



**Bench check**

The STS-26 crew dons clean-room clothes to take one last look at what will be in the middeck lockers. Story on Page 3.



**Radar repair**

A redesigned radar antenna for Space Shuttles is getting its finishing touches at JSC. Story on Page 4.

# Space News Roundup

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No. 25

## New manifest keeps planetary dates

NASA issued the newest update of its mixed-fleet manifest Tuesday, reflecting current planning for Space Shuttle missions and expendable launch vehicles (ELV's) through 1993.

The manifest—for planning purposes only—targets the STS-26 launch for late September, postpones the Hubble Space Telescope mission and continues to support three interplanetary launch windows.

An exact launch date for STS-26 is not expected to be announced until after the Flight Readiness Review scheduled for Sept. 13 and 14.

The early flight order becomes:

- STS-26 aboard *Discovery* in September;
- STS-27 aboard *Columbia* in November;
- STS-29 aboard *Discovery* in February 1989;
- STS-30 aboard *Atlantis* in April 1989; and
- STS-28 aboard *Columbia* in July 1989.

The new manifest supports Department of Defense mission requirements and continues to reflect the high priority assigned to civil space science and applications payloads and commercial space initiatives.

STS-28, the DOD mission that is to fly on *Columbia*, has been moved from February to July 1989 and now will follow the STS-30 launch of *Magellan*.

STS-30, the Hubble Space Telescope mission, has been moved back seven months until February 1990 to accommodate the delayed launch of STS-26; support an orderly flight rate buildup in 1989; maintain planetary launch opportunities and avoid the long mission slippages incurred when planetary windows are missed; and preserve important DOD missions.

The DOD mission that had been scheduled for February 1990 moves to July 1990. To accommodate this series of changes, one of two DOD Shuttle missions previously slated for 1991 is now scheduled on a DOD expendable launcher.

A top priority in revising payload schedules

has been to maintain the fixed launch window opportunities of three interplanetary missions:

- *Magellan*—a mission to map the planet Venus, scheduled to be launched in 1989;
- *Galileo*—a cooperative project with Germany to survey Jupiter and its moons, scheduled to be launched in October 1989; and
- *Ulysses*—a cooperative project with the European Space Agency to investigate the properties of the Sun and its environment, scheduled to be launched in October 1990.

Launch of NASA's U.S. Microgravity Laboratory (USML-1), and the first step in extending mission durations beyond nine days, remains

Please see **MANIFEST**, Page 4

## Grueling sim tests all hands

By James Hartsfield

*Discovery* was launched at 9:04 a.m. Tuesday on a grueling 56-hour simulated flight, a final, full-scale dress rehearsal of America's return to space for the crew and more than 300 JSC employees.

"The pace of this sim compared to the last long sim we did appears to be much more confident and relaxed," Flight Director Milt Heflin said in a mid-simulation briefing Wednesday. "It seems that working the problems has been going smoother. I take that as an indication that these people are ready to go fly 26. When this is over ... the next big thing for us is the flight."

Despite a string of major problems, the simulated mission was successful in accomplishing its primary objective, deployment of TDRS-C. Heflin complemented the work of the crew during the simulation.

"We've worked up a pretty good rapport with the crew during all the training we've been through," he said. "In some cases, there's only so much you can do to help the crew procedure-wise ... we simply have to look over their shoulders, listen to what they're saying and tell them they're doing good work."

The simulation exercised the crew, all of the flight controllers and support personnel for the return to flight, the

Please see **SIMULATION**, Page 4



Suit technician Troy Stewart helps Mission Specialist Pinky Nelson into his bright orange partial pressure suit before the start of the final STS-26 Long Duration Simulation.

## Countdown test is next hurdle for STS-26 crew

Primary payload installed; solid rocket test successful

As the STS-26 crew put the finishing touches on its mission training this week, workers at Kennedy Space Center began preparing to receive the astronauts for next week's Terminal Countdown Demonstration Test (TCDT).

The TCDT, designed to exercise both the launch team and the crew in a launch countdown dress rehearsal, has a T-0 of 9 a.m. CDT Thursday.

The crew, Commander Rick Hauck, Pilot Dick Covey and Mission Specialists Dave Hilmers, Mike Lounge and Pinky Nelson, will arrive at the Cape on Tuesday for two days of Shuttle emergency evacuation practice before the TCDT. The crew also will practice landing procedures in the Shuttle Training Aircraft.

The dress rehearsal will begin with a crew breakfast at 5:10 a.m. CDT Thursday.

The mission's primary payload, the Tracking and Data Relay Satellite-C

(TDRS-C), was installed in the payload bay Monday along with the Inertial Upper Stage (IUS) that will boost it into geosynchronous orbit.

An interface verification test was scheduled to begin today to check connections between TDRS, the Orbiter and ground support systems.

The explosive charges that will allow TDRS-C to separate from the IUS were successfully installed on the IUS before the payload-booster combination was loaded into the payload bay.

Post-Flight Readiness Firing main engine and main propulsion system checks are continuing. The main engine heat exchangers were checked for leaks Wednesday. And crews are still investigating the presence of a small amount of hydrogen in the 4-inch disconnect fuel line.

Two of the three main engines' gaseous oxygen control valves, which

Please see **INSPECTION**, Page 4



**STS-26**  
The Return to Flight

## China bound

Contracting officer gears up for Kung Fu competition

Leon Blum, a contracting officer for research and engineering in the JSC Procurements Division, has been working out as many as four hours daily for the past month to gear up for an upcoming Kung Fu competition—to be held in China.

Blum, a veteran of the martial arts, will compete in the 1988 President's Cup International Kuoshu Kung Fu Tournament in the Republic of China Sept. 21-26. Events will include Tai Chi kata forms, Blum's specialty, Kung Fu kata and hand-to-hand competition. Tai Chi, literally translated as "the circle," is a kata involving complicated movements in a graceful flowing pattern.

"Being invited to the tournament is really a rare experience, but initially I didn't know if I'd be able to go because of my workload," Blum said recently. "But I'm in perfect health and I'm ready."

Weight lifting, running and perfecting a 15-minute Tai Chi form routine are daily workout routines for Blum. He will compete in the international tournament as part of a 20-member, Houston-based coed team called the Wu Shu Kung Fu Federation Team. They will represent the United States at the event in Fengshan City, Kaosiung Hsien, Taiwan.

During the early 1960s, Blum was introduced to the martial arts while living in Seoul, Korea, with his parents.

Blum practiced Tae Kwan Do and earned a black belt at age 10.

"A person should be able to defend himself, but not force his way on others," Blum said.

Blum's skill has been reinforced through teaching private karate classes at the YMCA, the study of Judo and teaching Aikido at the Clear Lake Community Recreation Center.

"There are as many similarities between the martial arts as there are between the various religions. If you keep your mind open to new concepts and ideas, learning a new art is easier and the old practice is not wasted effort," he said.

His achievements include a first-degree black belt in Tae Kwan Do-Mudoc Kwan style, a second-degree black belt in Aikido-Tomiki style, a first-degree brown belt in Judo; a third-degree brown belt in Tae Kwan Do-June Rhee style; and a purple belt in Tai Chi from the Wu Shu Kung Fu Federation.

On Sept. 10, a Tai Chi and Kung Fu Tournament will be held at Moody Park in Houston to raise funds for the team's trip. Blum must personally raise \$2,000 to cover travel costs. The tournament will include Tai Chi and Kung Fu demonstrations and presentations by the U.S. National Team.



Leon Blum, a JSC contracting officer, displays the Kung Fu form that has earned him an invitation to an upcoming tournament in the Peoples Republic of China.

# JSC People

## Johnson receives AIAA recognition

Karen J. Johnson has been named the first recipient of the American Institute of Aeronautics and Astronautics (AIAA) Professional Woman of the Month award. Johnson, an AIAA counselor and registered professional engineer, is currently technical assistant to the manager of Trajectory Operations, with the Rockwell Shuttle Operations Co. Her 10 years of engineering service at JSC also included jobs as a flight controller and quality engineer for space suit manned testing.



Johnson

## Thornton receives secretarial award

Kari K. Thornton recently received the Marilyn J. Bocking Secretarial Excellence award. Thornton, then a secretary in the Media Service Branch, Office of Public Affairs, was cited for her initiative and willingness to take on duties not ordinarily assigned to secretarial staff. She relayed to media and general public prepared responses to questions on space program activity, coordinated with NASA Headquarters on the timing and distribution of agency statements and releases and researched answers to reporters' questions. Thornton now works as a public relations specialist for Boeing Aerospace.



Thornton

JSC

# Dates & Data

## Today

**Alley Theatre Pass Subscriptions**—Preferred pass subscriptions for the Alley Theatre are now available for the '88-'89 season. Prices range from \$90 for six vouchers to the large stage to \$45 for three vouchers to the arena stage. Subscriptions include two for one dinner coupons at some of Houston's popular restaurants. For information call Doris Wood, x37545.

**Cafeteria menu**—Entrees: barbecue link (special), liver and onions, broiled codfish, deviled crab, seafood gumbo. Vegetables: buttered corn, green beans, new potatoes.

## Monday

**Cafeteria menu**—Entrees: French onion soup; BBQ sliced beef, parmesan steak, spare rib w/kraut, chili & macaroni (special). Vegetables: ranch beans, English peas, mustard greens.

## Tuesday

**Cafeteria menu**—Entrees: split pea soup; meatballs and spaghetti, liver & onions, baked ham w/ sauce, corned beef hash (special). Vegetables: buttered cabbage, cream style corn, whipped potatoes.

## Wednesday

**Aerospace education conference**—JSC will host the 27th Annual Education Project Conference Sept. 7-14. Specialists from each NASA center will participate in the week-long training session. For more information, call Jim Poindexter, x38624.

**JSC Toastmasters Club entertainment**—JSC Toastmaster Dan Haller will host the club's Humorous Speech, Table Topics Speech, and Lip Sync contests beginning at 6:30 p.m. on Sept. 7 at Mario's Pizza, NASA Road 1.

**Cafeteria menu**—Entrees: seafood gumbo; cheese enchiladas, roast pork and dressing, BBQ link (special). Vegetables: pinto beans, Spanish rice, turnip greens.

## Thursday

**Cafeteria menu**—Entrees: beef and barley soup, roast beef w/dress-

ing, fried perch, chopped sirloin, chicken fried steak (special). Vegetables: whipped potatoes, peas and carrots, buttered squash.

## Sept. 9

**Cafeteria menu**—Entrees: seafood gumbo; fried shrimp, baked fish, beef stroganoff, fried chicken (special). Vegetables: okra and tomatoes, buttered broccoli, carrots in cream sauce.

**AIAA China trip**—A technical delegation from the Houston Section AIAA will depart for a trip to China to visit with the Chinese Society of Astronautics. Participants will meet with technical counterparts in Chinese space facilities at Beijing, Xian and Shanghai, home of Houston's sister section, the Shanghai Astronautical Society. Non-technical activities are planned for spouses. The delegation also will visit scenic and historic sites at Guilin and Hangzhou. For information on applications, call Jim McLane, 488-0312.

## Sept. 12

**Dance class**—Country and western dance classes will begin Sept. 12 and continue for six weeks, meeting from 7-8:30 p.m. each Monday at the Rec Center. Cost is \$20 per couple. Call x30303 for more information.

**NAMU meeting**—NASA Area Macintosh Users next monthly meeting will begin at 7 p.m. Sept. 12 at 600 Gemini (RSOC cafeteria).

**JSC On-site Blood Drive**—The third JSC Onsite Blood Drive is scheduled for Sept. 12 at the Gilruth Recreation Center from 8 a.m.-noon and 1-4 p.m. For appointment call Bob Jones, x33004.

## Sept. 14

**Hypermedia '88 conference**—JSC and UH-Clear Lake will sponsor a two-day conference dealing with software engineering, documentation and education training. For registration and program information,

call Glen Van Zandt, x33069.

## Sept. 15

**Apollo 14 workshop**—The Lunar and Planetary Sample Team will sponsor a workshop centering on Apollo 14 samples and the Apollo 14 landing site through Nov. 16 at the Lunar and Planetary Institute. Topics to be discussed include: regional geology of the Apollo 14 landing site; Apollo 14 plutonic rocks; and the relation of Apollo 14 lithologies to the magma ocean hypothesis and other models of early lunar differentiation. Abstracts for contributions are due at the LPI by Sept. 15. For more information, call Jeffrey Taylor, (505) 277-9159, or Paul Warren, (213) 825-2015.

## Sept. 17

**Deep sea fishing**—The JSC-EAA will sponsor a deep-sea fishing trip aboard the New Buccaneer departing Galveston at 7:30 a.m. and returning at 7:30 p.m. Tickets will be on sale through Sept. 16, and are \$40 to fish, \$15 to ride and \$15 for children 12 and under to fish. A limited number are available. For more information, call x35350.

## Sept. 22

**Mixed soccer sign-up**—Registration for the Saturday mixed soccer league will be at 7 a.m. for badged teams and 5:30 p.m. for unbadged teams. League play will begin Oct. 1. For more information, call x30303.

**IEEE Education Committee conference**—A video conference focusing on "Photonic Switching in Communications and Computing" is scheduled from 10:30 a.m.-2 p.m. at the Rec Center. For more information call Eddie Robinson, 333-7029.

## Sept. 23

**Nature symposium and plant sale**—Armand Bayou Nature Center will host its fourth annual symposium from 9 a.m.-5 p.m. Sept. 23-25. The

event is sponsored in an effort to promote landscaping that maximizes benefits for both homeowners and the community. A plant sale to raise money for the non-profit nature center also will be held.

## Sept. 25

**Challenger 7 Memorial Park fund-raiser**—A fund-raiser for the Challenger 7 Memorial Park has been scheduled Sept. 25; Oct. 2 is the rain-out date. Scheduled events include a volleyball tournament, a celebrity softball tournament, a chili cook-off and a multi give-away raffle. For more information, call Bridget Vahfossen or Meresa Prather at 482-4162.

## Sept. 29

**NACA reunion**—The National Advisory Committee for Aeronautics (NACA) will be holding its fourth national reunion Sept. 29 through Oct. 2 in San Jose, Calif. NACA Reunion IV is for former employees, spouses and military detailees and will be held at the Red Lion Inn in San Jose. Super meeting saver air fare discounts are available with a savings of up to 40 percent from American Airlines in cooperation with Abel Love, Inc. For airfare information, call the JSC Travel Office at x38688. For other information, call x33067.

## Oct. 13

**Return to flight celebration**—The eighth annual North Galveston County Chamber of Commerce's Bayou Festival will adopt "A Return to Space Flight Celebration" as its theme Oct. 15-16 at Walter Hall Park in League City. A return-to-flight banquet has been slated Oct. 13 at the South Shore Harbour Resort and Conference Center. As part of the festivities, a special award will be presented to the "North Galveston County Citizen Most Responsible for the Safe Return to U.S. Space Flight."

JSC

# Swap Shop

## Property

Rent: Lake Livingston waterfront, 3-2, fully furnished, covered decks, pier, ex. fishing, swimming, skiing, new cond. 482-1582.

Sale: Gilchrist beach house, 2-2, cen. A/C, beach 300 yards, on canal. 996-1911 or 332-3312.

Sale: 3 BR house on heavily wooded 75' x 150' lot overlooking Taylor Lake, w/separate one BR apartment, many extras, \$89,500. 474-3181.

Sale: Heavily wooded lot, 75' x 150', with lake view, all util., avail., \$19,500. 474-3181.

Lease: Tranquility Lake 1 BR condo, elec. sec. gates, covered parking, W/D, refrig. w/ice maker, microwave oven, FPL, cable TV hook-up avail., pools, \$300. 554-6892.

Sale: Big Bend area hunting land, 160 acres, \$170 per acre, OBO. 337-4051.

Sale: Kirkwood South, large custom built 2-story, 4-2-5-2, 2,400 sq. ft., formals, family room, FPL, study, intercom, oversized cul-de-sac lot, near Dobie H.S., \$76,500. 488-5210.

Sale: 3-2-2, Fairmont Park, La Porte, \$3,000 equity, no qual. assumpt., very low closing, \$630/mo., fixed 10%. 471-8776.

Lease: Baywind I, 1-1 fresh paint, new carpet, \$275/mo. 333-6216 or 333-6692.

Sale/Lease: Friendswood, Galveston County 3-2-1, quiet street, fenced yard, Friendswood schools, \$540/mo. or \$47,500. Jeff, 282-7744 or 996-1907.

Sale: Pearlland/Dixie Hollow, lot on concrete street, all util. x39530 or 482-5003.

Sale: Heritage Park, 3-2-2 atrium, fenced & decked yard, custom kitchen cabinets, new vanities in baths, cedar accents, new paint inside & out, new tile baths, mini blinds, \$58,500. Lori or Tony, x32304 or 482-5139.

Lease 2-2-1CP condo, FPL, W/D, refrig., \$400/mo. plus dep. Danny Taylor, x39674 or 326-5754.

Sale: Middlebrook, 3-2-2, FPL, wet bar, covered patio, large lot, FHA assum. 10%, \$81,000. 480-9363.

Sale/Rent: Lake Livingston townhouse, 2-2-2CP, 24 hr. sec., clubhouse, pool, tennis and volleyball courts, playground, boat ramp, on the water. 554-5514.

Sale: League City, 3-2-2, cul-de-sac, landscaped, low equity, FHA 10% fixed assum. David, x35464.

Lease: Egret Bay condo, 2-2-2CP, near water, W/D, ice maker, FPL, covered parking, \$400/mo. 280-9822.

## Cars & Trucks

75 International Scout XL3, 350 Chevy eng., 350 Turbo trans., Dana Posi-Trac rear end, less than 5K on drive train, bikini & soft top, \$2,500. 332-5057.

'85 35' Mallard motor home for rent 337-4051.

'83 Porsche 944, silver, 5 spd. trans., sun roof, 43K mi., alarm system, two new tires. ex. cond.

\$14,500. Frank, x36221 or 333-5251.

'86 Jeep Cherokee Laredo, 2WD/4WD, select trac, loaded, 26K mi. 280-0144.

'80 Mazda RX-7, A/C, sun roof, \$2,650. 488-4453.

'79 Oldsmobile Cutlass Cruiser S/W, low mi., AM/FM cass., new tires, ex. cond., \$2,000, OBO. 280-9822.

'69 VW bug, runs great, new brakes, paint, \$1,295. John, x36484 or 486-1186.

'59 Mercedes Benz 220S, \$3,000. David, x35464.

'58 Porsche 356A coupe, 1964C engine, \$5,500. David, 554-2992.

'86 GMC Safari van SLE, 2-tone, 38K mi., fully loaded, Bob, 335-6066 or 486-1766.

'79 Ford Granada, runs good, A/C, dent in pass. door, some rust, \$790. 480-0150.

'82 Mercury Capri, 6 cyl., auto., P/S, P/B, A/C, AM/FM cass., cloth int., 51K mi., ex. cond., \$2,800. Bob, x39079 or 488-5881.

'77 Mercury Capri, parting out, V-6, 4 spd. Bob Cordes, x39377 or 474-5420.

'83 Mitsubishi Cordia, 2 dr. hatchback, A/C, cruise, AM/FM cass., CB, louvers, new battery & brakes, clean, \$2,695, OBO. Maas, 977-2560.

'79 Mercury Capri, A/C, auto., good tires, runs good, \$650. x33558.

'67 Mustang, 289, V-8, 3 spd., red, new paint, air shocks, plugs & wires, rebuilt carb., A/C, good tires, AM/FM stereo, \$3,395, OBO. Mike, x38169 or 482-8496.

'80 Toyota Tercel, 4 cyl., A/C, P/S, P/B, new brakes/clutch, orig. owner, \$850. 481-8608.

'23 Mercedes kit car on VW chassis, \$4,000, OBO. 488-4019.

'87 Ford XLT Lariat, F-250 Supercab, auto., 351 H.O., V-8, blk. w/red int., Gemtop, 21K mi., \$14,500. Dan, 282-4225 or 486-3938.

'87 Dodge custom van, all power, cruise, dual A/C, AM/FM cass. stereo, CB, high caliber Swordsman conversion, x36729 or 480-1223.

'88 Chevrolet Beretta, new, auto., A/C, aux. lighting, AM/FM stereo, elec. RR wind defog, tilt, cruise, intermittent wipers, \$10,200, OBO. Debra, x35245 or 931-1651.

'77 Ford Pinto, hatchback, standard, stereo, runs great, very clean, no A/C, \$800. Chris, x36601 or 488-5533.

'84 VW rabbit, Wolfsburg Edition, 5 spd., A/C, AM/FM stereo cass., 80K mi., good cond., \$3,895. Plauche, x39034.

'77 Toyota PU w/camper cover, new paint, engine has one burned valve, \$600. x31226 or 534-3710.

'74 VW, has one burned valve, parts to repair and enough parts for spare engine, \$2,000. x31226 or 534-3710.

## Cycles

'86 BMW K75C, blk., 8,200 mi., warranty, \$4,250. John, x36484 or 486-1186.

'77 Honda 750, fairing, CB, luggage rack, \$600.

Tim, 996-9191.

'80 Honda 200 Twinstar, ex. cond., 7K, \$500; '72 Honda 450CC, needs brakes, clutch & throttle cables, \$225. x34270 or 337-1896.

'86 Suzuki RM250 motocross bike, many new and updated parts, \$1,400, OBO. Tim, 333-6613 or 859-8773.

'83 Honda 650 Nighthawk, always garaged, 3,600 mi., w/helmet, ex. cond., \$1,300. David, 282-1987 or 480-4692.

Two Honda Express motorbikes, '78 and '80, run great, sell both for \$550. x34202 or 559-2850.

## Boats & Planes

'16' Hobie Cat, loaded w/trailer, \$1,485. 488-4453.

'83 Hobie Catamaran, ex. cond., orange rainbow sails, sailbox, trailer, \$1,850. x35067 or 333-3544.

'15' center console w/25hp Evinrude, galv. trailer, trolling motor, assorted access, less than 100 hrs. on new motor, ex. cond., \$1,800. Donald Thompson, x39475 or 644-5044.

'85 20' Rinker deck boat, 305 V-8, SSP, cover & trailer, \$7,950. Bob, 335-6066 or 486-1766. Beginner windsurfer & sail, \$200. Tim, 996-9191.

'10' kayak collapsible to 10' x 12", good cond., \$85. x34270 or 337-2682.

'81 16' Newman Cam II runabout, 100hp outboard w/trailer, ex. cond., \$3,800, OBO. 480-9363.

'18' Hobie Cat w/dilly trailer, \$2,350. x31226 or 534-3710.

## Audiovisual & Computers

Realistic 200 channel programmable scanner w/AM/FM/VHF/UHF, AC & mobile, 50' coax & antenna, 6 mos. old, \$225. 554-3622.

Commodore 1526 (802) dot matrix printer, needs new. easy to install, print head, \$20. Samouche, x35094 or 482-0702.

## Household

Queen size mattress, \$30. Tim, 996-9191.

Sears washing machine, \$50. 996-9690. GE portable 5" color TV, w/stereo, AM/FM "removable" cass., ex. cond., \$190. C.W., 282-1871 or 280-8796.

2 RCA XL-100 color televisions, 1981 and 1976, both in good cond.; 2 TV stands, good cond., BO. 486-8865.

Cane & rattan Bentwood rocker, \$50. 554-5002.

Sears window A/C, \$150; RCA 25" console color TV, \$150; regulation size pool table, slate top, \$250; 6' x 9' ft. blue oriental style rug, \$50, all ex. cond. 479-1004.

9 pc. light oak country dining room set, oval, drop leaf table w/6 chairs, china cabinet and buffet, \$800. 282-2223 or 474-2292.

Budweiser hanging Clydesdale spectacular

sign, horses pulling beer wagon, Dalmation dogs running along side and atop wagon, buckets hanging from wagon, clock is lighted, sign has 4 fluorescent lights, collectors item, \$200. George, 996-1755.

Sofa and chair, ex. cond., \$100; brass shelf, \$20; 2 brass end tables w/glass, \$10 ea.; closet organizer for sweaters, \$15; small brass bookshelf, \$10; purses, \$5-\$25. x36186 or 488-4774.

Sofa, tuxedo style, beige fabric, subtle pattern, ex. cond., \$180. Lucy, x34910.

## Wanted

Need data sheets and schematics for S100 TEI products. 480-5720.

Want to rent an RV, for 1 week around Thanksgiving, must be reliable and should sleep 4-6. Karen, x38850 or Marie, x38875.

Rider needed for van pool, Braeswood & South Post Oak to NASA. Richard, x37557.

Want IBM PC XT Turbo compatible, 640K, 1 floppy, Hercules graphics, 480-8268.

Want a slide projector in good working cond. Ann, 280-2229.

Want freezer, frost free, 15 or 19 cu. ft., must be in very good running cond., and inexpensive, ext. cond. is not important. Earl Rubenstein, x34807 or 326-2354.

## Pets & Livestock

Calico kitten, female, 6 mos., free to good home. x34618 or 486-1058.

Free 3 Manx-Balinese kittens, 6 mos. old, Balinese markings, 2 males, 1 female, indoor kittens. 488-9005.

Beautiful Sheltie puppies, sable & white, Sire and Dam from Ch. bloodlines, shots and wormed, ready Sept. 22, \$300-\$350. 532-1728.

## Musical Instruments

King trombone, music stand, etc., ex. cond., \$200. Tom, x31252 or 482-2425.

Gerrard turntable w/cartridge, \$10. Samouche, x35094 or 482-0702.

WERSI DX-100, 5-octave, digital multi-sound keyboard, fully road ready w/pedalboard, shoe, stand, 70 watt audio, mixer, MIDI, RS232 computer interface, software, data pack, more, \$3,000. Samouche, x35094 or 482-0702.

Cleveland King coronet, school approved, \$125, OBO. Bob Cordes, x39377 or 474-5420.

Yamaha PSR-12 elec. keyboard, 16 rhythm, 32 instrument, extras, \$200. 554-3622.

Jessee French & Sons upright studio piano, \$500, ex. practice piano. Lynne, 331-0608.

Alec custom voice of the theater sound reinforcement speaker system, \$1,000. 480-9363.

Alto saxophone, King Cleveland, good cond., new case, w/swab, neck strap, reed guard, mouthpiece, and a lyre, \$450. Laura, x34249 or 488-9721.

## Lost & Found

Bicycle lost from Mission Control Center. J. Axford, x37671.

## Miscellaneous

Boys' bikes, 1 Land-Cruiser, \$10; 1 BMX, \$5. 280-0144.

Tour Model System II golf clubs, 1-9 PW, SW, new, peripheral weighted, ex. cond., \$225. 554-5514 or 282-3827.

20" girl's Royce Union bicycle, \$20; Strollee booster seat, \$10; Hedstrom big wheel, \$15; Playschool indoor slide, \$10. Barbara Ashley, 554-6200.

VW type 1 rebuilt engine, 2110CC, approx. 150hp, all new parts, bench run only, \$2,100; VW transmission, Porsche axles, Super-diff, Beef-a-diff, steel forks, never used, \$550. David, 554-2992.

Catalytic converter fits any auto, \$25; 24% leaded crystal by Tiffin, orig. \$30 per stem, "Encantum Platinum", 8 stems per set, 2 sets ice tea & champagne, very nice, \$125. Donald Thompson, x39475 or 644-5044.

Electric grinder, 1/4hp w/grinding wheel and wire brush wheel, \$45; range hood w/light and fan, \$45. J. Kinsey, x32271 or 486-0421.

Coleman versa trailer, 5' x 4' x 2' w/Fiberglass top, all lights, spare tire, \$400, OBO. 488-0719.

Boat generator install. instr. booklet, for low-cost light-weight air-cooled generator, \$24.50. 280-8796.

Notary Public (State of Texas) hand-held seal device, ex. cond., \$15. M.C. Ball, 282-4686.



During Friday's bench review at Boeing, STS-26 crew members inspect some of the equipment that will be stowed in *Discovery's* middeck lockers before launch. From left to right are Mission Specialists Mike Lounge and Pinky Nelson, Pilot Dick Covey, Mike Maher of the EVA/Crew Systems Section, Mission Specialist Dave Hilmers and Commander Rick Hauck.

## LOCKER CHECK: Bench review gives STS-26 crew chance to go through equipment

By James Hartsfield

The STS-26 crew got a look Friday at most of the loose hardware to be packed aboard *Discovery*—from toothbrushes to cameras to a myriad of specialized tools—items the astronauts won't see again until they leave Earth.

Dressed in clean room hats, smocks and booties, they pored through the equipment to see how equipment will be packed in mid-deck lockers, ask questions about specific items and get an overview of several modifications. It was the first flight bench review conducted in Boeing's Locker Bench Review facility at 1045 Gemini.

The crew checked the contents of about 35 lockers during two and a half hours Friday afternoon in one of the final steps in processing those items for flight. Boeing has had the responsibility for processing such articles since January 1986 under the Flight Equipment Processing Contract (FEPC), said Sharon Jones, a crew systems instructor in the EVA/Crew Systems Section who

oversees bench review.

"Bench review is the first time the crew has an opportunity to go through all of their hardware as it's padded in flight configuration," Jones said. "The crew went through it locker by locker, making sure everything looked OK to them and seeing exactly where everything is. A lot of people have their major milestones for flight, and bench review's my major milestone."

The bench review displayed items that will be packed in middeck lockers, including the food supplies, clothing, personal hygiene kits, medical kits, some extravehicular equipment, and virtually all other loose equipment to be flown aboard *Discovery*. All of the locker equipment was packed as it will be in orbit, stowed tightly in foam to hold it in place in microgravity and to ease the shocks of launch and landing.

"Everything was at the bench review except for certain things," said Jones. "For example, the Flight Data File wasn't there, and certain middeck experiments have

already been sent to the Cape."

Jones said the review went smoothly, and lasted only half the time of some past reviews. "Overall, it was great. The problems were very minor. I think the crew was pleased with it."

Among the modifications in stowing and equipment made since the last Shuttle flight are new storage bags that include flaps over their outside pockets and transparent windows to allow crewmembers to see inside. The In-flight Maintenance tool tray also has been extensively reorganized, she said. "We added some tools, deleted some tools and reduced the weight. We made it more convenient."

Boeing FEPC Mission Equipment Manager Lee Wible said the items reviewed by the crew Friday will be stripped down, completely cleaned, serviced and repacked before they are shipped to Kennedy Space Center on Sept. 12.

"The crew is allowed to take everything apart and look at it, and we essentially

repack it again. This is now their equipment," Wible said. "When you get this close, bench review's like, 'Hey, we're getting ready to fly. We must be getting serious.' Everybody's really gung-ho now."

Boeing has studied its processing methods during the past two and a half years, and some procedures have been updated. "We have to ensure that we're processing to the latest standard," Wible explained. "We've taken a look at every processing feature out there and aligned it."

The reviewing room is a clean environment and anyone entering must don protective smocks and headgear. That cleanliness is extended to shipment by the use of Iso-pods, specially sealed crates. Before being shipped, each middeck locker is weighed, and the reading must fall within a 70-pound limit.

In a separate, dressing-room area, the crew inspected its clothing and personal items.



Above: Dick Covey and Pinky Nelson check out some of the camera equipment they'll be using during the mission. Left: Mike Lounge removes a screwdriver from its lens cleaning kit stowage bag.

JSC Photos by Mark Sowa

# Cohen earns top presidential rank award

## Young, Duke receive Meritorious Executive Rank Awards

For the second time in his career, JSC Director Aaron Cohen has received the highest presidential rank awarded to members of the federal Senior Executive Service (SES).

Cohen has been selected to receive the Distinguished Executive Rank Award twice.

President Ronald Reagan personally presented the awards to Cohen and 59 other government officials at a Tuesday morning ceremony in the old Executive Office Bldg. in Washington, D.C.

Two other JSC executives, John Young, Cohen's special assistant for engineering, operations and safety, and Michael Duke, chief of the Solar

System Exploration Division, received Meritorious Executive Rank Awards, the next highest honor given to SES members. Twenty-four other NASA executives received Meritorious Executive Awards.

Cohen was nominated for the award by NASA Administrator James C. Fletcher on Feb. 16, "in recognition of his significant and lasting improvements to America's space program through his work as center director, JSC engineering director, and project manager for the Space Shuttle Orbiter and the Apollo Command and Service Modules."

Young was nominated for playing "an integral role in managing the

design, development and testing of manned spacecraft for each major program from Gemini through space station .... Mr. Young's technical expertise and depth of knowledge have enabled him to effectively participate in the management and resolution of issues critical to the success and advancement of manned spaceflight."

Duke was cited for earning "an international reputation as an eminent scientist and highly skilled administrator in the field of Planetary Sciences. His exceptional capability for innovative thinking, his consummate skill as a manager of scientific research, and his unique talent as a conceptualizer of

advanced programs for manned and unmanned planetary exploration have resulted in a series of outstanding scientific accomplishments.

Five other NASA officials earned Distinguished Executive rank: James B. Odom, former director of science and engineering at Marshall Space Flight Center and now NASA associate administrator for space station; John E. O'Brien, NASA general counsel who retired last month; William F. Ballhaus Jr., Ames Research Center director and now acting NASA associate administrator for aeronautics and space technology; and Jon R. Busse, director of engineering at Goddard Space Flight Center.



Aaron Cohen

In establishing the award in 1978, Congress limited the number of Distinguished Executive awards that could be given each year to no more than 1 percent of all SES members. Individuals may receive the award only once every five years. Cohen first received the award in 1982.

## Radar upgrade gets finishing touches at JSC

By James Hartsfield

An upgrade of the radar the Orbiter uses as one method of judging rate of descent during landings is getting finishing touches at JSC, specifically a redesign of the radar antenna using a mockup of the Orbiter's underside in Bldg. 14.

A new type of radar already has been installed in *Discovery* during the past two and a half years to correct a problem that caused the system to sometimes give false readings. The false readings resulted from a deflection of the radar beam by the Orbiter's nose gear and thermal protection tiles, causing the radar altimeter to "lock up," said Jim Ratliff, an engineer in the Orbiter Avionics Systems Office.

The new radar, a type borrowed from the Department of Defense (DOD) and modified for NASA's uses, includes circuitry that will make the altimeter ignore the false readings created by tile and nose landing gear interference. But, even though it won't show up in the readout of the radar altimeter, the interference will still occur.

"The radar altimeter does have the circuitry in there to avoid the lock-up, but our goal is to not have the interference there at all," Ratliff said. "The real fix to the problem is to have the new radar in there plus a new antenna."

The antenna now being worked on at JSC in the Communications Development Section of the Tracking and Communications Division also is borrowed DOD technology. The goal is to have an antenna that sends out a more concentrated signal and aims the beam slightly aft of the Orbiter, thus avoiding any nose gear interference. "The antenna uses phase-to-ray technology, meaning it can electron



JSC Photo by Jack Jacob

Three workers in JSC's Bldg. 14 put the finishing touches on a high-fidelity mock-up of the Orbiter's front underside to be used in an upgrade of the radar altimeter antenna. From left are Lockheed's Romeo Sanchez and Rockwell's Dick Jackson and Jim Siminski.

ically steer the beam it sends," Ratliff said. "We're taking the basic design from DOD, changing it to our needs and then upgrading for our temperature and vibration requirements."

The recently built mockup of the Orbiter's front underside, constructed by the JSC Technical Services Division, includes the nose landing gear and high-fidelity tiling installed by Rockwell. Tiling over the areas where antennas are placed is the actual thermal protective tiling used on the Orbiter. Other tiles on the mockup are electrically equivalent to actual tiles, Ratliff said.

"It's very difficult to design antennas with all of the unknowns we have, the tile, the skin and others," he explained. "We have to get a conceptual design and put it in the mockup to check it out."

Engineers are now evaluating the design using the Bldg. 14 mockup,

and will soon have Honeywell, Inc., contractor for the project, build a prototype. The prototype will then undergo qualification tests.

"We want to have the new antenna installed in line on OV-105, the Orbiter now under construction," Ratliff said. "And once we're certain this is the design, we'll go back to the program and request funding to have it installed in all the Orbiters."

The radar altimeter, not used until the Orbiter descends past 5,000 feet, is only one of many systems that can be used to determine altitude and descent rate during landings. Other systems include the tachyons and the microwave scanning landing system.

But during a night landing or at abort landing sites, one of which have no microwave scanning system, the radar altimeter "would really come into play," Ratliff explained.

## Manifest rearranges early Shuttle flights

(Continued from Page 1)

scheduled for March 1992. All other payloads manifested on *Columbia* have later launch dates than those published in the March 1988 manifest.

Seventeen Space Shuttle missions are planned through the Ulysses launch (STS-42) in October 1990. Of these, seven are DOD, one carries both a DOD and NASA payload (STS-32) and the remaining nine are NASA missions.

In each of the fiscal years beyond 1991, there are two DOD dedicated flights. This approach is consistent

with the National Mixed Fleet concept. This mixed-fleet manifest reflects NASA's plans to use ELV's for those payloads not requiring the capabilities of the Space Shuttle. Twenty-eight ELV launches are planned through FY 1993.

The manifest is for planning purposes only. Firm Shuttle payload assignments are made during the formal integration process about 19 months before launch. The new manifest reflects NASA's current assessment of the rate at which Shuttle flights can be resumed during 1989.

## Simulation proves crew, controllers ready to fly

(Continued from Page 1)

White Sands Ground Terminal and the STS Operational Support Complex at Onizuka Air Force Base. The three-day drill included a simulated spacewalk by mission specialists Mike Lounge and Pinky Nelson in the Weightless Environment Training Facility early Wednesday morning to free a jammed TDRS-C deployment mechanism.

The onslaught of simulated problems began only five minutes after liftoff. One of *Discovery*'s three main engines shut down prematurely, forcing the spacecraft to abort into a low, irregular orbit. Soon after, an Orbital Maneuvering System engine failed during a firing of the two 6,000-pound thrust engines that insert *Discovery* into orbit. The problem was overcome by firing the remaining OMS engine for a longer period.

The sim was adjusted later to put *Discovery* in a standard 160-mile circular orbit, and soon after, difficulties began with the tilt table designed to lift TDRS-C from the payload bay. The table jammed in a partially inclined position, and all efforts made

from inside the cabin to deploy it fully were unsuccessful.

On the first sleep period of the simulated orbit, a problem with an auxiliary power unit heater forced Commander Rick Hauck and Pilot Dick Covey to remain awake in shifts, flipping a switch at 18- and 45-minute intervals. During a contingency EVA the following morning, Nelson and Lounge manually moved the table to its proper position, and TDRS-C was deployed.

Despite early computer problems in controlling the attitude of TDRS-C, its inertial upper stage was fired and the satellite was sent on its way to a 22,250-mile high geosynchronous orbit Wednesday afternoon.

Throughout the simulation, seemingly incessant problems, ranging from trouble with the Orbiter's oven to four thermal protection system tiles found by pad crews following liftoff, tested the skills of every flight control discipline.

A slow leak in a main landing gear tire and a leaky OMS fuel line forced *Discovery* to make an early landing Thursday at Edwards Air Force Base.

# Inspection of solid rocket yields good results

(Continued from Page 1)

operated sluggishly during the Flight Readiness Firing (FRF), were to be removed and taken to the Shuttle Service Center for review.

Crews also are performing some tile and foam insulation repair needed after the FRF.

Post-firing inspection of Production Verification Motor-1 show the redesigned solid rocket motor (SRM) performed well during the last full-duration firing before STS-26. Multiple flaws were introduced for the test, but none compromised the firing.

"I don't think there was anything that

was unexpected," said Rod Lofton, JSC's Level 2 SRM project integration engineer. "The damage to the flawed O-rings was what we expected."

In the center field joint, a channel was cut into the J-seal bonded insulation to make sure pressure got as far as the capture feature O-ring.

Lofton said pressure reached the capture-feature O-ring, but there was no evidence of leakage.

In the aft field joint, a channel insulation bonding flaw was aligned with a flawed capture feature O-ring to assure that hot gas reached the primary O-ring.

"We burned through the capture feature O-ring, but the primary O-ring did its job and contained the pressure," Lofton said. The primary and secondary O-rings showed no evidence of blowby, he said.

"From what I've seen so far I'm confident we have a good design."

## Test pushes main engine 2,000 seconds

Firing four times longer than mission duration

The longest Space Shuttle main engine firing ever performed recently pushed a single engine 2,017 seconds — four times longer than a normal mission firing.

About 600,000 gallons of liquid hydrogen and 230,000 gallons of liquid oxygen were burned, and 10 million gallons of water were needed to cool the test stand's flame deflector.

The milestone test of engine 2206

performed at Stennis Space Center on Aug. 3 was part of a series of long and short tests designed to demonstrate additional main engine margins. It was followed by a second 2,000-plus second firing Aug. 15.

Earlier this year engine 2030 — scheduled to fly on Atlantis later this year — had problems involving its fuel preburner injector. To resolve that issue, the special series of ground tests using engine 2206 is

being conducted.

Tests essentially are complete, lacking only a final test of 340 seconds to accumulate the desired 8,000 seconds of run time. The long-duration firings allowed engineers to achieve their 8,000-second goal with a minimum number of tests.

Stennis officials say achievement of 8,000-second total with no indication of problems will clear engine 2030 to fly aboard Atlantis.

## Space News Roundup

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Editor . . . . . Kelly Humphries  
Asst. Editor . . . James Hartsfield

## Beware of thieves

JSC employees should beware of thieves who are stealing cash cards and draining bank accounts, according to Don Ackerman of JSC Security.

Ackerman and Tony Baiamonte of University Savings said at least one JSC employee has had a bank card stolen and later been talked out of their personal identification number.

Employees should never give out their personal identification numbers over the phone, Baiamonte said. Anyone who has had their cash card stolen should report the theft immediately, Baiamonte said.