

**NASA**National Aeronautics and  
Space AdministrationLyndon B. Johnson Space Center  
Houston, Texas**Nothing to sneeze at**

How much of a blow to science is a space shuttle sneeze? The Microgravity Disturbances Experiment may take readings. Story on Page 3.

**Launch delay**The launch of the Space Shuttle *Columbia* on STS-32 has been postponed at least until Jan. 8, 1990. Story on Page 4.

# Space News Roundup

Vol. 28

December 22, 1989

No. 50

*A*s the holidays arrive, we at the Johnson Space Center again find ourselves preparing to do what we do best — fly a mission. If we do our jobs well, it will be the first successful space shuttle mission of a busy, challenging year. It's a mission that will close the circle on a research project that began more than five years ago, one that will help our scientists and engineers expand and extend our ability to live, work and travel in space. We also find ourselves working toward the well-defined, long-range goals of establishing a permanent base on the Moon, and then sending humans on to Mars and beyond. Separate, these efforts are extremely important. Together, they are the realization of dreams. We must not forget the connection between the two. Without a reliable space shuttle, we cannot build Space Station Freedom in this decade. Without the space station, we cannot build a Moon base or travel to Mars in the next century. By combining our skills and commitment, however, we can make these things happen. I wish all of you and your families a joyous holiday and a successful new year.

*Aaron Cohen*

*Peace  
on Earth*

# Ticket Window

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

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

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

Sea World (San Antonio, year long): adults, \$17.25; children \$14.75. Christmas special: (Dec. 16-Jan. 1, includes snow ski jump and acrobatics and children's snowy play area): \$11.

Powderhorn Ski Trip (Jan. 23-27): 12 seats still available: \$385 each (four to a condo); \$339 each (six to a condo).

Holiday in the Park (at Astroworld): Pick up a coupon at Bldg. 11 for admission to a winter wonderland: \$5.95 each.

Gold C and Entertainment Coupon Books are now available in the Bldg. 11 Gift Store.

Ice Capades at the Summit (11 a.m., Dec. 30, features Super Mario Brothers and Barbie) \$7.50

JSC

# Gilruth Center News

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

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

**Defensive driving**—Course is offered from 8 a.m.-5 p.m., Feb. 3 and Feb. 17; cost is \$15.

**Ballroom dance**—Classes begin at the Gilruth Rec Center on Jan. 4, and meet each Thursday for 8 weeks. Beginning and advanced classes meet from 7-8:15 p.m., intermediate from 8:15-9:30 p.m.; cost is \$60 per couple.

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

**Weight safety**—This class, required for those who wish to use the weight room is available from 8-9:30 p.m. Jan. 4 and Jan. 17; cost \$4.

**Soccer and flag football registration**—Sign-ups will be held Jan. 10-11 at the Gilruth Rec Center.

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

**Fall Intercenter Run t-shirts are in, please present I.D. at room 146 when picking up t-shirts.**

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: 60 acres, 3 mi. from Karnes City, TX, on Hwy. 80, 50 mi. from San Antonio; 2-story house, on 1.5 lots, fig, pecan, peach, pear trees. 783-9164.

Sale: Lot, Arrowhead Lake, near Willis, \$7,000, OBO. 482-2877.

Sale: Ganado, TX, 1.5 acre lot, 5 min. from Lake Texana, 100 mi. SW of Houston. 335-1250.

Vail, lg. condo, sleeps 10, 3 BA, furn., indoor-outdoor pool, hot tubs, sauna, racketball, free lg. screen movies, March 24-31, 1990. (214) 644-2674.

Sale: 966 acres, sell all or part, 4-2.5-3 brick home, fenced yd., 50' x 110' metal shop, 150 pecan trees. (512) 771-3893.

Lease: Condo, 2-1.5, all appli., W/D, fans, new paint, floor tiles, upst. unit w/balc., \$395/mo. L. Das, x33235 or 488-5532.

Lease: Baywind I condo, 2-1.5-2, appli., W/D, fans, new paint, tiles, clean, 930 sq. ft., upst., \$395/mo. L. Das, x33235 or 488-5532.

Sale/Lease: Taylorcrest custom 3-2.5-2D contemp., neat, lg. living w/brick FPL, master w/dbl. jacuzzi, vaulted ceilings, \$148,500 or \$1,500/mo., furn. Mike, 333-6889 or 532-3010.

Sale: Kemah country home, 1.33 acres, 3-2, gar./CP comb., Clear Creek school, \$85,000. 334-1883.

Sale: Kemah lot, 180' x 111', some trees, \$7,200. 334-1883.

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

Sale: Shoreacres, 4-2-2, 1,800 sq. ft., new paint and carpet, lg. wood-ed. lot, near Houston Yacht Club, \$65,000. Sally, x37485 or 488-5501.

Rent: League City, 2 rooms in house, \$250/mo. furn. or \$225/mo. unfurn., bills split evenly, non-smokers only, pets tolerated. Russ, 332-4336.

Lease: Webster/Ellington, nice 2-1 apt. w/ many extras, \$415 with W/D or \$390 w/out. Dave, x38156 or 486-5181 or Eric, x38420.

Sale: League City, 2.06 acres, near schools, 15 min. from NASA. 554-6695.

Sale: Seabrook, 3.29 acres w/s.m. 2-1 home, quiet, secluded, \$95,000. 532-4784.

Sale: 14'x70' mobile home, 2-2, neat, curtains and miniblinds, \$16,000. 534-4770.

Trade: Custom canyon view, 4-3 off 360 west of Austin, prefer 5-yr.-old, open plan w/in 20 min. of JSC. 471-8795 or 333-6083.

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

Rent: Lake Travis cabin, priv. boat dock, CA/CH, fully equipped, accomm. 8, wkly./daily rental, \$325/\$75. 326-5652.

Lease: El Lago condo, 1-1, mirrored walls, miniblinds/verticals, W/D, 650 sq. ft., \$330/mo. Lindemann, 488-3300 or 532-2218.

Lease: CLC Baywind II condo, 1 BR, drapes, FPL, appli., util. closet w/W/D conn., swim, tennis, \$300/mo. 488-5019.

Sale: Nassau Bay, 4-2.5-2, 2,350 sq. ft., updated papers, fixtures, fans, baths, ceramic tile in kitch., new insul. and furnace, \$124,000. Sue, x35357 or 333-9197.

## Cars & Trucks

'85 Ford Bronco XLT, high mil., ex. cond., \$8,500. 471-4985.

'83 Impulse, ex. cond., tan/blue, 59K mi., Pirellis, upgraded stereo, \$4,995. Mike, 333-6889 or 532-3010.

'88 Honda Accord DX coupe, 5-spd., A/C, pwr., AM/FM/cass., maroon, 18K mi., ex. cond., \$10,000, OBO. Brian, 283-4126 or 996-9415.

'81 Chevy Citation, very good cond., 91K mi., newly reb. trans., new brakes, maint., 4-dr. w/hchbk., PS, PB, AC, AM/FM, runs great, \$1,200, OBO. Don, x39313 or 486-6726.

'82 M-B 300 SD, 107K mi., \$13,900. x34129 or 326-2659.

'85 Toyota MR2, silver, tail fin, loaded, 5-spd., ex. cond., 54K, \$6,500, OBO. Cindy, 779-4515 or Darwin, 483-2142.

'60 Willys jeep, red w/camouflage, canvas top, PTO wench, gun rack, trlr. hitch, 5 orig. tires plus 4 wide track, current license, \$2,500. Kandy, x37256 or 482-2750.

'85 CAD Fleetwood, FWD, 25mpg, like new, 64K mi., \$9,300, OBO. Tom, x38298 or 488-4089.

'86 Celica GT-S, 5-spd., like new, PS, PB, AC, PWR, PL, pwr. moonroof, cruise, stereo cass., \$9,500. 474-2384.

'84 Pontiac Brougham, ex. cond., auto. trans., PS, PB, cruise, stereo/cass., AC, PL, \$4,600. 474-2384.

'81 Ford Courier PU, runs good, \$500. Ed, x39847 or 559-1215.

'73 Datsun 240Z, blue, 91K mi., \$1,500, OBO. Mike, x32808 or 532-1051.

'74 Bethany camper trlr., pop-up, sleeps 8, stove, heater, ice box, water tank, sink, converter, good cond., \$2,000. x33100 or 337-4803.

'87 Isuzu Imark, ex. cond., loaded, 40K mi., \$3,750. 480-4814 or 480-9158.

'81 Dodge Challenger, sharp, clean, mags, 5-spd., low mil., custom int., \$2,800, OBO. 488-4743.

'80 Model elec. car, Comuta-Car, 40 mi. range, 38mph cruising, licensed, inspected, on-board charger, \$1,950. 532-4784.

'75 Lincoln, 2-dr., 460 eng., paint and carpet needed, BO. Jim, 283-4402 or 480-6528.

'83 Supra, bl. bk. \$5,150, loan \$3,600, less \$425 for high mil., sell for \$2,200. Phil Peterson, 282-3600.

'79 Ford F-150 PU, V-8, std., AC, \$1,000. x38971 or 554-7779.

'88 Hyundai Excel, 4-spd., 5-dr. hchbk., AM/FM stereo, cass., cruise \$4,400. Susan, x37424 or 480-8259.

'78 Chevrolet Capri Classic, very good cond., \$1,400, OBO. 480-5090.

'66 Mustang, classic, straight 6 cyl., 269hp eng., \$1,800, OBO. Chad, x35786 or 486-6125.

'84 Honda Civic, 4-dr. sedan, auto., AC, AM/FM/cass., tinted wdws., ex. cond., \$4,850. Vic, 334-2335 or 282-3216.

## Cycles

'83 Honda XL 600R, street legal, runs, \$625. Brad, 485-2101.

Suzuki touring bike, 850, windscreens/fairing, footrests, backrest, low mi., ex. cond., \$1,300. Patrick, x32635 or 488-1079.

Two 26" girls bikes, \$10 ea. Joa, x35259 or 486-5565.

# Dates & Data

## Today

**Cafeteria menu**—Special: tuna and salmon Croquette. Entrees: pork chop with yam rosette, Creole baked cod. Soup: seafood gumbo. Vegetables: Brussels sprouts, green beans, buttered corn, whipped potatoes.

## Monday

**Christmas holiday**—Most JSC offices will be closed and the center will be closed to visitors in observance of the Christmas holiday. Both the Bldg. 3 and Bldg. 11 cafeterias will be closed. The Space News Roundup will not be published Dec. 29.

## Tuesday

**BAPCO meeting**—The Bay Area PC Organization (BAPCO) will meet at 7:30 p.m. Dec. 26 at the League City Bank and Trust. Contact Earl Rubenstein at x34807 or 326-2354, or Ron Waldbillig at 337-5074 for information.

**Cafeteria menu**—Special: stuffed cabbage. Entrees: turkey and dressing, round steak with hash browns. Soup: beef and barley. Vegetables: corn cobbette, okra and tomatoes, French beans.

## Wednesday

**Cafeteria menu**—Special: pepper steak. Entrees: catfish with hush puppies, roast pork with dressing. Soup: seafood gumbo. Vegetables: broccoli, macaroni and cheese, stewed tomatoes.

## Thursday

**Cafeteria menu**—Special: chicken fried steak. Entrees: beef tacos, barbecue ham steak, Hungarian goulash. Soup: turkey and vegetable. Vegetables: spinach, pinto beans, beets.

## Dec. 30

**Cafeteria menu**—Special: tuna and noodle casserole. Entrees: liver and onions, deviled crabs, roast beef with dressing. Soup: seafood gumbo. Vegetables: whipped potatoes, peas, cauliflower.

## Dec. 31

**New Year's Eve dance**—The JSC-EAA New Year's Eve Dance will begin with a social hour at 7 p.m., dinner (cold cuts) at 8, and dancing from 9 until 1 a.m. at the Gilruth Rec Center. Music will be provided by Sterling Silver and 4th Wave Rhythm; cost is \$12.50 per person. Tickets sales end on Dec. 22 at 2 p.m. For information, contact Larry Davis, x38055.

## Jan. 1

**New Year's Day**—Most JSC offices will be closed in observance of the New Year's Day holiday.

## Jan. 2

**ASQC meeting**—The monthly meeting of the American Society for Quality Control (ASQC) will begin with a social at 5 p.m. on Jan. 2 at the American Host Hotel, 2020 NASA Rd. 1. Dinner will follow at 6, and the guest speaker, Robbie Robbins, SR&QA manager, Lockheed Missiles and Space, will begin his talk at 7. All professionals interested in improving quality in their organization are invited to attend. Contact Ray Swindle at 280-7718 for information.

**Cafeteria menu**—Special: fried chicken. Entrees: Salisbury steak, shrimp Creole. Soup: split pea. Vegetables: mixed vegetables, beets, whipped potatoes.

## Jan. 3

**Cafeteria menu**—Special: stuffed bell pepper. Entrees: fried catfish with hush puppies, braised beef rib, BBQ plate, wieners and beans, shrimp salad. Soup: seafood gumbo. Vegetables: corn O'Brian, rice, Italian green beans.

## Jan. 4

**Cafeteria menu**—Special: BBQ smoked link. Entrees: beef Stroganoff, turkey and dressing. Soup: chicken noodle. Vegetables: lima beans, buttered squash, Spanish rice.

## Jan. 5

**Cafeteria menu**—Special: meat sauce and spaghetti. Entrees: baked scrod, liver and onions, fried shrimp. Soup: seafood gumbo. Vegetables: green beans, buttered broccoli, whipped potatoes.

## Jan. 31

**Thrift Savings Open Season ends**—Federal employees wishing to join or make changes to their thrift savings plan must do so by Jan. 31. For information, contact the benefits area at x32681.

## April 2-3

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

'82 Yamaha 650, good cond., needs minor work, sale or trade for 4-spd. man. Ford trans for sm. block. x31670 or 334-3069.

'85 Suzuki Madura, 1,200 mi., still under warr., \$700 and assume next 30 mos. or \$2,799 cash. 538-1479.

## Boats & Planes

'74 Stevry 17' tri-hull, fiberglass, split windshield w/'74 OB 130hp Chrysler motor, '76 shoreline trlr., tilt, wench, buddy bearings, \$2,000. x33100 or 337-4803.

'78 Renken 19' Bowrider, 170hp freshwtr. cooled Cruiser I/O, galv. EZ loader trlr., depth finder, runs great, good cond., \$3,900. 532-3515.

'84 Carver 26, sleeps 4, loaded w/elec. instruments, new bottom, \$27,800, nego. 532-2213.

## Audiovisual & Computers

XT Turbo 640K RAM, 1 MEG ex. mem., math co-roc., VGA 14" color monitor, 2 hd. drives, 60 MEG, 2 floppy drives, 2 serial ports, 2 parallel ports, 1 game port, 200 watt pwr. supply, batt. bkup. clock, \$2,100 all, \$1,450 w/out VGA. Bill, 282-3351 or 482-3002.

Daisy wheel wide carriage printer, C-ITOH, \$190; Hayes SMARTMODEM 1200B, ext. modem w/manual, \$95, 150 watt XT power supply, \$39. Bill, 282-3351 or 482-3002.

Radio shack Model 100 port. comp. w/after-market word proc., spreadsheet and thought outliner ROM chip, Ni-cad batt., phone and printer cables, manual, \$400. Steve, x38651 or 996-7742.

PC-XT clone, 640K, turbo, 2-360K drives, multi I/O card w/clock, color graphics card, AT-keyboard, amber monitor, \$550; co-roc. chip, \$100; Magnavox RGB monitor, \$175, pkg. deal, \$750. Steve, x38651 or 996-7742.

Panasonic port. VCR (PV-6000), programmable tuner (PV-A500), video camera (PK-957), carrying case for camera (PK-H60), carrying case for recorder (PV-H50), AC adaptor (intrnl. voltage PV-A100), batt. pack (LCS-2012P), film transfer adaptor (PK-F35B), wireless remote, \$1,199. Rom, 333-6490 or 937-0287.

Commodore (C-64) w/disk drive (1541), modem, printer interface cable, joy stick and tons of software and documentation, \$195. 488-5471.

Complete video camcorder sys. w/camcorder, tripod, lights, carrying case, batt. packs, etc., new, \$900. David, 486-5259.

T1-99 comp. w/assorted software cartridges, \$150, OBO. Ed, x36969 or 332-0442.

Apple IIc w/mono monitor, ext. drive, 300/1200 modem, mouse and assort. software, \$650. 538-1479.

Hayes 2400 baud ext. modem, practically new, used less than 3 hrs., serial cable incl., \$250. 334-3490.

Peavey P.A. sys., 400W, 4-channel, 8 input, 2 col. ea. w/4-10" spkrs., \$375; CPB bass pedals, \$150; acoustic lead amp, 400 W, 4-12" spkrs., \$225. Steve, x34176 or 486-8424.

## Household

4-pc. LR set, brn./beige tone, \$300, OBO. Ricky, 283-5501 or 332-5161.

DR table, solid oak, butcher block style, rect., 7' x 3' w/6 solid oak cane-bottomed chairs, plain style table, \$750, OBO. Patrick, x32635 or 488-1079.

Solid oak BR wall w/chest of drawers, ex. cond., \$1,300; full size swing set w/slide, good shape, \$40. x30789 or 280-9974.

Curio cabinet, \$125; 4 antique chairs, \$150; lg. wardrobe, \$100; drop leaf table, \$150; sideboard, \$150; drop front desk, \$90. Kay, 283-5616 or 488-3595.

5-pc. lt. brn., sec. couch, L-shape, good cond., \$375; solid oak coffee table, \$30; Danish modern end table, \$30, x31588 or 488-1326.

DR set, table, 6 chairs, lighted hutch; sofa, 3 cushions, green/brn./rust; beige recliner, BO. Ray, 283-5824 or 333-2977.

Queen waterbed, hibernation, semi-motion matt, 9 mos. old, pine mirrored hdbd./bkcase, heater, linens, \$325; dinette set, antique white, 4 padded chairs and bench w/table, \$75; twin bed frame and matt, \$30; wicker Etager, wicker stand, wicker chair, all \$75. Steve, x34176 or 486-8424.

Lg. green marble coffee table from Germany, very good cond., 5' x 3 1/2', wooden base, was \$800, now \$325, OBO. Scott, 488-9080, ext. 3315 or 488-1044.

## Photographic

Pentax K1000 35mm camera, perf. cond., Vivitar flash, 50mm lens, 2x converter, cover, case, neckstrap, instruction bklet., was \$225, now \$75. x30554 or 486-4369.

## Pets & Livestock

Red-nosed pure bred fem. pit bull dog, 7 mos. old, very friendly, \$100, OBO. Ricky, 332-5161 or 283-5501.

Free, 2 beautiful longhaired cats, 1 lg. grey male, 1 sm. blk. fem., both fixed and declawed. 486-7017.

Two tiny toy fem. poodles, apricot, AKC reg., born 10-27-89, \$250. Rick or Heather, 538-1146.

Free, good natured healthy mutt, med. sz., 35 lbs., male, all shots. 486-9520 or 488-4194.

## Personal

UH-CL offers noncredit evening classes in French, German, Russian, and Spanish, starting the wk. of Jan. 8. 488-9277 or 283-3033.

## Wanted

'17 to '18' V-hull ski boat, walk thru windshield, open bow. Andy, 333-6671 or 332-9105.

Want cheap work car or truck. 482-4156.

2 male non-smoking roommates to share lg. 4 BR house in CL, near NASA, \$250/mo. plus 1/2 util. Dow, 282-3957 or 486-5220.

Want fem. to share 2 BR apt in CL area, beginning Feb. 1. Kristen, 486-4868.

Gospel musician wants to practice w/others who like gospel, bluegrass, country, folk styles, need fiddler, 5-string, steel, etc. 283-4402 or 480-6528.

Want Starwars spaceships, toys, figures and books. Ron, 482-1385.

## Miscellaneous

Remote control model airplane, 63" wingspan Eagle II w/45 KB eng. w/muffler, 7-channel Futaba FGK-7 radio sys. w/4 servos, was \$700, now \$400, OBO. Jerry, x34611 or 338-1393.

Skiing exer. mach., \$30; Zenith 25" remote control console TV, \$200; clean water filter appli., \$120. 482-4



JSC Photo

Among the many people who have worked together to bring the Microgravity Disturbances Experiment (MDE) to fruition in a short time are, from left, Max Vallejo, Fluid Experiment Apparatus project engineer for Rockwell; Don Thomas, co-principal investigator at JSC; Pat Wilson, a JSC project engineer; Mike Gaudiano, chief of JSC's Instrumentation and Processor Applications Branch; and Jeff Schoess, accelerometer project engineer for Honeywell.

# Could a cough crater crystal growth?

## Experiment will track effects of microgravity disturbances

By Kelly Humphries

How much of a blow to science is a space shuttle sneeze? Could a cough crater a crystal growth experiment? Will running on a treadmill ruin results of space station microgravity work?

Experimenters who have worried about such things should have more to go on after STS-32. For the first time, a shuttle experiment will attempt to quantify how disturbances in orbit affect the sensitive microgravity processes being tested.

The Microgravity Disturbances Experiment (MDE) was conceived, developed and coordinated at JSC. Don Thomas, a materials scientist in Engineering's Structures and Mechanics Division, and Mission Specialist Bonnie Dunbar are co-principal investigators, and they've had a lot of help and cooperation throughout the center.

"We know that the lower the microgravity level, the better," Thomas explained. "We know that these levels generally provide high quality crystals—larger crystals with fewer defects. What we don't know is how low do you need to go in the microgravity level."

Thomas said the experiment is unique because it is the first attempt to correlate measurements of on-board disturbances with the success of a crystal growing attempt.

While in orbit, every change in speed or direction increases the amount of acceleration or "gravity" experienced inside the spacecraft. Since every action generates an opposite and equal reaction, even small movements can make minute changes in an orbiting shuttle's speed or direction—and affect the level of microgravity. A cough or a sneeze is estimated to raise the level to a hundred-thousandth or millionth of Earth's gravity. A crew member running on the exercise treadmill could raise it to a hundredth or thousandth of Earth's gravity. An engine burn could raise it to a tenth or a hundredth. These changes are believed to affect microgravity materials processing, but the precise extent has not been measured.

"In almost every other materials processing experiment that's been done so far, they've always tried to avoid any disturbances at all. They've wanted to get as good a microgravity level as they could. We know we get the best crystals that way.

"Nobody has taken a look at what happens if you *do* have these disturbances. Can we tolerate the crew running on the treadmill? Because we're always going to have crewmen running on treadmills, especially on space station. We're always going to have engine burns. Whenever you're going to have man operating in a spacecraft environment, you're going to have these perturbations in the microgravity level. We hope to be able to come out of this and say 'These are the effects of those disturbances.'"

Development of the experiment has been at a whirlwind pace. Thomas and Dunbar learned this April that there was no NASA microgravity experiment planned for use on STS-32. They decided to try to take advantage of NASA's agreement with Rockwell for 25 percent of the Fluid Experiment Apparatus (FEA) time.

Thomas said they decided to do operations-oriented research since JSC is primarily a mission operations center. In addition to looking at how disturbances affect a specific crystal growth experiment, the MDE also will help characterize the shuttle middeck area

as a laboratory for conducting microgravity research.

"We don't want to just be doing pure research on crystal growth processes without any correlation to operations," he said.

The MDE will involve seven samples of commercial purity indium, a well-characterized material with a relatively low melting point. Indium is of interest for the production of advanced electronic devices.

Basically, a furnace in the FEA will melt a polycrystal of indium, which will resolidify in microgravity as a single, more perfect crystal. The melts will be timed to coincide with specific activities on-board *Columbia*, such as orbital maneuvering system (OMS) burns and crew exercise on the treadmill. The crew also will be asked to record any other disturbances—sneezes, door slams, etc.—that occur during the melt.

Two separate microgravity accelerometer systems will record the times and amounts of the disturbances so that they can be correlated with the effects on crystal growth once the experiment is returned to Earth.

The Honeywell In Space Accelerometer (HISA), a small, portable accelerometer package, will be mounted directly to the FEA furnace. A High Resolution Accelerometer Package (HIRAP) will be mounted near the rear of the payload bay.

"We have one accelerometer right on the furnace itself, so we're going to monitor the disturbances right at the growing crystal, which is really important in correlating post-flight any impact of the disturbances on the crystal," Thomas said.

The HISA also will provide one of the first opportunities to measure microgravity levels in the orbiter's middeck.

Since the MDE relies on other activities, its schedule is subject to change as the mission timeline changes. That will require a lot of cooperation during the flight, something that has characterized the experiment's development.

"It isn't just an experiment that sits in a locker and runs on its own," Thomas said. "It really involves a lot of other people on the ground and what other people do really impacts us."

Thomas said he and Dunbar have been working closely with the Flight Activities team for the flight, especially Glenda Laws and Dan Kaley. They've also had to coordinate with Heather Mitchell in the Guidance, Navigation and Control world because that flight controller will have to turn the HIRAP on and off from the ground at the appropriate times. Charles Chassay of the NSTS Operations Integration Office was helpful in getting the experiment on board, and Ray Malone and Gary Morgan found stowage space on an already crowded middeck. In Engineering's Avionics Systems Division, Pat Wilson and Mike Gaudiano helped develop the cable connections for the Honeywell accelerometer and assisted in the final testing of the flight hardware.

There also are three co-investigators: Michael McNamara of the Indium Corporation of America, who was a co-investigator for the FEA experiment on STS-30; Jeff Schoess, who was involved in development of the HISA that was first flown on STS-34. Rockwell's A. Max Vallejo provided project support for the FEA.

"As a result of all this cooperation, we really feel we have a first-class microgravity experiment flying on STS-32," Thomas said.

**"In almost every other materials processing experiment that's been done so far, they've always tried to avoid any disturbances at all. Nobody has taken a look at what happens if you *do* have these disturbances. We hope to be able to come out of this and say 'These are the effects of those disturbances.'"**

—Don Thomas, MDE Principal Co-Investigator





# Workers earn Space Act, Patent, Suggestion Awards

Twenty-six JSC workers received Space Act, Patent Application and Suggestion Awards in ceremonies Dec. 13.

Space Act Award winners were:

Scott A. Swan, for a Bi-Directional Drive and Brake Mechanism; Eugene K. Ungar and W. Russ Long III, for Mass-Optimized Lenticular Radiating Fin Geometry; Jonette M. Stecklein for Space Systems Inte-

grated Simulation (SPASIS) Version 6.0; Timothy E. Fisher, for a Programmable Remapper for Image Processing;

Lubert J. Leger for Modification of the Surfaces of Bio-Medical and Bio-Technical Devices Using Atomic Oxygen; William C. Schneider and Jon B. Kahn for a Debris Catcher for Space Shuttle Orbiter; Leo G. Monford Jr., for a Magnetic Ball Lock Pin;

and David A. Wolf for a Three Dimensional Cell to Tissue Assembly Process; and Pat B. McLaughlan for an Astronaut Boot Toe Translation and Restraint Device.

John A. Schliesing, John P. McManamen and Gregory A. Lange for a Docking Mechanism for Spacecraft; Kornel Nagy, Clarence J. Wesselski and William C. Schneider for a Preloaded Brake Disc; William

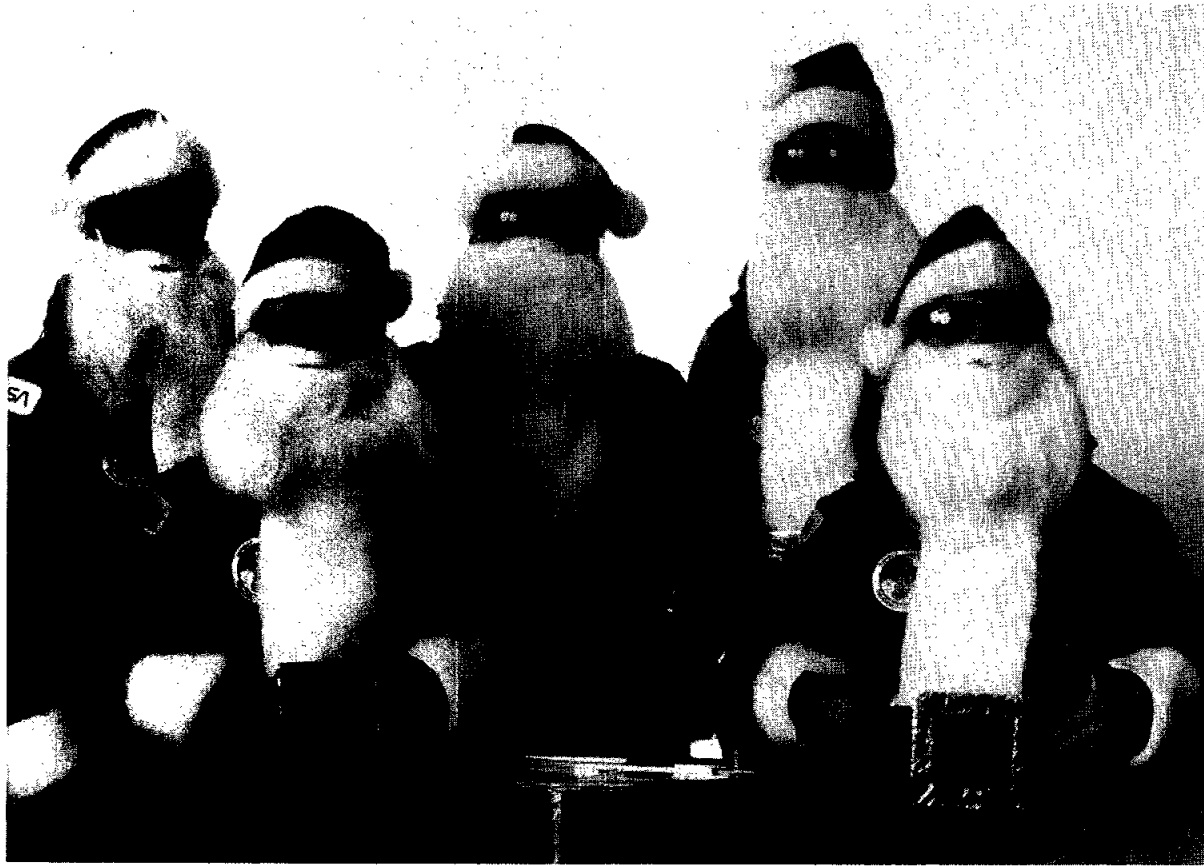
E. Thornton Jr. for an Improved Method and Apparatus for Waste Collection and Storage; William B. Wood and Gary Krch for EVA Slide-wire Material; and Richard J. Bozeman Jr. for a Vibration Analyzer.

Patent Application Awards were received by:

Scott A. Swan for the Bi-Directional Drive and Brake Mechanism; Andrew J. Petro for a Semi-

Active Orbital Debris Sweeper; Richard D. Juday for Optional Joint Transform for Eye Motion Compensation; Jimmy D. Bradley for an EVA Power Saw; and Hatice S. Cullingford for a Method and Apparatus for Bi-Regenerative Life Support System.

Suggestion Award winner: Larry Davis for Duplicate Flight Cards.



**SEASON'S GREETINGS**—Seasonally attired in their customized shuttle launch and entry suits, the crew of *Columbia* posed for this special holiday portrait as a means for wishing their families, friends and NASA co-workers the very best for a happy holiday season.

## Ford wins SRM&QA support contract

Five-year, \$128.5 million agreement begins February 1

By Linda Copley

Ford Aerospace Corp. has been selected for a five-year, \$128.5 million contract to provide safety, reliability, maintainability, and quality assurance (SRM&QA) support services at JSC.

The cost-plus-award-fee contract includes a two-year basic period, plus one three-year option. The first contract year will begin about Feb. 1, 1990.

"This is a very important part of the agency's program for safety and mission assurance," said Charles Harlan, director of Safety, Reliability, and Quality Assurance (SR&QA). "We hope to

continue the successful effort we've had in the past—and build on that to keep the support effort of SR&QA up-to-date."

Other companies submitting proposals were Advanced Technology Inc., Reston, Va., and Boeing Aerospace Operations Inc., Houston. Boeing, the current contract holder, has provided SRM&QA support to JSC since 1971.

The contract calls for approximately 350 employees to provide safety engineering tasks; reliability and maintainability engineering tasks; and quality assurance and engineering including on-site and off-site special

system and product analysis.

Ford also will provide information resources management, maintenance, operation, and upgrade of the SRM&QA correspondence and library center and the SRM&QA analysis laboratory; pyrotechnic devices and training support; product control; and training program services.

Major Ford subcontractors include Ebasco Services Inc., New York; Unisys Corp., Houston; Arvin Calspan Corp., Tullahoma, Tenn.; SRS Technologies, Newport Beach, Calif.; and Technical Analysis Inc., Houston.

By Kyle Herring

Continuing problems with launch pad validation last weekend led shuttle managers to postpone to no earlier than Jan. 8 the launch of *Columbia* on its STS-32 satellite deploy and retrieval mission.

The 58-minute Jan. 8 launch window begins at 7:06 a.m. CST.

*Columbia* and its crew of five are scheduled to deploy the Syncom IV-5 Navy communications satellite and retrieve the Long Duration Exposure Facility (LDEF), which has been collecting data on the effects of exposure to the space environment for more than five years.

The stand down for the holidays will allow the Kennedy Space Center to conduct its scheduled facilities power down with little impact to the processing schedule for flights next year. It also will allow workers at the launch site and here at JSC to be with family members for the holiday season.

"The team worked very hard to get *Columbia* off before Christmas, but the added work of going off a refurbished pad and a new mobile launch platform really slowed us down," said William Lenoir, associate administrator for space flight.

Shuttle managers are discussing the possibility of picking up the count earlier than usual at 3 p.m. Jan. 4 to protect against any last-minute propellant loading problems associated with the pad.

Managers are scheduled to meet Jan. 3 to conduct a "delta" flight readiness review to assess final read-

iness of the vehicle, crew and flight control team to safely conduct the mission.

At the pad this week, work continued to validate systems to be used in loading liquid oxygen and liquid hydrogen propellants into the orbiter's on-board storage tanks. One of the major pieces of equipment being validated is the orbiter midbody umbilical unit used to feed propellants into the orbiter's fuel cells during the launch countdown.

Leak checks of connections between the unit and the orbiter's service panel near the aft fuselage are planned Wednesday. Plans to load propellants into three of the five power reactant storage and distribution system tanks this week were changed in order to swap hoses between the various tank sets to preclude interference with equipment in the vicinity.

Close outs of the aft compartment continued with flight door installation before final vehicle power down Thursday night.

The Syncom IV-5 in *Columbia*'s payload bay will undergo daily battery charging until a holiday charging schedule is in place.

The crew will continue integrated simulation, Shuttle Training Aircraft, and T-38 training at JSC before flying to the launch site Jan. 5 for the actual mission.

Crew Commander Dan Brandenstein said that while the crew was disappointed not to get off before Christmas, "We'll get a good running start at launch after the holidays, and we can't think of a better way to start a promising new decade."

## Space Center Houston planning 'Feel of Space'

Space Center Houston unveiled initial plans Thursday for "The Feel of Space," a hands-on interactive area featuring work stations and live demonstrations with visitor participation.

The IBM Corporation has committed \$1.5 million in technology and support to make the major component of the \$50 million visitor center a reality, said Harold S. Stall, JSC public affairs director and president of the Manned Space Flight Education Foundation Inc. (MSFEFI). Walt Disney Imagineering is expected to complete final designs for the project early next year.

A simulated work station similar to the one being developed for astronauts to use on Space Station *Freedom* was demonstrated for community leaders following the announcement in JSC's Teague Auditorium.

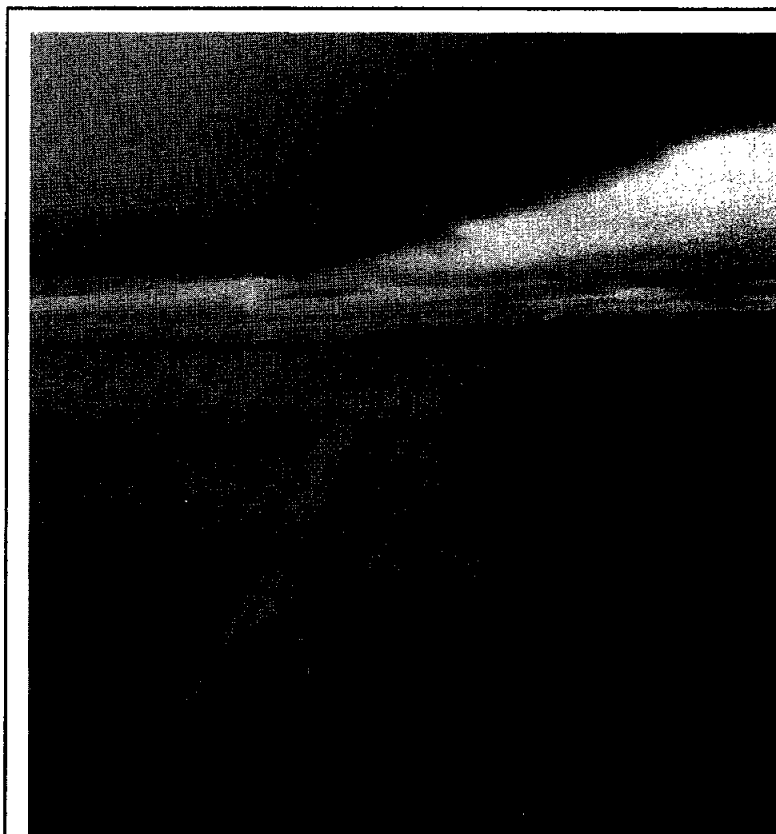
Visitors to "The Feel of Space" will be able to operate hands-on simulations of the manned maneuvering unit (or space backpack) and the remote

manipulator system (or robot arm), try on a space helmet, put on pressurized space gloves, explore a computer model similar to those used to design the space station and learn about daily living aboard space station.

"IBM's computer expertise has played an important role in many aspects of the manned space flight program at Johnson Space Center, including astronaut training. We're hopeful that their experience in computer systems and simulations will allow us to recreate the environment and feel of space for each guest," Stall said.

"We will be drawing upon three decades of support to the U.S. manned space flight program to strengthen our ability to create life-like experiences for visitors to Space Center Houston," said Anthony J. Macina, manager of Onboard Space Systems for IBM.

Construction of the new visitor center on 123 acres just west of JSC's main gate is expected to begin in February.



JSC Photo by Pete Stanley

**LANDING PANORAMA**—During training, Astronaut Robert Cabana approaches a runway at White Sands Test facility. The landing was one of a series of T-38 approaches flown as part of the shuttle landing training program for pilots. Photographer Pete Stanley took the photos from the rear seat of the aircraft.

## Mock-ups open for employees, families next Wednesday

The facility managers of Bldgs. 9A and 9B will host an open house Wednesday for employees and their families.

Visitors are invited to tour the Full Fuselage Trainer (FFT) and the Space Station *Freedom* mock-ups from 9-11 a.m. and 1-4 p.m. on that day.

Employees often express high interest in touring the FFT and space station, according to facility managers, but usually cannot arrange visits because of scheduled crew training and engineering activities.

Experts will be available in each area to answer questions about the testing and training activities normally scheduled in these buildings. In addition to the FFT and space station, the Manipulator Development Facility (MDF) and the Precision Air Bearing Floor (PABF) will be open for viewing.

Reservations for tours will not be required, but due to the anticipated large turnout, some waiting is to be expected.

Access will be limited to six people at a time in the FFT, eight on the MDF platform, and 12 people in the space station modules. Adult supervision of children is required.