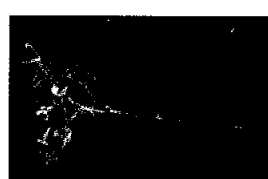


JSC's Space Station Support Office keeps the astronauts involved in mission design. Story on Page 3.



Flight controllers at NASA's Jet Propulsion Laboratory are checking a partially unfurled antenna. Story on Page 4.

Space News Roundup

Vol. 30

April 19, 1991

No. 16

Endeavour delivery to fill out shuttle fleet

By Pam Alloway

NASA will formally receive its newest space shuttle, the *Endeavour*, when it rolls out of its California factory Thursday, marking the end of the fifth operational orbiter's major construction and testing phase.

Endeavour, also known as OV-105, tentatively is scheduled to leave Edwards Air Force Base in California on May 1 and stop over at Houston's Ellington Field that evening as it is ferried to Kennedy Space Center. It is expected to arrive at KSC May 2.

The Houston stop over will be contingent on the orbiter's final ferry preparations and weather conditions.

Endeavour will join its sister ships *Columbia*, *Discovery* and *Atlantis*, restoring the shuttle fleet to the number of vehicles originally contracted by NASA in 1972. The fourth orbiter, the *Challenger*, was destroyed in January 1986. The first orbiter constructed, the *Enterprise*, was built as a test model and now is stored at the Smithsonian Institute.

Rockwell International's Space Systems Division managed *En-*

deavour's construction at the company's facilities in Downey and Palmdale, Calif., under JSC's direction.

The final assembly, testing and checkout have taken place at Rockwell's SSD orbiter assembly facility in Palmdale. More than 250 major subcontractors and thousands of associated suppliers throughout the country performed work on shuttle components and support services.

Endeavour's design incorporates the many modifications, upgrades

and technologies added to the orbiter fleet over the past several years. While nearly identical to *Discovery* and *Atlantis*, *Endeavour* will have two major features that will temporarily distinguish it from the rest of the fleet.

Endeavour will have a drag chute to aid deceleration and reduce loads on the landing gear and brakes. The other orbiters will be retrofitted with drag chutes at a later date. Additionally, *Endeavour* has been designed to accommodate an extended duration mission capability that, if incorporated, could enable it

to remain in orbit for up to 28 days at a time.

NASA's second Shuttle Carrier Aircraft, NASA 911, will fly *Endeavour* to KSC from its construction facilities. The journey will mark the new SCA's first flight.

The first flight of *Endeavour* is scheduled for May 1992. During the STS-49 mission, *Endeavour's* crew will attempt to reboost a communications satellite that is stuck in an errant orbit and perform three spacewalks.

Please see **ENDEAVOUR**, Page 4



JSC Director Aaron Cohen and backup STS-1 Commander Joe Engle laugh at a John Young witticism during Monday's shuttle 10th anniversary festivities at the Gilruth Center.

Celebration hails flight of *Columbia*

By Kelly Humphries

The space shuttle was a source of pride for the entire country on its maiden voyage 10 years ago, STS-1 Commander John Young said Monday, and it will continue to boost America's prestige for years to come.

"That's one of the things the space shuttle is all about — making us look good around the planet," said Young. "It's more than just transportation to space. With the payloads and the people we have up there, we're making progress — real progress — in science and engineering. We're mak-

ing advances in new technology to the benefit of the best outfit on this planet, the United States of America."

Young and his backup, STS-2 Commander Joe Engle, spoke to more than 3,500 people who enjoyed sunny skies and braved muddy Gilruth Center grounds to commemorate the April 12-14, 1981, first flight of the shuttle.

"One of the most important things about the shuttle, and one of the most rewarding things," Engle said, "was that first of all it said United

States of America on the side of it and it had an American flag on it. And we knew that the whole world was going to watch us fly that thing, and we knew that we had better do it right.

"All of us made this thing a source of pride for our whole country," Engle added. "I think it is as important today, maybe even more important, than it was 10 years ago because... we're fixing to build a space station and that space station is going to have United States on it, too. And the

Please see **PARTY**, Page 4

Discovery gets 'go' for launch early Tuesday

By James Hartsfield

Space shuttles will be on the move from coast to coast this week and next, with the main event a launch of *Discovery* on STS-39 at 6:05 a.m. CDT Tuesday.

The decision to launch Tuesday was made at this Monday's flight readiness review.

Atlantis, fresh from deploying the Gamma Ray Observatory on STS-37, departed Edwards Air Force Base, Calif., atop the Shuttle Carrier Aircraft Tuesday for its trip to Kennedy Space Center. After weather troubles during the ferry flight home, *Atlantis* was scheduled to arrive at KSC by Thursday to begin being readied for its next flight, STS-43, and payload, a Tracking and Data Relay Satellite, in late July.

And *Columbia*, entering the home stretch of preparations for a late May launch on STS-40, is set to leave KSC's processing hangar Wednesday for the Vehicle Assembly Bldg. In the VAB, *Columbia*, with the Spacelab Life Sciences-1 module tucked aboard, will be attached to the solid rockets and external tank for STS-40.

To cap it off, another shuttle is now in the final stages of beginning several moves of its own: *Endeavour* is to be

rolled out of its California factory Thursday in preparation for its delivery to KSC.

But the spotlights are on *Discovery* this week.

The STS-39 crew — Commander Mike Coats, Pilot Blaine Hammond, and Mission Specialists Greg Harbaugh, Don McMonagle, Guy Bluford, Lacy Veach and Rick Hieb — is planning to leave Houston Saturday afternoon for KSC.



Final closeouts were made on *Discovery* this week, including those of the Air Force Program-675 and Infrared Background Signature Survey/Shuttle Pallet Satellite-II payloads. The launch countdown will begin Saturday at 7:45 a.m. CDT.

During the eight-day mission, the crew will participate in one of the most dynamic, complex shuttle missions ever attempted, a virtual orbital ballet. *Discovery* will play hide and seek with the IBSS/SPAS, testing revolutionary sensor technologies for the Strategic Defense Initiative.

With an on-time launch, *Discovery* would land at 1:29 p.m. CDT May 1 at Edwards Air Force Base, Calif., the same day *Endeavour* is scheduled to depart for its delivery trip to KSC.

'You folks didn't ever let it rain on us'

Atlantis crew's homecoming wet

The five STS-37 crew members returned to a wet welcome home at Ellington Field last Thursday night, but about 200 co-workers and family members were warmed by their thanks.

"You folks didn't ever let it rain on us," Mission Specialist Jay Apt told the trainers and Mission Control workers who had supported the mission, its successful deployment of the Gamma Ray Observatory and its two space walks.

Commander Steve Nagel said he knew the flight would be interesting when he was assigned to it two years ago, but that it became even more interesting than the crew had anticipated with a contingency space walk and a one-day landing wave-off for weather.

Employees are invited to a briefing by the crew from 1:30-3:30 p.m. today in Teague Auditorium.

In spite of those changes to the flight plan, Nagel said the crew was "comfortable" with everything it did during the flight.

"I really felt well trained," he said. "No matter what nook and cranny we got into, we had been there before or in a similar place in training."

That was especially true when Mission Specialists Jerry Ross and Jay Apt were called on to make the first unscheduled space walk in six years to free a snagged high-gain antenna so that GRO could be deployed.

"When we got into that snag, it was just like running a sim over again. Except with much higher stress levels than a sim — I had a tension headache and I'm sure Chuck (Shaw) did," Nagel said.

"It still has dream-like qualities," said Pilot Ken Cameron, a first-time space flier.

"We opened up a new eye on the universe with the Gamma Ray Observatory, we explored the universe within a little bit by looking for the secrets of protein molecules in our bodies, we made explorations that would lead to a space station. I'd like to thank all of the

Please see **HEMOCOMING**, Page 4



JSC Photo by Mark Sowa

Umbrellas were the order of the day for the STS-37 welcome home celebration at Ellington Field. CapCom Bob Cabana holds his as he talks to Pilot Ken Cameron and Mission Specialist Linda Godwin. In background, Commander Steve Nagel talks to another group of firends.

JSC

Ticket Window

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

- General Cinema (valid for one year): \$4.
 AMC Theater (valid until May 1992): \$3.75.
 Loews Theater (valid for one year, can be used two weeks after premiere): \$4.
 Astroworld (valid 1991 season): season, \$44.94; children less than 4-feet, \$10.12; one day, \$15.85; Waterworld, \$8.13.
 Seaworld of Texas (valid 1991 season): children (3-11), \$12.25; adults, \$17.25.
 Galveston Historical Homes Tour (May 4, 5, 11 or 12): \$11.
 JSC Picnic (May 4, Gilruth Center, includes barbecue dinner, children's rides and carnival games, entertainment, refreshments, bingo and laser show): children, \$2.50; adults, \$4.
 Rockets playoff tickets (first week of playoffs if Rockets earn home court): \$14.

JSC

Gilruth Center News

Sign up policy—All classes and athletic activities are first come, first served. Sign up in person at the Gilruth Center and show a badge or EAA membership card. Classes tend to fill up four weeks in advance. For more information, call x30304.

EAA badges—Dependents and spouses may apply for a photo I.D. 6:30-9 p.m. Monday-Friday. Cost is \$5.

Defensive driving—Course is offered from 8 a.m.-5 p.m., June 15, July 13 and Aug. 10. Cost is \$15.

Aerobic dance—Class meets 5:15-6:15 p.m. Tuesday and Thursday nights. Cost is \$24.

Exercise class—Class meets 5:15-6:15 p.m. Monday and Wednesday nights. Cost is \$24.

Weight safety—Required course for employees wishing to use the Gilruth weight room. The next class will be from 8-9:30 p.m. April 25. Cost is \$4.

Ballroom dance—Beginner and intermediate ballroom dancing lessons will be offered for eight-weeks from 7-8:15 p.m. Thursdays beginning May 2. Advanced lessons will be offered from 8:15-10 p.m. beginning May 2. Cost is \$60 per couple.

Almost Anything Goes—Six teams needed for JSC Picnic competition. Cost is \$10 per six-person team. Registration deadline is 7 p.m. April 25.

Softball tournament—Men's open "C" softball tournament will be April 27-28; \$95 per team. Registration deadline is 7 p.m. April 25.

Intercenter Run—Two-mile and 10K runners may record their times throughout April outside Gilruth Rm. 146.

JSC

Swap Shop

Property

Sale: Toledo Bend lot, Holiday Forest Subdiv, Hemphill, TX, includes sm travel trlr, \$9K. 488-2652.

Sale: LC Countryside South, 3-2-2, ex cond, new carpet, paint, wallpaper, assum FHA 10%, \$75K. David, x35464.
 Sale: Camino South, 3-2-2A, corner, new roof, trees, brick accent wall w/FPL, lg kitchen w/islnd, oak cabinets, ceramic tile, lg Sallillo tile patio w/trellises, Jacuzzi, 279.9K. x33335 or 326-2582.

Rent/Lease: Clear Lake marina condo, 3-level, 2-2-5-2, all appls, FPL, wet bar, \$850/mo. 474-4922.

Rent: Lake Travis cabin, private boat dock, CA/H, fully equip, accom 8, wkly/dly, \$325/\$80. 326-5652.

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Rent: West Galveston beach house, fully furn, 2-2, lg deck w/Gulf view, beach 100 yd, boat landing, marina w/pool, \$650/wk. Fendell, 486-1746 or 538-1147.

Sale: Lake Livingston Lakeview, 2 BR, CA/H, \$39.5K. x33526.

Sale: Friendswood, custom 3-2-2-D, landscaped, atrium, FPL, whirlpool in master, lots of decking and trees, \$87K. 482-2138.

Sale: Lake Livingston Waterwood, mod 2 story, 1/4 acre wooded cul-de-sac, CA/H, Robert Kline, 670-0090.

Lease: Friendswood, Forest Bend, 3-2-2, formal DR, ceiling fan, FPL, fenced, no pets, \$625/mo. 482-6609.

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Rent: Galveston condo, Seawall Blvd & 61st St, furn, sleeps six, cable TV, swimming pools, w/wknd/dly. Magdi Yassa, x38470 or 486-0788.

Rent: Nassau Bay townhouse, 4-2-2, over 2000 sq ft, master dwn, huge garage, 2-story den, FPL, deck, atrium, \$1095/mo. Jerry, x38922, 488-5307.

Sale: CLC, 1BR condo, appls, FPL, W/D connect, microwave, tennis, ex rm. Jim Briley, 488-7901.

Cars & Trucks

'59 Mercedes Benz 220SB, \$3000. David, x35464.

'84 Volvo GL, ex cond, 86K mi, sun roof, pwr windows, auto, \$4995. David, 554-5514 or 282-3827.

'81 Datsun King Cab, w/hoor box, \$750. Jimmie, 333-2029.

'80 Pontiac Phoenix, V6, 5 dr ltrbk, auto, stereo AM/FM, good cond, \$1950. x30092 or 481-3637.

'83 Toyota Celica GT, white, auto, new tires, 107K mi, tint, AM/FM/cass, 6/9 speakers, loaded, \$3000. Shalle, x37471 or 482-1759.

'82 Ford Exp, does not run, \$250 OBO. Kim Murray, x37721 or 996-0936.

'80 Oldsmobile Cutlass LS, 4 dr, sm V8, auto, A/C, good cond, \$3500. state insp, main/repair manual, \$1400. Guess, 649-5092.

'87 Toyota Corolla FX16, red, 53K mi, 4 cyl, 5 spd, PS/PB, A/C, tint, cloth int, cruise, AM/FM/cass, new exhaust/alternator, ex cond, \$5600. x31698 or 480-2467.

'77 Datsun 280Z, high perf eng, runs great, few dents, good cond overall, 5 spd, \$2300 OBO. Cheryl, x32889.

'87 Toyota Corolla, white, 4 dr, auto, A/C, ex cond, new tires/brakes. 283-4258 or 480-9125.

'86 Toyota 4X4 PU, ex cond, \$7500 OBO. 992-3447.

'83 Ford Country Squire wagon, good cond, BO. Dan, 481-3056.

'87 Ford Tempo GL, blk w/red int, 4 dr sedan, 75K mi, ex cond, std, \$3500. 538-1051.

'77 Chev Monte Carlo, 350 V8, 115K mi, A/C, AM/FM/cass, new tires/trans w/ yr warr, runs great, \$1500 OBO. Mark, x37491 or 335-1494.

'90 Chrysler LeBaron GT convert, leather int, alarm, radar det, 9K mi, fact warr, red w/gray top, 6 mo old, was \$20K, now \$15.9K OBO. Pat, x32661 or 485-5636.

'90 Jaguar XJS, V12, 2 dr cpe, red, ex cond, 13K mi,

\$37.5K; '89 Toyota 4Runner, V6, 2 dr, sun roof, all options SR5, lg fancy wheels, two tone beige, 51K mi, ex cond, \$14.5K. 485-8648.

'85 Chevy S-10 PU, 4 cyl, A/C, AM/FM/cass, short bed w/camper shell, 76K mi, \$3800. 486-5927.

'86 Toyota Celica, loaded, leather int, \$6K OBO. 488-8781.

'89 Fiebird, auto, V6, A/C, 15K mi, ex cond, \$8500. Carrie, x38506 or 333-4089.

'77 Pontiac Grand Prix, sunroof, P/S, P/W, \$1500; '82 Ford van, 56K mi, ex cond, \$5000, x36604 or 482-7156.

'88 Suzuki Samurai, removable hard top, new soft top, 42K mi, assume \$227/mo OBO. x38843 or 332-6153.

'79 Chevy Malibu, one owner, A/C, stereo, new paint, some body damage, \$1100. Rick, 283-1988 or 996-8961.

'83 Porsche 928S, 58K mi, auto, sunroof, alarm, all pwr, ex cond, records, \$15K; '84 Ford Mustang GT convert, red/blk, new clutch/muffler/tires, ex cond, \$6000. Gloria, 480-0235 or 485-7555.

'87 Mustang, red, body and int retored, new tires, 6 cyl, std, A/C, \$4500; '79 Toyota Celica, new paint, refurbished int, Michelin tires, A/C, 5 spd, \$2400; '83 Olds Cutlass Supreme, low mi, new paint, A/C, pwr locks/wind, \$3300. Keith, x33-8559 or 488-5019.

'79 Ford Fairmont, rusty, runs great, \$600 OBO. 471-2885.

'57 Porsche Speedster kit car, hi perf eng and trans, \$10.5K. David, 332-9044 or 929-7012.

'82 Jeep Eagle Wagon Ltd, 4WD, 6 cyl auto, pwr windlocks, 75K mi, \$2700 OBO. x34213 or 286-7149.

'82 Pontiac Berneville wagon, ex cond, all pwr, cruise, tilt, AM/FM/cass, V8 DSL, A/C, \$1300 OBO. Glenn, x38087 or 484-4709.

Cycles
 '90 Suzuki Katana 600, blk, ex cond, 3K mi, 2 helmets, cargo net, \$4500 OBO. Renee, 480-3377 or 457-0256.

'83 Honda 550 Nighthawk, good cond, 29K mi, \$600. 947-7028.

'85 Yamaha Maxim 750, runs great, helmet, \$1200 OBO. 283-1844 or 474-5002.

'83 Suzuki RM80, new top end, \$300 OBO. 532-3395.

'81 Honda 650cc CB, new tires/battery, windshield, back rest, good cond, \$750. Gene, x36424 or 474-4289.

Miyata 110 10 spd bike, good cond, new tires, \$75. Cindy, x30678 or 992-4153.

'87 Kawasaki KLR-650, multi purpose, 6K mi, liq cooled, elec start, ex cond, \$1900 OBO. 282-3307 or 486-4016.

'81 Honda 750 Custom, Windjammer radio, low mi, good cond, \$650 OBO. Bruce, 485-0396.

'84 Honda Sabre 1100, V6, 30K mi, runs great, \$1200 OBO. x36155 or 534-3279.

Velodrome track bike, look pedais, sew-up wheels, Campy record parts, Cinelli track bars, Columbus tubing. 286-4703.

Boats & Planes

Quachita 17' aluminum canoe, \$400. 474-4663.

'78 19' Grand Prix Deep-V, walk through windshield, 3 gal tank, w/steering, no motor, no trlr, \$350. Darby, x37069.

Clear Lake boat slip w/roof, motorized hoist for pwr boats, \$125/mo. 474-4922.

'79 Renegade 1540 ski boat, 140 hp Evinrude, SST prop, custom trlr, new seats, carpet, paint, ign sys, 45+ mph, \$2450 OBO. 333-6868 or 486-7846.

'79 17' Hydrostream, 150 hp Merc, ex cond, galv trlr, \$2500; '87 17' Montauk Boston whaler, 90 hp Yamaha w/tul instrumentation, galv trlr, ex cond, \$8000. x30208 or 538-1106.

'89 18' Bass Tracker, 150 hp Evinrude, loaded, ex cond, x39032 or 554-2206.

14' alum jon boat, 7.5 hp Sears O/B, \$500. Tony, x39696 or 488-3238.

Audiovisual & Computers

Amiga A501 expansion RAM, 512K, \$45. Joe, 996-1667.

IBM PC, color monitor, 2 FD, 256K, lota LQ daisy wheel printer, \$700. 488-2652.

Macintosh, 128K RAM, 2 FD, assorted SW, carrying case, all documentation, \$900. Glenn, 280-8580.

Mod SPF 880 EL GAR batt pack for computers, 550 VA, ex cond, \$300. Jimmie, 333-2009.

IBM XT computer, 640K, 30 MB HD, 2 FD, color monitor, \$975. x30092 or 481-3637.

Apple IIc, 12" monitor, ext drive, 300/1200 modem, mouse and assorted SW, \$600. 538-1479.

AM/FM stereo receiver, turntable four speakers, wood frame/glass door cabinet. \$100; tree eight track player. Brian, 280-2748 or 332-9124.

Pair of Advent Prodigy tower speakers, \$250; pair of Advent Baby speakers, \$175; pair of Infinity book shelf

Today

HSS meeting—The Houston Space Society will meet at 7:30 p.m. April 19 in the Space Science Bldg at Rice University, Rm. 106. Astrophysicist Thornton Page will discuss "Great Expectation Despite Defects for the Hubble Space Telescope." Call 649-7684, for more information.

Spring Star Party — The JSC Astronomical Society and Challenger-7 Memorial Park will host public telescope viewing from dusk to 9:30 p.m. April 20. Call Bill Williams at x33849 or 339-1367 for more details.

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

Monday

Lockheed NMA meets—The Lockheed National Management Association will present a brown bag luncheon at 11:40 a.m. April 22 in the Lockheed Plaza 4, Rm. 44F. "The Collapse of Communism in Europe and Africa," will be the topic. For more information contact Charles Campbell at 333-6107.

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

Tuesday

IDEF seminar—The American Institute of Aeronautics and Astronautics and Software Systems

Technical Committee will host "IDEF (ICAM Data Definition Language): In Support of Requirements Analysis" presented by Mark Smith of D. Appleton Co. at 11:45 a.m. April 23 at Franco's Restaurant. For more information contact Karen Lee-Taylor at 283-1961.

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

Wednesday

Astronomy seminar—The JSC Astronomy Seminar will be at noon April 24 in Bldg. 31, Rm. 129. The University of Houston's Dr. Dave Criswell will discuss lunar power stations. For more information contact Al Jackson, 333-7679.

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

Thursday

IEEE conference—The Institute of Electrical and Electronics Engineers-Galveston Bay Section will present a videoconference at 10 a.m. April 25 at the Gilruth Center. For more information, contact Dr. Zafar Taqvi, 333-6544; or Andy Lindberg, x31474.

SCS meets—The Society for Computer Simulation, Bay Area/Houston chapter, will meet at 11:45 a.m. April 25 at Lockheed Plaza 3,

first floor Pic Rm. Troy Henson of IBM will discuss "Neural Networks." Call Robin Kirkham, 333-7345, or Wade Webster, 244-4306, for details.

NCMA meets — The National Contract Management Association's Space City-Houston chapter will meet at 11:30 a.m. April 25 at the Gilruth Center. Tom Reid, general counsel for Martin Marietta Strategic Systems/Civil Space Systems, will speak. Deadline for lunch reservations is April 19. Contact John Trahan, x30543, or Theresa Borrego, 282-6679, for details.

AIAA meeting—The American Institute of Aeronautics and Astronautics dinner meeting will be at 5:30 p.m. April 25 at the Gilruth Center. Dr. Carolyn Huntoon, director of Space and Life Sciences, will speak. Reservations deadline is April 22. For more information contact Frankki, 333-6064, or Carroll, 283-6000.

NASACOM meeting — NASACOM (a Commodore users' group for the C64, 128 and Amiga computers) will meet at 7:30 p.m. April 25 at the Clear Lake Park Bldg. For more information contact Glenda, x31764.

JARC meets—The JSC Amateur Radio Club will meet at noon April 25 in Bldg. 16, Rm. 253. Andy McAllister will speak. For more information, call Dale Martin, x37740.

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

Property

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speakers, \$150. 996-1382.

Amiga 2000 computer, color monitor, printer, 3 MB RAM, 72 MB HD, PC bridgeboard, SW, \$1800. Chris, x38080 or 482-3019.

Apple II, 2 FD, NEC 8023 printer, monitor, 80 col card, modem, tapes/documentation, text to speech module, serial port, SW, \$500. 282-3705.

Expo 286 AT clone, 6/10 MHz, 5.25 and 1.44 floppies, 40MB HD, EGA, SW, books access, \$1200. Steve, 481-4238 or 795-1034.

Hercules monochrome card w/Packard Bell amber monitor, \$120 OBO; 2 port joystick card, \$20; Silveered daisy wheel printer, \$120 OBO

An eye toward the future

Co-op student is engineering liaison

By Barbara Schwartz

If you want to know what's next after STS-37's successful back-to-back space walks and smooth performances by the space station crew transportation devices, you need look only as far as the Space Station Support Office.

That office, a part of the Astronaut Office, is keeping flight crews involved in the conceptual stages for advanced programs and new initiatives, in addition to Space Station *Freedom*.

Astronaut Mike Lounge is chief of SSSO, the focal point for forming crew positions on space station design, operations and training issues, systems and hardware development.

But the office isn't made up solely of astronauts. Twenty-eight civil service and contractor employees keep communication flowing between the astronauts and the various space station control boards and panels, the engineering and operations community and contractors.

Beth Stubbings, a Purdue University aerospace engineering major, describes her current co-op assignment in the SSSO as an "engineering liaison."

Stubbings works with Fernando Ramos, who is responsible for assembly, shuttle test objectives, extra-vehicular activities and space suits. She's been assigned to track the STS-49 Assembly of Space Station by EVA Methods (ASEM) payload.

STS-49 will be *Endeavour's* maiden flight. In addition to reboosting INTELSAT, which requires an EVA to attach a new booster, the crew will support two more EVAs to test various assembly techniques for Space Station.

"One of the primary purposes of ASEM is to demonstrate that the orbiter has the capability to do three back-to-back EVAs on three consecutive days," Stubbings said.

STS-49 crew members Pierre Thuot, Rick Hieb, Kathy Thornton and Tom Akers will don their suits and step out of *Endeavour's* airlock to conduct the EVAs. Other STS-49 crew members are: Commander Dan Brandenstein; Pilot Kevin Chilton; and Mission Specialist Bruce Melnick.

"The ASEM payload is unique

because it is the first flight demonstration of Space Station assembly operational techniques, so a lot of management and integration issues are being worked out," Stubbings said.

Many questions about various assembly operations remain unanswered such as how do astronauts attach large masses to the space station and accurately fix them in precise positions? Is there enough light? Can the shuttle's robot arm reach the necessary orientations?

"ASEM is going to stretch the envelope to find out if we can actually build the station the way we would like to build it," Stubbings said. "ASEM will simulate techniques required for the entire Space Station building process."

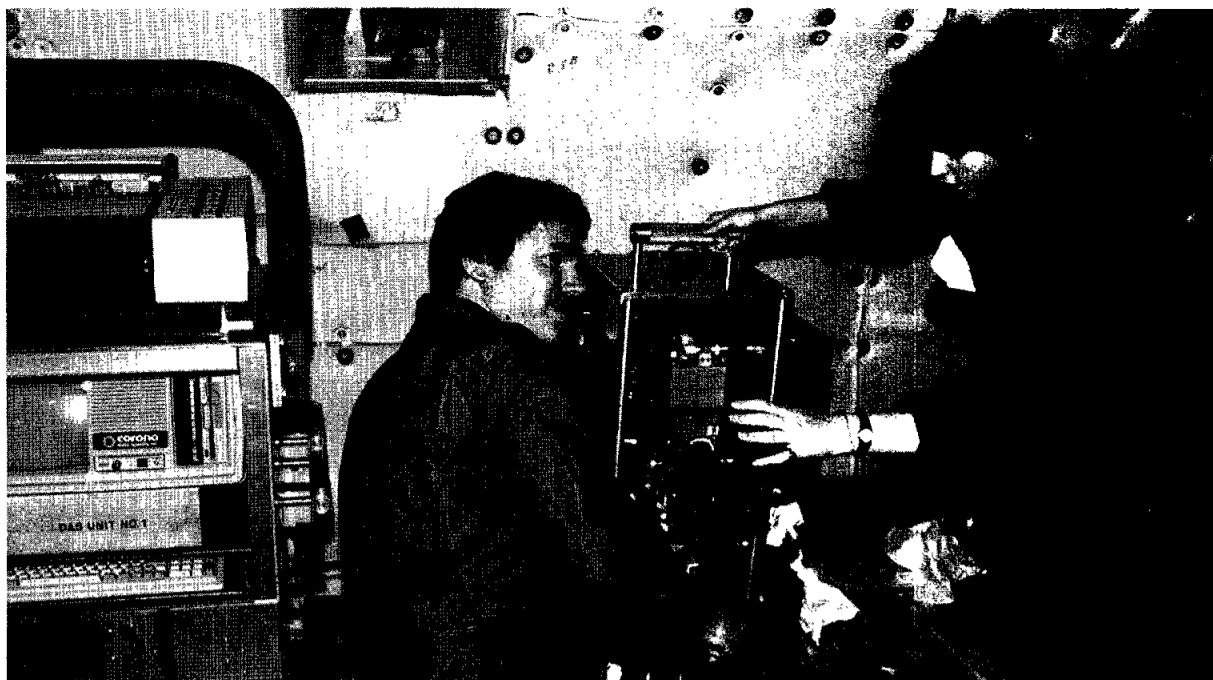
Stubbings' daily tasks includes keeping the crew informed of these issues and assuring that their concerns are incorporated into the ASEM design. Having an assigned crew to work with is unusual in the SSSO because it is too early to designate Space Station crew members. Other office members coordinate issues with the astronauts who have technical assignments in related hardware, training or operations areas.

At ASEM's preliminary design review, an issue arose regarding whether a particular test objective would exceed the hardware capability.

"The operational scenario had the crew members fix a strut into a node attached to the sill of the payload bay," Stubbings said. "That strut would stick straight up out of the payload bay, and then a crew member would hand-over-hand climb up the pole. Since the strut was fixed only at the payload bay end and was free to move on the other end, would a crew member induce a load at the free end and create a bending moment that might destroy the joint?"

In response, Stubbings designed and conducted tests involving all four STS-49 EVA crew members to determine actual loads.

"We suspended a strut over Bldg. 9's air bearing floor and had a crew member in an air bearing sled translate up and down the strut," she said. "The strut was instrumented so we could tell what kind of loads the crew member was putting on the strut. The translation loads varied between one and



University of Alabama at Huntsville's Guy Smith and Purdue University co-op Beth Stubbings work on Stubbings' experiment on board NASA's KC-135 aircraft.

four pounds, and the installation and handling loads at the end of the strut varied between one and seven pounds."

Stubbings attends meetings with ASEM designers and payload managers. She also attends preliminary design reviews, cargo integration reviews, and safety panel meetings.

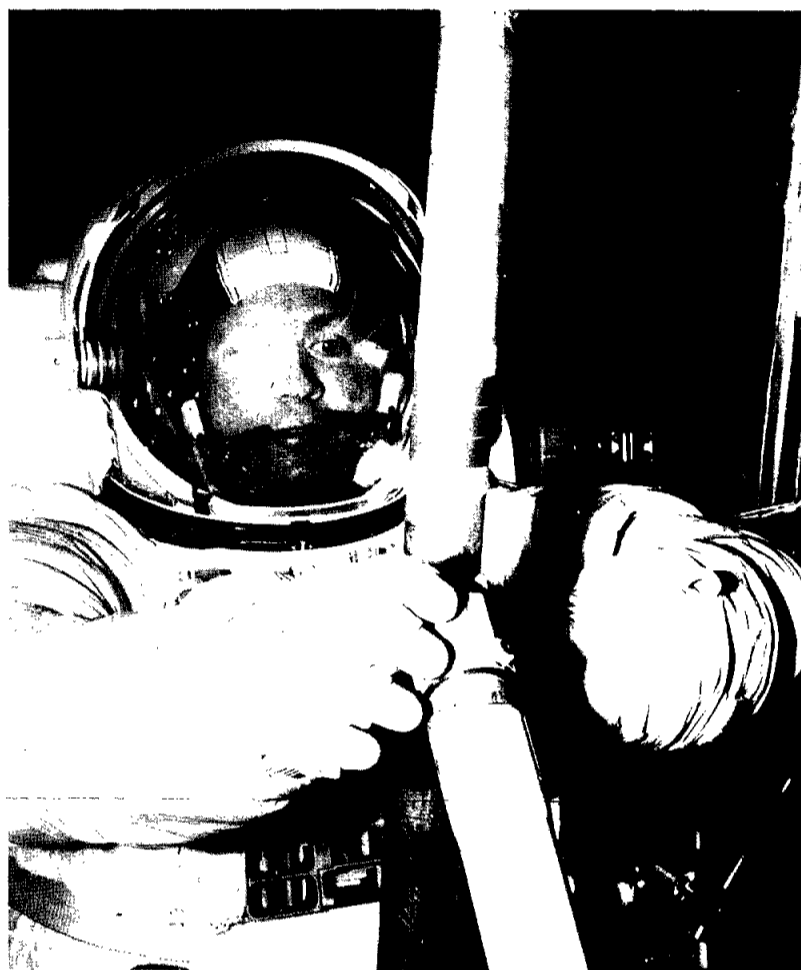
"I interface with about every organization on site — from management overview meetings to engineering specific details such as how-many-threads-do-we-put-on-a-bolt-type meetings," Stubbings said. "Each decision influences the crew. . . and it is my job to make their job easier."

Stubbings values the experience she acquired in her previous assignments in the Weightless Environment Training Facility, the Structures and Mechanics Division, and the Space Station Training Office. She said this background and Ramos' guidance helped her adapt quickly to the wide range of duties in her present job.

Stubbings, one of JSC's 75 co-ops representing 20 universities, praises the co-op program for the opportunities she has had, saying "this is the best possible education I could receive."

When Stubbings returns to Purdue, she will resume her work as payload manager on a Getaway Special canister experiment—a foamed metal experiment. With the help of Astronaut Don Thomas, who previously was in the Materials Branch, Stubbings entered her experiment in a National Space Foundation student contest and won a chance to test the experiment's feasibility on the KC-135. She borrowed a furnace from Marshall Space Flight Center and processed 18 samples of foamed metal during her flights. Stubbings hopes to have the GAS experiment completed and manifested before she graduates in December 1992.

Co-op coordinator Jack Kochner said this is the first time in eight years that Purdue students have outnumbered Texas A&M students. About half of JSC's co-op students are from schools throughout the U.S. and the other half are from Texas schools. He said JSC employs 215 co-ops on a rotational basis. The co-ops are either working here, going to school or about to graduate and waiting for job offers.



STS-49 Mission Specialist Pierre Thuot works on an operational scenario in which crew members would fix a strut into a node in the payload bay.



STS-49 Mission Specialist Kathy Thornton translating up a strut on a sled that moves across the air bearing floor.



Purdue University student and JSC co-op Beth Stubbings attaching a strut used in her experiment to the air bearing floor's sled for a Space Station assembly operations test.

EVA team earns plaque-hanging honors

Bob Adams, leader of the extravehicular activity team, earned the honor of hanging the STS-37 plaque following the recent mission.

Lead Flight Director Chuck Shaw said the award went to the entire EVA team, which included the Crew Equipment Translation Aid and Gamma Ray Observatory technical support teams. The honor recognized the team's work on both the scheduled and unscheduled space walks.

"The EVA activities went smoothly because they worked super hard preflight to make sure if we ever got in that scenario it would go very smoothly," Shaw said. "The EVA guys had the necessary tools for us when we needed them during the flight."

Shaw said he believes the hallmark of STS-37 was the return to flight for EVA.

"Both the unscheduled GRO and scheduled CETA space walks demonstrated that we send crews into space for a reason, not just a ride."

JSC

People

Buras earns Scouts' honor for volunteers

Ted Buras, an employee of JSC's Space Shuttle Avionics Office, will receive one of scouting's highest honors May 14.

The Sam Houston Area Council of the Boy Scouts of America will present Buras with the Silver Beaver Award, the highest award a council can bestow, for his "unselfish and distinguished service to young people."

Buras, who helps develop, verify and integrate space shuttle software, has been a scout master for 10 years.

The award will be presented at the Council Annual Recognition Dinner at 7 p.m. May 14 at the Sheraton AstroDome Hotel.

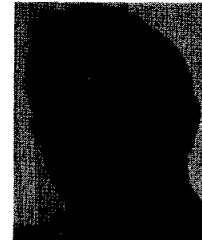
Pena top secretary

Mara R. Pena, secretary for the Public Services Branch in JSC's Public Affairs Office, has received the Marilyn J. Bocking Award for Secretarial Excellence.

Pena, now secretary to the deputy director of public affairs, was cited for her work as records custodian and for her courteous and professional manner. She also displayed a desire to learn, researching answers to questions posed by the public in an effort to expand her knowledge of the space program.



Adams



Buras



Pena



Kelly

Pena received a plaque from JSC Director Aaron Cohen and a \$500 stipend.

Employee's son wins science fair first

Al Kelly of the Mission Operations Directorate's Management Integration Office has a new reason to be proud of his son, Keith.

The younger Kelly recently won first place in the engineering division at the Science Engineering Fair of Houston, a regional fair covering 18 southeast Texas counties.

Kelly's project, "Prototype Light Activated Circuit," increases the energy efficiency of a solar cell by mounting it on a platform that tracks the Sun. Kelly used photo sensors and an electric motor to keep the solar cell pointed directly at its light source at all times.

Kelly, an eighth grader at Friendswood Junior High School, also won prizes in the Friendswood and Galveston science fairs. His mentor was Paul Wheat of Lockheed Engineering and Sciences Co.

Promotion board gives approvals

JSC's Senior Promotion Board approved 19 nominees for dual career ladder promotions in April based on expanding job responsibilities and scientific and engineering impact.

The promotions to the GS-14 and GS-15 levels were made separate from those under the Competitive Placement Plan.

Those receiving promotions, which become effective April 21, are:

Human Resources Office: Teresa R. Sullivan.

Flight Crew Operations Directorate: John H. Starnes and Robert K. Williams.

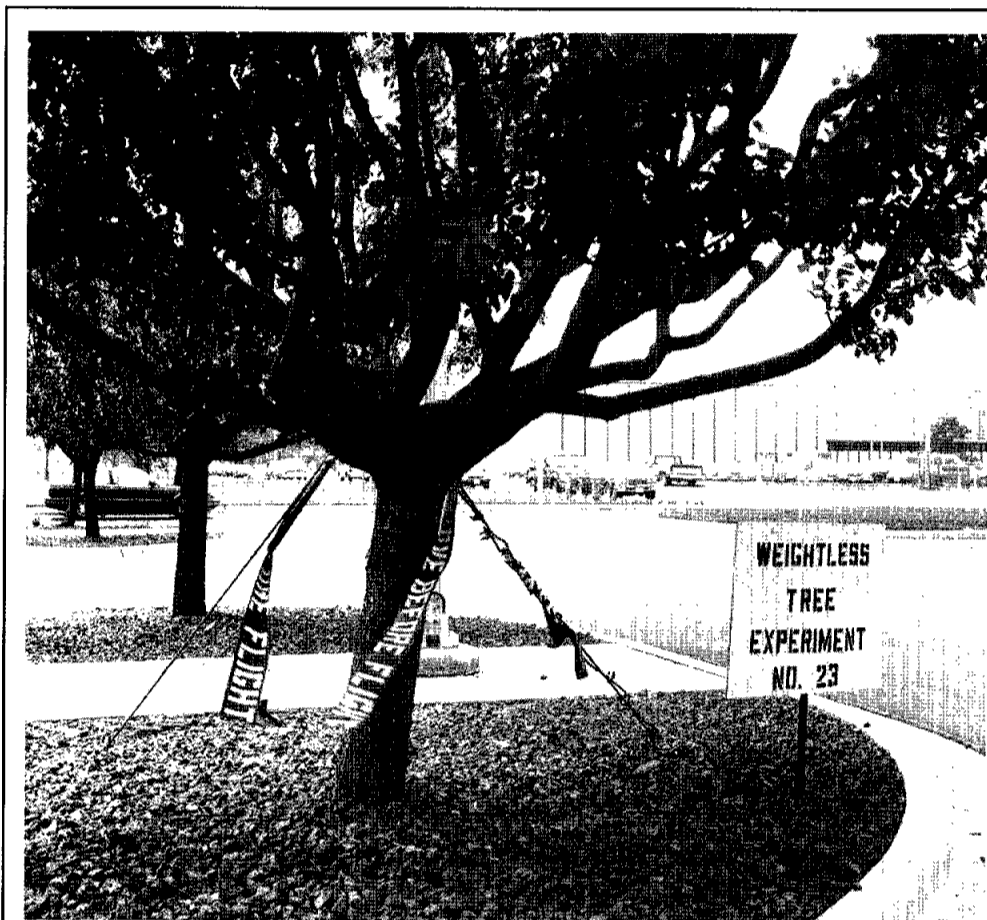
Mission Operations Directorate: William P. Gravett and Ben L. Sellari.

Engineering Directorate: Larry W. Abbott, James D. Bagwell, Willard L. Castner, Palmer B. Chiu, Donald M. Curry, John W. Griffin Jr., Donald L. Henninger, James H. O'Kane, Indulis Saulietis and Mark D. Schmalz.

Space Shuttle Program Office: Kathleen M. Leary and Francis J. Monahan.

New Initiatives Office: Michael K. Hendrix.

Space Station Projects Office: Joseph W. Snyder.



JSC Photo by Robert Markowitz

TOO MUCH FERTILIZER?—An unidentified prankster left this calling card on one of the trees between Bldgs. 31 and 37 recently. Note the "Remove Before Flight" banners. JSC Horticulturist Alan Miyamoto said that there are no official weightless tree experiments on site. The cables support the tree against the wind.

Galileo antenna fails to unfurl on first attempt

NASA officials believe a critical antenna on the Galileo Jupiter probe has failed to fully extend and are examining data to determine how to correct the problem.

Galileo's antenna was commanded to unfurl April 11, but controllers at NASA's Jet Propulsion Laboratory did not receive indications in either the spacecraft spin rate, which should have slowed, or in the antenna-deployment limit switches, that the antenna had properly opened.

Officials are investigating possible causes and fixes. Officials said they may attempt to fully deploy the antenna again next week.

The high-gain antenna is an umbrella-shaped, 16-foot device. Failure of the antenna could limit the speed at which data about Jupiter could be transmitted to Earth and reduce the number of photographs that could be beamed back to the inner solar system.

The probe, in a relatively quiet cruise en route to a flyby of the asteroid Gaspra next October, went into a safing mode March 26 but controllers restored normal activities last week. Galileo was launched from the Space Shuttle *Atlantis* on Oct. 18, 1989. It is scheduled to begin its orbit around Jupiter in 1995 to study the planet and its many moons in detail. In addition, a small probe will be dropped into Jupiter's atmosphere for the first direct measurements of its structure and composition.

A large radio antenna is needed on Galileo to achieve the necessary signal strength to transmit high-speed data from Jupiter to the Earth. The high-gain antenna is capable of transmitting 134,000 bits of data per second.

The spacecraft also is equipped with two smaller antennas that transmit at much lower speeds.

Party, round table celebrate shuttle's first decade of operations

(Continued from Page 1)

whole world is watching that. I know it's going to happen."

The party followed and personal reminiscences by past and present program managers in Teague Auditorium. JSC Director Aaron Cohen, was joined by John Yardley, associate administrator for manned space flight from 1974-1981; Robert Thompson, space shuttle program manager from 1970-1981, Christopher C. Kraft Jr., JSC director from 1972-1982; Young and Engle. The STS-1 pilot, Space Shuttle Program Director Robert Crippen, and his backup, NASA Administrator Richard Truly were unable to attend the celebration but sent their best wishes.

Cohen, who was shuttle orbiter project manager for the decade of its development, noted that the orbiter team was constantly encountering new obstacles as the vehicle was designed and built, and recalled the "first" construction problem. "We were putting the forward fuselage together

and I got a call that we had used soft rivets. I said, 'Why me? Why on this high-technology spacecraft should we use something so mundane as soft rivets?'"

Adjustments to the design continued down to the wire.

"Every step along the way, we thought, my gosh, something was not going to work. We were stumped. But engineering, either at the contractor, or at NASA, . . . came and solved the problems," Cohen said.

On the day *Columbia* was to lift off for the first time, Cohen said, he was confident but worried about "everything."

"I thought, in all honesty, we had done a very sound technical job. Maybe what worried me the most was everybody was talking to me, telling me things. Was I listening to everybody the way I should have been and reacting the way I should have been? Was I paying attention to everything I should be paying attention to? It turns out I did, we all did, and it was a very

successful flight and a very successful vehicle."

Yardley, who held leadership roles in the Mercury, Gemini, Skylab and shuttle programs before returning to McDonnell Douglas in 1981 as president of its astronautics division, said he believes it will be another 20 years before the shuttle ceases to be America's No. 1 launch vehicle.

"I believe it's the most magnificent flying machine ever created by man in this world."

Kraft, who pioneered human spacecraft operations in Mercury, Gemini and Apollo, remembered with amazement the feat of launching a space vehicle with people on board for its maiden flight.

"We had the criticism of a lot, we had the belief of many, but we only had the guts of a few," he said. "It took a lot of guts to go to the pad with that machine the first time."

He said the criticism of the press, Congress and dubious engineers of the time sharpened the wits of those

developing the shuttle and made them think about what could go wrong. The one fatal accident in the shuttle program, he said, was the result of thinking too much about success and not enough about failure.

"The *Challenger* accident still lingers in my soul," he said. "It was such an unnecessary thing. It was a result of human frailty, it had nothing to do with the machine. Certainly the rocket failed, but there were telltale signs it should have been fixed."

"In my mind, the shuttle is the finest machine ever built, and we'll be a long time producing a machine of equivalent reliability," Kraft said.

Thompson, program manager during design and construction and now vice president of McDonnell Douglas' space station division, said the shuttle and space station programs are inextricably linked and that the lessons of the shuttle apply to station. The shuttle was designed as a tool to build a space station and make living and working in low-Earth orbit and possi-

ble.

"Frankly, the things it's done up to now are just preparing itself for the things it's really going to do," he said.

Young remembered five things that Apollo Spacecraft Program Manager George Low insisted on: redundant and flexible designs, explicit test procedures, independent checks and balances, unwavering discipline and inquisitive, penetrating, challenging people.

"All the accomplishments of this incredible national program are thanks to you," he told JSC employees in the audience and others participating via agency-wide television coverage. "If you hadn't done your jobs right, Crip and I and all the other 120 people who have flown the space shuttle wouldn't be here today."

Young and Engle thanked the people who had made the shuttle program possible, and Young added a special thanks to Don Puddy, Chuck Lewis and Neil Hutchison, the flight directors for STS-1.

Homecoming crew gives thanks

(Continued from Page 1)

NASA family for making it possible."

Mission Specialist Linda Godwin, who operated the shuttle's robot arm during GRO deployment and the Extravehicular Activity Development Flight Experiment, thanked the people who designed the procedures and trained her.

"We thought we trained a long time for two years," she said, "but this project has been in the making for years

beyond that and a lot of people here have been involved with it for a long time."

Ross joked that Apt had put a tie wrap on GRO's antenna boom so they would have to do a space walk to fix it.

"There was a leap for joy in my heart when the boom kicked free and we knew we had the problem licked," he said. "For the EVA return to flight, we did a pretty darn good job."

Apt said dedicated people at JSC are the core of the group that will build Space Station *Freedom*, adding that after the flight he is even more certain that a permanent human outpost is needed in low-Earth orbit.

"What we've done on this mission is get us back in the business of doing what people do best in space — that's cope with the unexpected and go out and do things that no machine can do."

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Editor Kelly Humphries
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Kari Fluegel

Endeavour delivery

(Continued from Page 1)

Endeavour's first mission will be to retrieve, modify and reboost International Telecommunications Satellite VI. A second objective will involve space-walking astronauts who will demonstrate space station assembly methods.

NASA gave Rockwell the authority to proceed with construction of *Endeavour* in August 1987, although production of many basic elements began in 1983 when Rockwell won a contract to build orbiter spare parts.

NASA-JSC