

**NASA**

National Aeronautics and Space Administration

Lyndon B. Johnson Space Center  
Houston, Texas



**Wanna be in pictures?**

NASA is making a movie about space station at JSC and is looking for employees to play astronauts. Story on Page 4.



**Winged horse**

The Pegasus air-launched booster blazes a new trail into low-Earth orbit for small commercial payloads. Story on Page 4.

# Space News Roundup

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No. 15

## \*Space tomato seeds taking root in JSC soil

By Linda Copley

The progress of one of the 90,000 kits of Long Duration Exposure Facility (LDEF) tomato seeds distributed to schoolchildren nationwide will soon be visible to JSC employees at a flower bed outside Bldg. 2.

About 40 Rutgers California Supreme tomato seeds, half of which

flew aboard LDEF and half of the Earthbound variety, are growing in pots in a plastic tray outside Bldg. 326, according to Dan Alexander, technical foreman in grounds maintenance. Within six to eight weeks, the plants will be large enough to be replanted in a flowerbed, he said.

"We planted them on March 26, and

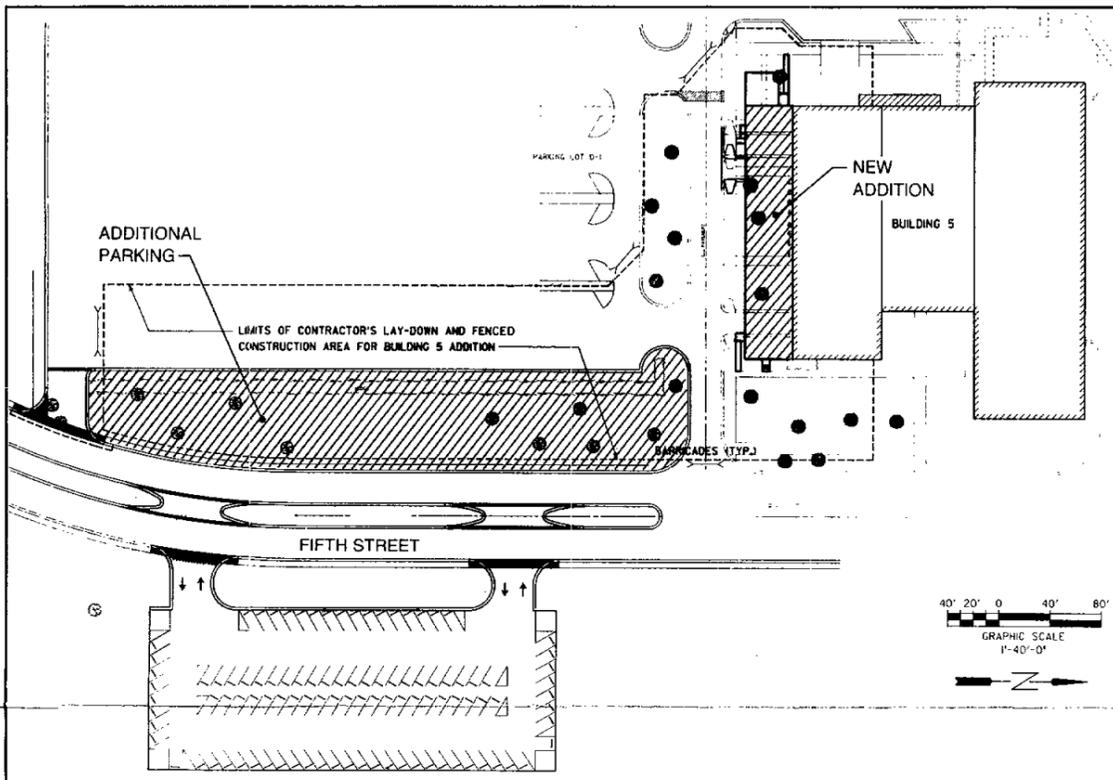
so far, after 14 days, we have an 85 percent germination rate with the space seeds, and a 62 percent rate on the Earth seeds," Alexander said.

Planting the seeds on-site, so employees and visitors alike could view the experiment firsthand, made good sense to Education Program Officer Jim Poindexter. He approach-

ed Center Operations Director Ken Gilbreath with the idea shortly after the seeds were retrieved from LDEF and became available for distribution from the Park Seed Co., Greenwood, S.C. A location easily accessible to viewers interested in the seedlings' progress was chosen in the plaza outside the Visitor Center.

Alexander is measuring the plants for height and thickness according to the elementary school version of the teacher's guide for the experiment. Once replanted in the flower bed, Poindexter and his education staff plan to complete recording the findings.

Please see **SEEDS**, Page 4



Construction of additions to Bldg. 5 and an expanded parking area will affect traffic flow on Fifth Street.

## Building for a new era at JSC

Space station construction projects take shape

By Linda Copley

Three major JSC construction of facilities projects, funded in the fiscal year 1990 budget and required to support Space Station *Freedom* activities, are now under way.

Construction activities to support the expansions to Bldg. 5, 9A and 30 already have begun to affect traffic and parking in the vicinity of the planned modifications.

"These are exciting and challenging times for the facility design and construction engineering groups at JSC," said Bill Roeh, manager of the Facility Development Project Design

Office. "There is more facility-related activity here at JSC than any time since the early '70s."

In addition to these projects, there are other multi-million dollar facility modifications taking place, Roeh continued, including Bldg. 220, the addition of Solar Simulation Capacity in Bldg. 32, the rehabilitation of systems in the Central Heating and Cooling Plant in Bldg. 24, and the construction of the new auxiliary chiller plant.

"We are also looking forward to a significant number of major projects planned in fiscal '91 and '92," he

added.

The construction of the Space Systems and Automation Integration and Assembly Facility, commonly referred to as Bldg. 9C, has already begun. The contract was awarded on March 6 to Spaw Glass/Cahaba Construction Co. for \$5,948,000.

Once the 170-foot extension to the east end of 9A is built, Bldg. 9C will support development, testing, and flight qualification of integrated component assembly and attachment hardware for space station. Joe Fulton, Facilities Development Div-  
Please see **BUILDING**, Page 4

## \*Last-minute glitch delays Hubble launch

By Kyle Herring

*Discovery* and its Hubble Space Telescope cargo will wait for at least another week while workers replace an auxiliary power unit (APU) that malfunctioned when powered up five minutes before launch Tuesday morning.

The STS-31 countdown had proceeded smoothly until reaching T minus five minutes when Pilot Charlie Bolden powered up the three APUs that control the flight control surfaces and main engine gimbaling during the ascent portion of the mission.

"We have an intermittent APU speed high on APU-1," reported Commander Loren Shriver at the T-minus 4 minute mark.

APU 1 fluctuated out of limits in normal speed, which prompted managers to terminate the countdown at T minus four minutes. While only one APU is needed for control, all three must be working properly to allow redundancy in the event one or two should fail during launch.

"We're going to scrub for today and you ought to be planning for an extended turnaround," Launch Director Bob Sieck told his Launch Control Center team minutes after the malfunction occurred.

No new launch date has been determined as managers continue to assess the time it will take to replace the APU while *Discovery* is on the launch pad. No APU has been changed while an orbiter was in the

vertical position, therefore the exact amount of time needed for the change-out was not immediately known.

"Everybody's disappointed," Sieck said. "We're not sure what the impact of this is yet. We're still assessing the timelines."

In parallel with the APU change-out, Hubble Space Telescope (HST) managers laid out a plan to recharge the batteries required to provide power to the telescope before its solar arrays are deployed on each side of the 43-foot-long observatory.

The STS-31 crew returned to Houston Wednesday morning for continued training in the Shuttle Mission Simulators. Shriver, Bolden and Mission Specialists Steve Hawley, Bruce McCandless and Kathy Sullivan will return to Kennedy Space Center three days before the next launch attempt.

"We go when the equipment is ready to go, and we're always ready to go," Shriver said before returning to JSC for additional pre-launch training.

Workers moved the Rotating Service Structure (RSS) back around *Discovery* to prepare for deservicing activities, HST battery charging and replacement of the APU.

Launch was scheduled for 7:47 am CDT Tuesday. With each day delay, the launch time moves about one minute earlier.

Please see **DISCOVERY**, Page 4



## \*The day the dice stopped rolling

Twenty years later, a brilliant rescue is remembered

By Brian Welch

The best show in Vegas that week was at the Stardust Hotel, where a 3.4 billion-year-old rock from the Ocean of Storms went on display the same day that James Lovell, Fred Haise and Jack Swigert left the Earth to bring back more such treasures, this time from a hilly place called Fra Mauro.

It was April 11, 1970. And although the launch was exactly on time, with the Saturn V delivering its standard thunderous spectacle, there was a certain ennui about it all. The liftoff inspired "little excitement at KSC or elsewhere across the land," the Wall Street Journal reported, citing the fact that only one tenth as many spectators saw *Odyssey* and *Aquarius* leave the planet as had seen *Columbia* and *Eagle* depart nine months before.

The launch wasn't even carried live on TV stations in Houston, where far fewer reporters than usual were on hand to cover the mission from the Manned

Spacecraft Center (MSC). Days later, Max Lerner, writing in Philadelphia's *Evening Bulletin*, declared that he and "millions of others" had simply "played a game of apathy... confident that Apollo 13 was just one more sure-thing deployment of what man already proved he can do."

Back at the Stardust, meanwhile, people were filing by the Apollo 12 sample in droves, as if to prove that at least somebody was interested in the lunar expeditions. Later that day, when a fire broke out at the Stardust, three guards stood by their posts, watching over the precious lunar stone while firemen scrambled about fighting the blaze. It was only a temporary inconvenience, however, and more than 20,000 people managed to visit the lunar exhibit in the days that followed, during a week when the whole world's attention was quite suddenly focused on the Moon and the three men flying toward it.

Please see **HOUSTON**, Page 3



NASA Photo  
Astronaut James A. Lovell Jr., Apollo 13 commander, reads a newspaper account of the safe recovery of the problem-plagued mission's crew. Lovell was aboard the USS *Iwo Jima*, prime recovery ship for Apollo 13, on April 17, 1970.

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# Ticket Window

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

General Cinema (valid for one year): \$3.75 each.  
AMC Theater (valid until May 1991): \$3.50 each.  
Sea World (San Antonio, year long): adults, \$17.25; children (3-11) \$14.75.

Astroworld (valid 1990 season): season, \$39.95; regular, \$15.97; children, \$9.21.

The Bay Area Chorus (8 p.m., April 21, Clear Lake Presbyterian Church): \$7.50.

JSC EAA Picnic tickets (May 5, Rec Center): adults, \$4; children, \$2.50.

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# Gilruth Center News

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

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

**Defensive driving**—Course is offered from 8 a.m.-5 p.m. May 19 and June 16; cost is \$15.

**Weight safety**—Required course for those wishing to use the Rec Center weight room. The next classes will be from 8-9:30 April 18 and May 2; cost is \$4.

**Ballroom dance**—Beginning, intermediate and advanced ballroom dancing. Classes begin May 3 and meet every Thursday for eight weeks. Beginning and advanced classes meet 7-8:15 p.m. Intermediate class meets 8:15-9:30 p.m. Cost is \$60 per couple.

**Aerobics and exercise**—Both classes are ongoing. Sign up in the Gilruth Center.

**Tennis**—Beginning tennis lessons, meets Mondays from 5:15-6:45 p.m. for six weeks, beginning April 16. Cost is \$32.

**Almost Anything Goes**—Six teams of three men and three women are needed for JSC Picnic. Registration deadline is May 2. Cost is \$10 per team, includes T-shirt.

**Spring Intercenter Run**—The 10 kilometer and/or 2-mile races for the annual intercenter run will be held throughout April. Runners may submit their times at the Rec Center.

**Country and Western dance**—Lessons begin June 4 and are held every Monday for six weeks, cost is \$20 per couple.

**Mixed volleyball sign-ups**—Registration will be held on May 2. This season will consist of Monday, Tuesday, and Friday night leagues. NASA badge teams will be signed up first.

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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

Lease: 10 acres, 1/2 mi. W. of Hwy. 146, 20'x40' barn, ponds, util. Trey, 280-4381 or 484-7834.  
Sale: Mobile home lot, Hwy. 3, \$70/mo. 282-2802 or 332-0365.

Sale: Piper's Meadow, immac. 3-2-2A plus sitting rm., fen., FPL, new paint, carpets, tile, \$800/mo. 486-0315.  
Sale: Bay house on Caranchua Bay near Palacios, furn., acc. to boat ramp, pier, \$40K. (409) 543-2052 or 486-4369.

Rent: Lake Livingston w/frnt. house, 3-2, CA/H, furn., cov. decks, pier, ex. cond., wknd. or wk. 482-1582.  
Sale: Galv. w/frnt., 3-3-6, deck, spa, 334-1909.  
Sale: 3-1.5 mobile home on 2-100'x100' lots in Birch Creek Estates, 5 min. from Lake Somerville, C/AC, maj. appl., furn., \$17,500. x38322 or 332-0207.

Rent: LC Pecan Forest, 3-2-2, FPL, priv. crtyd., \$725/mo. 554-6200.  
Trade: 4-3, W. 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., Oklahoma and Kinne, Bacflit, 488-1758.  
Sale: Pines Motel, Ruidoso, NM, 7,000' elev., 6 units on Main St. plus 3 BR cottage, \$140K, owner fin. (505) 257-2986 or 326-2664.

Sale/Lease: El Dorado 1 BR condo, all appl., FPL, \$395/mo., \$29,000. Bill, x31167 or 334-1307.  
Sale: 60 acres, 3 mi. from Karnes City, 50 mi. from San Antonio; 2-story house on 1.5 lots w/frnt trees in El Campo, 783-9164.

Lease: Nassau Bay 3-2-2, new carpet, paint, blinds, fans, oven, 333-2035.  
Sale: Lg. corner lot, Friendswood subdiv. 996-9157.  
Sale/Lease: Nassau Bay townhouse, 4-2-2, over 2,000 sq. ft., 2-story den, \$109,900 or \$1,095/mo. Jerry, x38922 or 488-5307.

Rent: Lake Travis cabin, priv. boat dock, CA/H, accom. 8, \$325/\$425 w/ky., \$75/\$85 dly. 326-5652.  
Sale: Lg. lots, waterfront subdiv., near NASA, mid \$30's. Don, x38039 or 333-3313.

Lease: 3-2 Univ. Green townhome, W/D, \$875. 333-6692 or 488-1988.  
Sale: 3-2-2 Camino So., new carpet, 9.5 FHA assum., \$79,900. Brian, 483-7070 or 280-8500.

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

## Cars & Truck

'81 Olds Cutlass Cruiser, ex. cond., 98K mi., new AC, trans., 2 tires, \$1,795. David, 554-5514 or 282-3827.  
Elec. truck, \$450; Holmes 500 wrecker, \$2,600. Walter, x37332.

'85 Toyota MRV Savannah, 21,250 mi., sleeps 5, refig. stove, much more, \$15,500. x34094 or 488-6326.  
'81 Pontiac Firebird Esprit, 305 V8, AM/FM ster., 63,300 mi., \$2,995. 282-3943.  
'82 Olds Cutlass, 2-dr., AM/FM tape deck, V6, 74K

mi., \$2,200. OBO. 483-6149 or 280-9506.  
'86 Honda Accord LX, 4-dr., 5-spd., 47K mi., ex. cond., \$7,750. Gary, x32844 or 333-1518.  
'86 Dodge Mini Ram van, auto., AC, AM/FM/cass., 67K, \$5,895. 992-1996.

'85 Olds Starfire sport coupe, good cond., \$2,500. OBO. Tom, x38298 or 488-4089.  
'83 Audi 4000S, 4-dr., 5-spd., AC, \$3,200. '89 Volvo 740 GL, auto., ex. cond., \$19,500. 333-9226.  
'79 Camaro, PS/PB, rew. eng., 10K mi., auto., \$1,695. Josh, x37663 or 486-2412.

'67 Pontiac Tempest, 326, auto., air, PS, new paint, ex. cond., Stan, x39779 or 997-1331.  
'75 Ford Granada, 6 cyl., 3-spd., AC, ster. cass., \$850. 483-9449 or 941-4208.

'85 Ford T-bird, V8, Richard, 538-1854.  
'78 Buick LTD, 4-dr., air, heat, pwr., \$1,100. 481-1971.  
'87 Volvo, 245 GLA, ex. cond., loaded, 52K mi., tac. warr., \$13,900. Scott, 283-5611 or 482-1809.

'83 Buick Regal, 2-dr., 60K mi., \$2,800. 280-2294 or 554-7346.  
'79 Toyota Corolla SR5 sport coupe, 5-spd., 15K on reb. eng., AM/FM cass., ex. cond., \$2,000 or will trade for equal cond. late model PU. x36160 or 482-4549.

'86 Plymouth Fury III, new trans., radiator, \$1,500. x36135 or 480-7196.  
'83 Ford van, well maint., \$7,500. 471-1488.  
'35 Mallard motor home, loaded, low mi., \$36,000. 337-4051.

'86 Ford Mustang LX conv., V6, auto., all pwr., ex. cond., \$8,100. 483-1755 or 660-7301.  
'81 Chevy Citation, new trans., tires, brakes, 100K mi., \$1,500. 484-5149.

'85 VW Jetta GL, all pwr., 5-spd., 77K mi., ex. cond., \$4,250. Deena, x32427 or 338-2429.  
'79 Chev. Caprice, V8, 70K mi., AC, 4-dr., PS, PB, good cond., \$1,900. OBO; '82 VW Rabbit Conv., 55K mi., AC, cass./ster., good cond., \$4,950. OBO. 280-2028 or 488-8919.

'86 Toyota Sunland Exp. motor home, gen., roof AC, \$16,700. 437-5442.  
'82 Olds Delta 88, 115K, good cond., needs AC wk., loaded, \$1,500. OBO. Terry, x33814 or 486-5126.  
'88 Honda Accord LXI, 5-spd., 2-dr. coupe, loaded, ex. cond., 24K mi., \$9,800. Bruce, x37677 or 480-0024.

## Cycles

Yamaha 360cc Motocross, ex. cond., used only 1.5 hrs., \$750. x34094 or 488-6326.  
Honda motorcycle, 650 turbo, low mi., new tires, batt. 334-1909.

'81 Kawasaki, 440 LTD, 6K mi., new tires, belt, ex. cond., \$800. x35916 or 326-2344.  
Vista Elite touring bicycle, wr. bil., \$120. OBO. Katy, x34546 or 486-9556.

'81 Suzuki 850cc, vetter fairing/windscreen, low mi., ex. cond., \$1,400. Patrick, x32635 or 486-1079.  
'80 CB 750c Honda, good cond., \$850 cash. 337-1896.

'88 Honda CR250 dirt bike, ex. cond., \$1,800. OBO. 480-4101 ext. 254 or 470-1858.  
Men's 59cm Schwinn Prelude bicycle, ex. cond., \$250. 568-6690.

'82 Suzuki GS 550 MZ, 10K mi., good cond., \$800. OBO. 480-2549 or 333-7076.  
'79 Suzuki wetbike, 44.1 cu. in., 50hp, trlr. incl., ex. cond., \$750. 333-6150 or 326-1254.

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# 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

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

**Cafeteria menu**—Special: Italian outlet. Entrees: braised beef ribs, chicken a la king, enchiladas with chili. Soup: cream of broccoli. Vegetables: navy beans, Brussels sprouts, whipped potatoes.

## Tuesday

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

## Wednesday

**Space Business Roundtable**—The monthly business program will feature Emyre Robinson, president of Barrios Technology and chairman of the Texas Space Commission, speaking on the Texas Space Commission. Registration begins at 11:30 a.m., April 18, at the Nassau Bay Hilton. Tickets are \$18 for members, \$20 for non-members, and reservations are required. Call 486-5068 for information.

**JSC Astronomy Seminar**—Tim Wegner will present "Fractals: A Demonstration" from noon to 1 p.m., April 18, in the Bldg. 31 conference room; contact Al Jackson at x33709 for information.

**IEEE Celebration**—The Institute of Electrical and Electronics Engineering (IEEE) will hold its 10th Anniversary in the Gilruth Recreation Center. Social time begins at 5:30 p.m., with dinner at 6:30. Former astronaut Col. Donald Peterson will speak on "Human Aspects of Spaceflight." Contact Marcia Taylor at x30195 for dinner reservations.

**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

**NPMA meeting**—The JSC National Property Management Association (NPMA) monthly dinner meeting will begin with a social at 5:30 p.m., April 19, at the Gilruth. Lupita Armendariz, Equal Opportunity Office, will speak. Contact Sandra Pierce at 282-4151 for information.

**Threshold Group**—The group social meeting for all JSC civil servants has been rescheduled for 4:30 p.m. April 19 at the side pavilion of the Gilruth Rec Center. A quick overview will be given on what Threshold is about and what its current activities are. For information, contact James Sturm at x33085.

**Parallel computing**—The AIAA will sponsor a third Parallel Computer Series lecture from 11:45 a.m.-1 p.m. April 19 at Mr. Gatti's Pizza on El Camino Real. The lecture, featuring Ernest Leiss, director of the Keck Research Computation Laboratory at the University of Houston, will focus on the parallel computing outlook. For more information, call Andre Sylvester, x31537.

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

## April 20

**Earth photos**—The Houston

Space Society will present an Earth Day lecture at 7:30 p.m., April 20, in University of Houston's Atlantic Room. William J. Daley, Lockheed scientist, will present space shuttle photography of the Earth. For more information call 639-4221.

**NCMS special meeting**—The Texas Gulfcoast Chapter of the National Classification Management Society (NCMS) will hold a luncheon meeting at 11:30 a.m., April 20, at the Ramada Kings Inn. Steven Garfinkel, director, Information Security Oversight Office, will speak. Contact Peggy Garcia, x24039, or George Guillory, 283-6618, by April 16, for reservations.

**Co-op Job Fair**—The JSC co-ops will display projects at the Gilruth Recreation Center from 10 a.m.-4 p.m. Contact Trang Le at x32449 for more information.

**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.

## April 21

**Earth Day at Challenger Park**—A nature workshop conducted by Joseph Cornell, environmental educator and author, and a star gazing party at 8 p.m. Saturday with the JSC Astronomy Club will mark the April 21 weekend observance of Earth Day at Challenger Park. Sunday, April 22 will feature a bird walk, canoe float and bike ramble. An Environmental Fair addressing the Earth Day theme of "Grassroots Ecology: What Can I Do To Make a Difference?" will begin at noon. A NASA slide show on New Initiatives will be shown in the afternoon. For information, call 991-6881.

**Star party**—In observance of Earth Day, the public will be allowed to view the heavens through telescopes provided by the JSC Astronomical Society at Challenger 7 Park from dusk-10 p.m. For more information call Bill at 339-1367 (evenings).

# Swap Shop

## Boats & Planes

Aircraft propeller, Sensenich 74DM6-0-58, fits some Beech Piper PA-18, PA-22, PA-28, \$900. 538-2299.  
'86 17' Thundercraft, 7-pass., 140hp, S/S prop, AM/FM cass., ex. cond., \$6,450. 486-4963.

'82 30' Cal sailboat, galley, John, x33817 or 488-2756.  
Sunfish sailboat, trlr., good cond., \$900. 483-8278 or 326-2995.

14' Dolphin Sr., sailboat, trlr., needs mast and sail, \$600. 483-6622.  
Sea Snark sailboat, good cond., \$150. 333-7118 or 332-2688.

12' alum. Semi Vee boat, 7.5hp, \$250. x33054 or 559-2737.  
'71 24' Searay cuddly cabin powerboat, 210hp OMC, trlr., VHF, \$4,000. x33054 or 559-2737.

'79 16' Renegade ski boat, 140hp Evin., SST prop, trlr., 50 plus mph, good cond., \$3,750. 282-3686 or 486-7846.

'83 25' catalina, 7.5hp Johnson, 6 sails, AM/FM ster. cass., EZ loader dbl. tandem trlr., \$13,500. OBO; '83 EZ loader trlr., galv., dbl. tandem, accom. 25' sailboat, \$1,500. OBO. Mike, 474-5414.

## Audiovisual & Computer

2 low baud Motorola Mocom 70s (2-way radios), 100 watts output, \$350. Howie, 282-3841 or 482-3985.  
IBM PC Jr., educ. software, games, \$225. 282-3788 or 480-2188.

Apple II plus PC clone w/mono monitor, mem exp., joy stick, 80-col card, 2 floppy drives, S/W and Docs incl. dBase II, Fortran, Wordstar, Pascal, CPM, Visicalc, print shop, \$500. Larry, 282-3161 or 996-1013.  
IBM PS/2 Model 50 w/VGA color, Coprocessor, 5 1/4" ext. drive, mouse, IBM 24 pin printer, software, \$3,300. John, x36814.

Brother word processor I, 2 yrs. old w/spreadsheet, \$225. 483-0521 or 480-9880.  
S&W 9mm Mod #439, \$300; AT&T 6300 PC, 640K Ram c/monitor, 30 MB HD, 360K Pan. 1080 prin., \$1,200. 484-8191.

Klipsch Heresey II loudspeakers, 2 yrs. old, \$650. Bill, x35844.  
Gemini Star NX-10 Dot Matrix printer, \$100; color graphics adapter, \$15; amber phosphor monitor, \$20; monochrome graphics adapter, \$20; Sanyo MBC-555 MS-DOS 2.1 comp. w/2 DSDD (TEAC) diskette drives, ser. and para. ports, amber phosphor monitor, \$150. Clark, x37080.

Hi040 headset w/push to talk switch, microphone inop., \$65. John, 283-4104.  
TI-994A comp. w/assorted software cart., access., \$150. Ed, x36969 or 332-0442.

8087-2 math coprocessor, works w/AT&T 6300 and other comp., \$75. x30852.  
Browning 9mm hi-pwr. w/ext. clip, hd. case, ear plugs, Pachmyr grips, cleaning kit, adj. sights, \$495. OBO. matt, 483-7984 or 326-3194.

PC-XT w/20 meg, 640K, dual floppies, CGA w/monitor, mult. fanet w/batt. backup clock, 101 keybd., P.O. reset, \$1,200. nego. James, 554-2929.

## Household

Brn. sofa sleeper, ex. cond., \$250. nego. 486-7996.  
3 yr. old kingsz. BR set, ex. cond., hdbd, base w/drvrs., split semi-motionless matt., dual httrs., dresser w/hutch, 2 end tables, \$600. 471-4100.

Whirlpool HD gas dryer, ex. cond., \$200. Nancy, 282-4315 or 331-2975.  
Queenzs. wtrbd., full motion, felour side rails, ex. cond. Lea, 333-7306 or 925-1678.

Kingsz. wtrbd., bkshel. hdbd., padded rails, \$100. Dave, x32592 or 482-6673.  
Antique drop leaf desk w/glass enc. shelf, \$50; antique buffet, \$75; 2 box fans, \$5/ea. Lynda, 335-1226.

Maytag washer, \$100; Frigidaire refrig., \$80; elec. stove, drop-in style, \$50. Ken, x32040 or 337-4513.

## Musical Instruments

Upright piano, x34727 or 480-7257.  
Yamaha ME-10 keybd. w/stool/instr., B-in amp/spkr., ex. cond., \$1,000. Bob, 483-8691.

## Pets & Livestock

Baby cackatiels, \$35. Linda, 484-7834.  
Free puppy, 2 mos. old, 483-5393.  
Siamese kittens, blue, flame, seal points, \$75, ready 4-18. Chris, 483-5172 or 997-1151.

Easter rabbits, \$10-17, incl. feed, instr. Would lady who bought Netherland rabbit from Greg call him. 554-6200.

## Personal

Galv. County A&M Club scholarship fund raiser and muster, muster spkr., Gerry Griffin, 4-21-90, 3 p.m. Caribbe Pk., \$7.50/person. Rob Way, x33195 or 332-3077.

## Wanted

Atari ST people, want to trade software. 282-3841 or 482-3985.  
Atari 5200 game or working joysticks. 282-2802 or 332-0365.

Want owner fin. or assum. loan, less than 10%, for house, patio home, townhouse or condo in CL. 488-2664.  
Toy trains, elec., windup or lead. Ron, 482-1385.

Male roommate to share LC house, \$200/mo. plus 1/3 bills. John, x31929 or 334-3422.  
Want to trade concert/church elec. organ for 30' plus cabin cruiser. 337-4051.

Non-smoking roomate to share new 3 BR house in LC, avail. June, \$375 plus 1/2 util. Mike, x31027 or 488-8636.  
Football table in good shape. Lea, 333-7306 or 925-1678.

Lead/rhythm guitarist/keyboardist interested in playing rock and roll, orig. either in working band or jammin. Randy, 486-4940.  
Volvo 15' turbo wheel, 5 spokes, good cond. Vincent, x30874 or 333-1316.

## Miscellaneous

Kettle grill, 22", \$30. 282-3788 or 480-2188.  
Headkit 25" color TV, troubleshooting kit, o-scope, VTVM, \$125. OBO. Larry, 282-3161 or 996-1013.

Office desk, 4-drw., wood, good cond., \$70. Mike, 282-3795.  
Tour Model II irons 1-9, PW & SW, ex. cond., \$150. David, 554-5514 or 282-3827.

Toro 6' riding mower, \$375; welder, \$90; trencher attach., \$140; Hammond 10" wet grinder, \$750; 4.5 MHz oscilloscope, \$50; elec. pipe threader, \$45. Walter, x37332.

Koher pedestal sink, was \$600, now \$225. Harry, x30263.  
Baby crib, ex. cond. x34727 or 480-7257.  
AMF pool table, good cond., access., \$125. Martha, x30062 or 482-9103.

Home water filter sys., 5,000 gal. warr., ex. cond., \$80. 333-7075 or 480-1024.  
Woman's shortie wet suit, sz. 12, \$45. 482-0275.

10' Sportsman shrimp net, \$75. Ron, 482-1385.  
Beginner golf clubs, 1.35 woods, 3-9 irons, \$25. Steve, x32311.

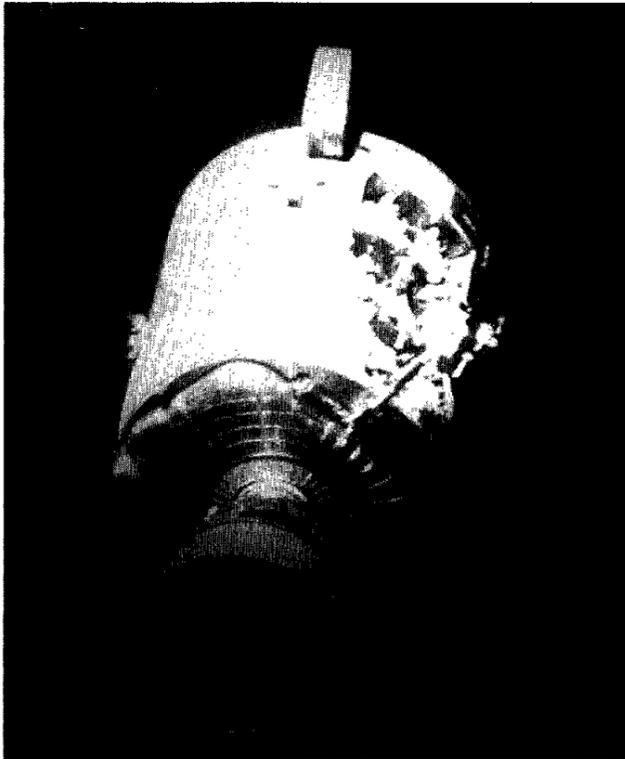
Twin box spring, ex. cond., \$35; men's Ross 26" 10-spd. bike, good cond., \$20. 532-1673.  
10" table saw, cast iron table, extensions, ex. cond., \$550. Kevin, x33650 or 482-2405.

8'x4' util. trlr., 1,000 lb. cap., \$100. OBO. David, x37058 or 486-9751.  
Sears 14" chain saw w/case, \$45; Coleman camp stove, needs wks., \$8; coffee table, \$20. 482-8627.

6" unfin. cedar bar, \$100. 486-0297.  
2 lawnmowers, 21" self propelled, \$35; 22" push mower, not working, \$20; sandbox, \$20. 484-51

# 'Houston, we've had a problem'

Apollo 13 flight directors remember how puzzle pieces fell together for safe return



Left: An entire panel secured by 250 bolts was blown off of the Apollo 13 Service Module by the oxygen tank explosion that placed the crew of the Odyssey and all of JSC (then the Manned Spacecraft Center) in a tense life-and-death struggle. The heavily damaged area became visible when the crew jettisoned it just prior to safely reentering the Earth's atmosphere in the LM. Above: During the mission, Command Module Pilot John Swigert holds some of the temporary hose connections used necessary to rig the Lunar Module Aquarius as a "lifeboat."

(Continued from Page 1)

To understand why and how, one has to go back in time to 1962, when the electrical specification for a particular thermostatic switch, one of 4 million parts that comprised the Apollo spacecraft, was set at 28 volts, DC power. There were two such thermostats on the heater system that was to be installed in the cryogenic oxygen tanks of the Apollo Command and Service Module (CSM). Three years later, modifications to the CSM raised the acceptable voltage on these heaters from 28 to 65 volts DC. The specifications for the thermostats, however, which were designed to protect against overheating by opening a circuit when they sensed a temperature of 80 degrees F, were never upgraded accordingly.

Manufacture of the eighth Block II oxygen tank, serial number 10024X-TA0008, began in 1966. It was originally scheduled to fly aboard Service Module 106—later known as Apollo 10—and was installed in the spacecraft in June 1968. Problems with cryogenic tank domes on earlier Apollo spacecraft prompted a modification, however, and ultimately the complete oxygen shelf was removed from Bay 4 of SM 106. During that process, this particular oxygen tank was accidentally dropped a distance of two inches, a meager jolt it would seem, but enough in all probability to loosen and dislodge the fill tube assembly inside. Tests followed and the tank passed. In November 1968, it was installed as Oxygen Tank 2 in CSM-109, scheduled to fly the third lunar landing mission.

After successful visits to the Sea of Tranquility and the Ocean of Storms, the stage was set for Apollo 13, and the Countdown Demonstration Test (CDDT) for that flight began on March 16, 1970. The cryo loading test went smoothly enough, but when the time came to drain the tanks to half quantity, Oxygen Tank 2, with its flawed feeder tube, was uncooperative and would only relinquish eight percent of its load. When technicians were unable to expel the liquid oxygen, a discrepancy report was written, and detanking operations resumed 11 days later. "Number 1 again emptied normally," Lovell later wrote, "but its idiot twin did not."

One way to coax the tank was to activate its heater in order to boil off the liquid oxygen, but that didn't work very well either, since the heater's thermostats, still rigged for 28 volts DC (a level supplied by the CSM in flight) but receiving 65 volts on the pad, were ruined the moment the temperature reached 80 degrees. It was at that moment, as the switches began to open once the temperature limit was reached, that 65 volts arced through the gap and welded the contacts closed. The heater kept right on heating for eight

more hours. Later tests at MSC showed that temperatures in the heater may well have reached 1,000 degrees F, more than sufficient to seriously damage Teflon insulation on adjacent fan motor wiring.

That's when the clock started ticking on Oxygen Tank No. 10024X-TA0008.

It was just before 9 p.m. on April 13 and Flight Director Gene Kranz, whose team was due to be relieved in an hour, was anxious to wrap up a live television downlink by the crew and finish the checkout they had been performing on the Lunar Module (LM) Aquarius. Now almost 56 hours and 200,000 miles outbound from home, Apollo 13 was, as Lovell put it, "looking like the smoothest flight of the program." After commenting that it seemed rather odd to watch their small tape player float free in zero-G aboard Odyssey, especially while playing the theme music from "2001: A Space Odyssey," Lovell bid viewers back on Earth a good evening and concluded the downlink.

There were just a few more routine house-keeping chores to complete before sending the crew to bed. One of these chores, considered to be about as routine and mundane as things got aboard a Moon-bound spacecraft, was a request by Kranz's EECOM, Sy Liebergot, for a "cryo-stir."

By this point in the flight, the spacecraft had consumed enough oxygen and hydrogen to allow the liquids to stratify into layers with different temperatures and densities. The fix was easy: just turn on the tank fans and stir the stuff back into a high-tech, homogenous supercold milkshake.

About nine minutes after the TV show, at 55:55 Ground Elapsed Time, with the cryo-stir under way the damaged wires on the fans in oxygen tank 2 finally gave way, causing short circuits, arcing and combustion. In a bath of supercritical oxygen, the result was like throwing a match in a gas tank.

The explosion rocked the spacecraft, and blew a panel from the Service Module that was 13 and a half feet long and 5 feet across and that, seconds before, had been securely fastened by 250 bolts. The crew heard a loud bang and felt the ship shudder. Telemetry to Earth dropped out momentarily.

Swigert saw a warning light and radioed home, "Okay, Houston, we've had a problem here."

CapCom Jack Lousma responded, "This is Houston. Say again please."

Lovell called back, "Houston, we've had a problem. We've had a main B bus undervolt." He saw more warning lights, indicating that two of the CSM's three fuel cells had just gone off line.

And then, with the remorseless certainty of interconnected, highly complicated plumbing that has just had a wrench thrown into it, the CSM began to die.

At first, the readings on the ground were too bizarre to believe. "For the first 5 or 10 minutes, I thought it was an instrumentation problem," Kranz recalled. "It looked basically like we'd had a significant power transient, and then the instrumentation went to Hell in a handbasket."

What looked bad was made worse by the fact that Mission Control in those days did not boast the same systems which today offer nearly instant insight through more than a thousand sensors into the health of the space shuttle, nor the ability to replay data in near real time for swift analysis.

"The real time data had already gone by," Kranz said. "We didn't even have an analog capability for that thing so it was a question of now taking this hour's worth of data that had unfolded, including the time period before the event, and getting somebody offline to start looking at it. Because the real issue was, how much of the space system was remaining, and then what the hell could we do with it?"

Kranz still has the notes he made in his logbook that night, and can pinpoint with some precision how and when his concerns escalated. "Within 10 minutes we alerted center management, because something just said this was well beyond the norm and we'd better start getting our people reporting in. What I'd call the second level of escalation was when Lovell reported at 56:14 that they were venting something from the spacecraft. That's when we called in all the LM guys and dug out the lifeboat procedures. About a minute after that, we got the crew going on an emergency powerdown, and about 10 minutes after that we brought up every resource we had."

Glynn Lunney, whose team was due to relieve Kranz and his controllers, was talking to operators in one of the back rooms when somebody told him he should plug in and listen to the Air-to-Ground traffic.

"It took a while for it to dawn on me how deep a set of problems we were into," he said. He does not recall exchanging any sentiments with Kranz when he plugged into the Flight Director console for what would turn out to be 10 very long and dangerous hours.

"I could just look at him and tell he was deep into working the problem," Lunney said. "It was one of those things where you didn't want to jump too fast, but the more you dug the muddier it got. And when we got to the point of thinking about using the LM as a lifeboat, we knew it was getting a little drastic."

Within the first hour, Kranz decided to take his team "offline" to consider options and prepare for the eventual reentry, a job which would involve rewriting all of the procedures normally honed over the course of several months, not to mention the challenge of stretching 30 hours of life support capability in the LM to something like 110 hours.

Arnie Aldrich headed a team of specialists to work out procedures for crew and flight controllers; John Aaron led another group responsible for power management; and Phil Shaffer was in charge of the group for guidance and navigation.

For Lunney's team, now on duty in the MOCR, it became a complex struggle simply to stabilize the situation, power up the LM and prepare it to handle the navigational tasks. "We didn't have time to go research what had happened to the CSM because it wasn't long into my shift before the CSM was basically gone anyway for all practical purposes. I remember thinking that we had to stabilize this thing because we were not on a free return trajectory and we were going to have to make some burns to swing around the Moon and get back home."

While Lunney's team wrestled with serious problems affecting virtually every discipline in the room—not the least of which was transferring a good guidance reference from the CSM to the LM—the world was waking up to the news that trouble had developed aboard Apollo 13.

At 12:20 a.m., MSC Deputy Director Chris Kraft, Apollo Program Manager James McDivitt and Director of Flight Operations Sig Sjöberg met with the media in Bldg. 2. When asked about the crew's chances, Kraft evidenced the same kind of confidence as had prompted Kranz to begin planning the reentry almost immediately after the accident.

"If the situation remains stable as it is at the moment," Kraft answered, "there's no question but what we have the thing under control and we can return the crew safely to the Earth."

But what if this had happened on the way back from the Moon, he was asked, would it have been a fatal situation?

"Indeed it would," he said, underscoring the notion that bad luck is one thing, but it's also relative.

For the next three days, the center, the agency and the nation's aerospace community were mobilized around the clock, testing ideas, developing procedures, figuring out how to stretch each watt of electricity and every drop of water out of the Aquarius. MSC's engineering community took the lead in working the problem of scrubbing carbon dioxide out of the crew's breathing air, while astronauts lined up in Bldg. 5 to try techniques in the simulator. There were various options for how swift an Earth-bound trajectory to plan for, involving, among other things, the prospect of "landing in a funny ocean," as Lunney puts it.

"When you look back at how many people were involved and how the thing dovetailed together, it was as if someone took a giant puzzle, threw it up in the air, and it all came down and fell right into place," Lunney said. "When you look at the total team performance, you have to have a tremendous feeling of pride in the people who were involved."

The payoff came April 17, when Odyssey separated from Aquarius and splashed down in the mid-Pacific near the recovery ship *Iwo Jima* at 142 hours, 54 minutes GET. When the crew jettisoned the venerable lifeboat Aquarius, there had been exactly 4 and a half hours of electricity and 5 and a half hours of water remaining.

It was one of those rare moments when the whole world was watching, singularly focused as the drama played out, a drama which earned the crew and the flight control team the Presidential Medal of Freedom, and one of those rarer moments still, when according to the newspapers, the dice even stopped rolling in Las Vegas.



Left: Astronauts and flight controllers monitor the console activity in the Mission Operations Control Room during the problem-plagued mission. Seated, from left, are: Raymond Teague, Edgar Mitchell and Alan Shepard. Standing, from left, are: Tony England, Joe Engle, Gene Cernan, Ron Evans, and M.P. Frank. Right: Three of the four Apollo 13 flight directors applaud the successful splashdown while MSC Director Robert Gilruth and Deputy Director Christopher Kraft Jr. light cigars. The flight directors are, from left, Gerald Griffin, Eugene Kranz and Glynn Lunney.

NASA Photos

# Flags fly at half-staff for Evans

JSC flags flew at half-staff Wednesday for Apollo 17 astronaut Ronald E. Evans, who died of a heart attack April 7 while sleeping in his Scottsdale, Ariz., home. He was 56.

Evans, who holds the record for the most time spent in lunar orbit, was command module pilot during the final Apollo lunar mission in December 1972. On that flight, he also logged 1 hour and 6 minutes of extravehicular activity, successfully retrieving three camera cassettes and performing an inspection of the Apollo spacecraft's equipment bay area during his space walk.

The St. Francis, Kan., native was backup command module pilot for Apollo 14 and the Apollo-Soyuz Test Project, and a member of the astro-

naut support crews for Apollo 7 and Apollo 11. After being active in the development of the Space Shuttle Program, he left NASA in 1977.

Most recently, he had been involved in motivational and educational public speaking and video tape sales through his own company, Ron Evans Enterprises.

A retired Navy captain, he joined the astronaut corps in 1966. He was notified of his selection while flying F8 aircraft from the carrier USS Ticonderoga—which also was the recovery ship for Apollo 17—during Vietnam combat. Before that, he was a combat flight instructor.

Evans is survived by his wife, Janet, one son and one daughter. Services were Wednesday in

Scottsdale.

## Chief medical scientist for space station dies

Dr. Stuart Nachtwey, chief scientist for the Medical Sciences Space Station Office and JSC's Radiological Health Officer, died March 20 after an 18 month battle with cancer.

Nachtwey, who joined NASA in 1975 as the Bioenvironmental Effects Officer, was chief of the Biomedical Applications Branch in the Medical Sciences Division from 1981 to 1986.

He was noted for his research on the potential effects of space shuttle exhaust on the upper atmosphere, solar ultraviolet-induced skin cancer,

radiological health strategy for the shuttle, space station and lunar and Mars bases. He recently had been NASA consultant to the National Council on Radiation Protection and Measurement, and responsible for defining new NASA limits for ionizing radiation exposure to astronauts.

A native of Seattle, he is survived by his wife, Juniel, and three sons.

## Croom receives secretarial honors

Donna L. Croom, branch secretary



Evans



Nachtwey



Croom

for the Orbiter Resources and Analysis Office in the Administration Directorate, received the Marilyn J. Bocking Secretarial Excellence Award for March.

Croom, who supports the office manager and nine program analysts, was specifically cited for her ability to prioritize work in an office that deals with a variety of reports, briefings, award fee evaluations and special projects.

## Would you like to be in pictures?

NASA is making a movie to introduce Space Station Freedom to the public, and six JSC employees will have an opportunity to play astronauts in the film.

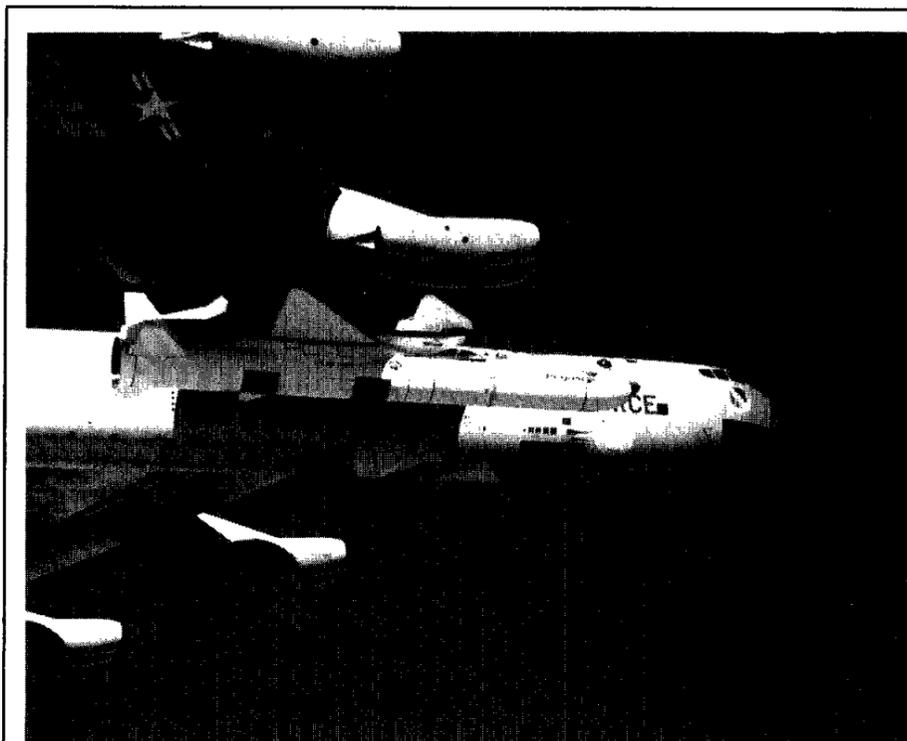
According to producer David Hamlin and director Frank Cantor, the aim of the film is to make Space Station Freedom appear fully operational as it will be in the late 1990s. It is being produced for NASA Headquarters Public Affairs' Broadcast and Audio Visual Branch.

Shooting for the movie will take place in JSC's Bldg. 9B space station mock-up, and in Hollywood, where special effects wizards image G of "Star Trek" fame will shoot a space station model on an effects stage. They will use a special "motion control" camera that can repeat moves exactly, allowing for sophisticated "matting" that mixes one image on top of another. The technique has been used extensively in movies such as "Star Wars," "Back to the Future," and "Raiders of the Lost Ark."

Cantimedia, the production company hired to make the movie for NASA, has issued a casting call for 7 a.m.-5 p.m. Tuesday, April 17, at the Ramada Kings Inn on NASA Road 1. Aspiring actors and actresses are asked to report to the motel's front desk and ask for the Space Station Movie Casting Room or Mary Ciambioti, casting director.

The producer hopes to choose six volunteers of various ethnic backgrounds to play the roles of astronauts. The chosen actors will be required to be on the set every day from 7 a.m. to 6 p.m. April 30-May 4. The actors will be paid \$50 a day, and breakfast and lunch will be provided. NASA employees will be required to take leave and get approval for outside employment to participate.

Production begins April 30, a rehearsal day, and actual shooting will begin May 1.



The Pegasus air-launched booster is carried aloft under the right wing of NASA's Ames-Dryden Flight Research Facility's B-52 carrier aircraft during a November captive test flight.

## Pegasus takes new path to orbit

### Air-launched booster first to orbit commercial payload

The Pegasus air-launched space booster successfully completed its initial launch April 5, marking the first time a privately developed launch vehicle has carried a payload into orbit.

The launch at 2:10 p.m. CDT last Saturday was a joint venture between Orbital Sciences Corp. of Fairfax, Va., and Hercules Aerospace Co. of Wilmington, Del.

Former astronaut C. Gordon Fullerton commanded the NASA B-52 that carried the unusual 49-foot-long, 41,000-pound triangular-winged rocket to its launch point 60 miles southwest of Monterey, Calif., over the Pacific Ocean. After release at 43,000 feet, Pegasus followed an autonomously guided, lift-assisted trajectory into a 320 nautical mile polar orbit.

David W. Thompson, OSC president, said the launch was "an important milestone for America's space program and a triumph for our country's commercial space industry."

Pegasus' primary payload was a three-function, 422-pound payload known as PEGSAT, developed under a joint agreement between Goddard Space Flight Center and the Defense Advanced Research Projects Agency (DARPA). PEGSAT carried instruments to measure launch vehicle and spacecraft attitude, temperature, pressure, structural loading and vibrations.

NASA also will use PEGSAT to conduct two barium chemical release experiments over central Canada this month to study conditions in the Earth's magnetosphere and ionosphere.

## NASA wants to lease pressurized module for shuttle cargo bay

By Kari Fluegel

NASA wants to lease space and related services on a pressurized manned module for the shuttle payload bay to expand the orbiters' middeck locker experiment capability.

The Commercial Middeck Augmentation Module (CMAM), a commercially developed and owned module, would be accessible through the air lock and add the volume equivalent of about 50 middeck lockers to the orbiters' capacity.

A request for proposals (RFP) issued March 30 seeks responses from companies that can provide the module for lease, physical and operational integration, operator training and data collection, processing and distribution.

CMAM will be managed by the CMAM Project Office in JSC's New Initiatives Office.

Need for the additional capability emanates from NASA's offers of shuttle-based flight research opportunities through its grant program for Centers for the Commercial Development of Space.

The experiments will involve breakthrough technologies in areas such as materials processing, protein crystal growth, biotechnology and fluid dynamics.

The government's minimum requirements are for the lease of 175 middeck locker volume equivalents over five flights between 1993 and 1995.

Deadline for the proposals is April 30. In fiscal year 1991, about \$14 million is available for CMAM; the entire project is budgeted for \$180 million.

## Lockheed gets engineering support contract extension

JSC has decided to extend the length and increase the required efforts of the Engineering Support Contract (ESC) with Lockheed Engineering & Sciences Co., Houston.

The value of options exercised is \$444,556,000. That increases the total value of the cost-plus-award-fee contract to \$884,831,870. The period of performance, which originally began May 10, 1987, has been extended to May 9, 1995.

The objective of the ESC is to provide research and development (R&D) support services to all elements of the Engineering Directorate, the New Initiatives Office, specified elements of the Space and Life Sciences Directorate, and to other JSC elements for related functions.

The major emphasis of the contract is continued support to the space shuttle, Space Station Freedom, and advanced space programs.

## Air Force unit wins aeronautics award

By John Sullivan

The Air Force Space Systems Division's Launch Systems Directorate—with Operating Location AW at JSC as one of its units—recently won the 1989 Field of Aeronautics Award.

The award, which carries with it the Gen. Thomas D. White United States Air Force Trophy, is sponsored by the National Geographic Society. It is presented to Air Force military members, civil service employees or organizations exhibiting the most outstanding contribution to the nation's progress in aerospace.

"While this award is intended for Air Force units, it reflects the outstanding cooperation that exists between the Air Force, NASA and our contractor team," said Lt. Col. James C. McLeroy, executive director of Operating Location AW. "Everyone who has helped the Department of Defense launch its payloads during the last year shares in this award."

The award cited the Launch Systems Directorate's acquisition of new expendable launch vehicles and its coordination with NASA and contractors on the space shuttle's return to flight.

## Building boom will prepare JSC for space station era

(Continued from Page 1)

ision, is the project engineer.

The facility will include a 21,000-square-foot high bay—25 feet taller than Bldg. 9A—and 26,000 square feet of laboratory. An air-bearing floor and a three-story office wing will be added, and a new parking lot is planned on the east side. Completion is expected by March 6, 1991.

Another major expansion project, an addition to the Bldg. 5 Mission Simulation and Training Facility, begins Saturday. Contract for the

\$3,037,000 project was signed with J.K. Richardson on April 4; completion is expected in June 1991. Gene Hajdik, Facilities Development Division, is the project engineer. Three stories will be added to the south high bay of Bldg. 5, freeing the existing high bay for space station simulators. The new addition will house computer support facilities and support personnel.

A new parking lot is now under construction on the east side of Fifth Street to alleviate the parking prob-

lems caused by construction south of Bldg. 5.

Finally, construction bids were opened March 22 for the Space Station Control Center (SSCC) addition to the Mission Control Center. A \$14,865,000 contract award is to be made Monday.

The SSCC project will add five-stories to the west side of Bldg. 30 to house the basic ground support for Space Station Freedom assembly and operation. Start date is April 16, with completion expected by mid-

November 1991. The fifth floor of the SSCC is to be completed by Sept. 1, 1991, to accommodate the start of computer systems installation. Project engineer is Facilities Development's Ed Hubenak.

Additional parking is planned on the west side of Second Street to offset the construction disruption, and should be completed 90 days after project start-up. Parking space in the lot on the south side of Bldg. 30 will be affected by the construction crew's need for crane access.

## Space News Roundup

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

Editor . . . . . Kelly Humphries  
Associate Editor . . . . . Linda Copley

## Seeds from space cropping up here at JSC

(Continued from Page 1)

"I don't expect to see many changes in the first generation of the plants," Poindexter said. "If we were to see any mutations resulting from the effects of five years of space radiation, I'd look for them in the second or third generations."

Requests to NASA by educators for SEEDS (Space Exposed Experiment Developed for Students) kits, written at elementary, high school, or university grade levels, will be accepted

through April 30 by writing to NASA SEEDS Projects, XEO, NASA Headquarters, Washington, D.C. 20546, on school letterhead.

"After the request deadline ends," Poindexter states, "some kits will be available, to educators only, in the Teachers Resource Center."

Visitors can expect to see plant flowering after about six weeks according to Alexander, and fruit should appear later in the summer. "The seeds are actually being planted

rather late into the local tomato growing season," he said, "and JSC's success in getting actual tomatoes to grow depends a great deal on the weather."

When asked how he felt about testing the result of the experiment, Alexander acknowledged he's wondered how it would be to eat one of the products from space. "I think I'd want to find out a little more about other people's findings, before I actually popped one into my mouth."