch vehicles for payloads not requiring the use of the Shuttle. Three new launches have been added to the ELV schedule in 1995. These include the Solar Heliospheric Observatory aboard an Atlas II, a Geostationary Observational Environmental Satellite (GOES) on an Atlas I and the Comet Rendezvous Asteroid Flyby marking NASA's first use of the Titan IV rocket.

Awards presented to NASA/JSC honorees

(Continued from Page 1)

Other recipients included Malcolm J. Himel, Jr., William J. Huffstetler, Jr., and Charles G. Krpec, Jr., Jerry E. McCullough, Elric N. McHenry, Thomas W. Redmond, Edwards Air Force Base, Carl B. Shelley, and Earl W. Thompson.

A NASA Public Service Medal was presented to Daniel R. Brown, of Rockwell at Downey.

JSC Certificates of Commendation were awarded to John R. Arnold, James D. Bagwell, William P. Bays, Robert E. Bobola, Byron J. Boeckel, and Frederick T. Boyes.

Others receiving the certificates were David M. Browne, Quinn L. Carelock; Willard L. Castner, Edward S. Chevers, James L. Cioni, Curtis C. Collins, Jesse J. Contreras, O. Constance Critzos, and Larry D. Davis.

Charles F. Deiterich, Paul D. Dell'Osso, Jeff E. DeTroye, Robert L. Duppstadt, Chirold D. Epp, Ph.D.; Royce G. Forman, Ronald H. Gerlach, and Rafael G. Gonzalez, also received the awards.

Additionally, Jesse F. Goree, Jr., Ted A. Guillory, David A. Hamilton, Kathryn A. Havens, Kathleen J. Healey, Ben W. Holder, Ph.D., John W. Holland, Jr., David J. Horrigan, Jr., and George E. Hyde, received certificates.

Certificates were also awarded to James R. Jaax, Debra L. Johnson, Michael W. Kearney III, Garner R. Kimball, C. Kenneth Land, John H. Langford, Kenneth W. Lassman, Clyde L. Lowrimore, and John J. Maca III.

Alden C. Mackey, Thomas G. Mancuso, Alma S. Martin, Fred W. Martin Jr., Connye L. McClendon; Harold A. Moffitt II, Ronny H. Moore, Brian G. Morris, Stacey T. Nakamura, and Gordon L. Norbraten were awarded certificates as well.

Also honored were John C. O'Loughlin, Charlotte D. Ownes, Charles W. Pace, Donald G. Prevett, Dianne L. Robinson, James O. Schlosser, Victor S. Schneider, M.D., Scott A. Seyl, and Emery E. Smith, Jr.

Additionally, certificates were given to Charles L. Slough, Kenneth L. Suit, James A. Taylor, John J. Thiel, Virginia M. Thompson, Linda D. Thoren, Lewis C. Wade, James M. Wallgora; Harold W. Whittington, David W. Whittle, William D. Womack, Robert W. Young, Ph.D., and Peggy A. Zahler at the hour-long ceremony.