

Herculean effort

Images taken with the HERCULES system go directly from computer disk to printed page. Story on Page 3.



First in space

Alan Shepard, the first American to fly in space, will be at Space Center Houston on Wednesday. Photo on Page 4.

Space News Roundup

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No. 17

Hubble servicing mission scheduled for 11 days

Record five space walks by alternating teams planned, another two possible if needed

By Kyle Herring

The December flight of *Endeavour* on STS-61 to service the Hubble Space Telescope will be an 11 day mission designed to accommodate a record five space walks with the capability for an additional two, if needed.

The decision to schedule five extra-vehicular activities was reached following extensive evaluations of underwater training, maneuver times required using the shuttle's robot arm based on software simulations and actual EVA tasks performed

on previous missions.

"Basically what we've done by going to five EVAs rather than three is to repackage our margin so that we have the capability to respond to the dynamics, or unknowns, of space walks," Mission Director Randy Brinkley said. "It improves the probabilities for mission success while providing added flexibility and adaptability for reacting to real-time situations."

In laying out the specific tasks to be



HUBBLE SPACE TELESCOPE

completed on each of the space walks, officials have determined that changing out the gyros, solar arrays and the Wide Field/Planetary Camera and installing the Corrective Optics Space Telescope Axial Replacement are priority objectives during the mission.

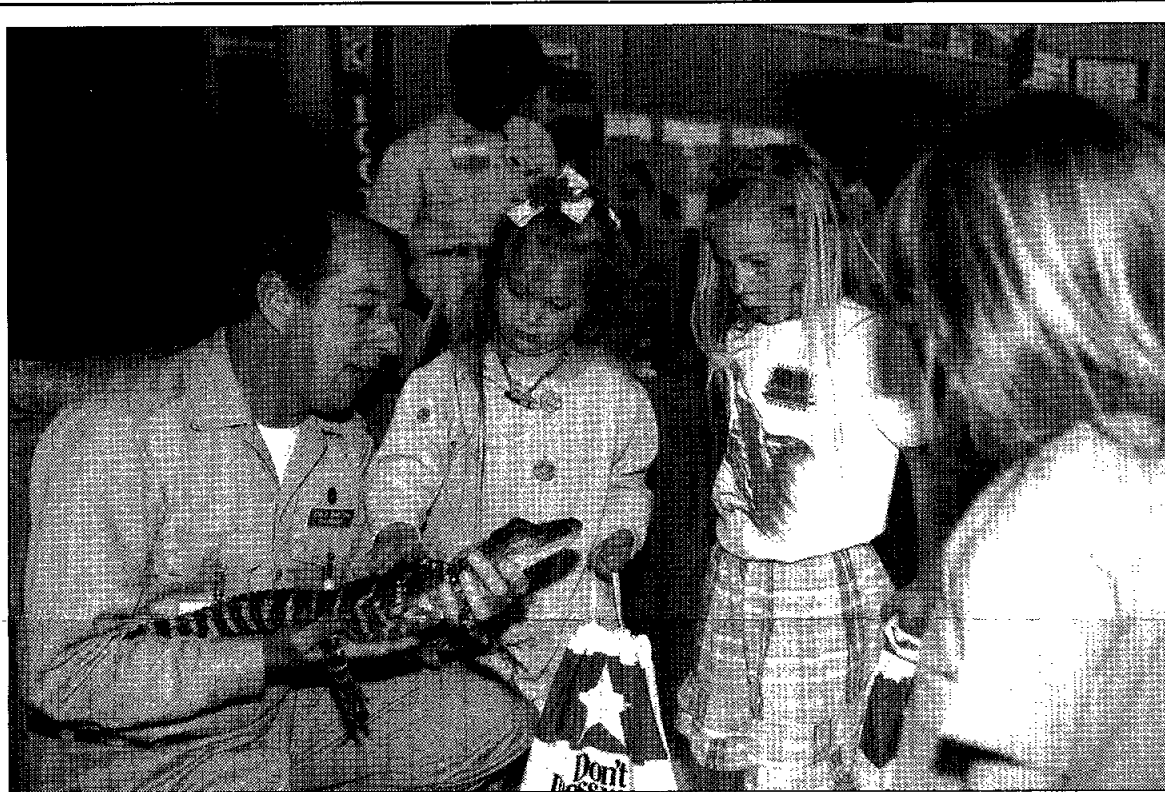
"When we looked at accomplishing all of the tasks, highest through lowest priority, and recognizing that the major tasks — gyros, solar arrays, WF/PC and COSTAR — would consume most of the

time set aside for each space walk, five EVAs were deemed appropriate," said Lead Flight Director Milt Heflin.

While the five space walks will be unprecedented, the use of two alternating space walk teams will alleviate placing more stress on the crew than previous missions requiring two, three or four EVAs.

"We have paid close attention to lessons learned during previous space walks and factored these into our timeline estimates for five EVAs," Heflin said. "In planning for all

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JSC Photo by Jack Jacob

Dale Martin, an employee of JSC's Imagery Sciences Division and a Houston Zoo volunteer, shows off an American alligator to a group of young Earth Day visitors in Teague Auditorium.

JSC Earth Day turnout doubles

The turnout for this year's JSC Earth Day celebration was almost double that of last year's, and organizers say they may try to expand the environmental offerings next year.

Coordinator Jo Kines said an estimated 700 people took time to check out the 21 Teague Auditorium exhibits that ranged from a live American alligator to recycling ideas and vehicles powered by alternative energy sources.

"Most said it was very informative and they learned something," Kines said. "We're thinking about expanding next

year and including some guest speakers, perhaps bringing in a panel of people to discuss environmental matters."

This year's exhibitors provided information on what people can do to help the environment through organic gardening; intelligent pesticide use; recycling household materials such as plastic, glass and paper; and safe disposal of household hazardous wastes such as solvents and pesticides.

The Texas Department of Transportation shared its "Don't Mess With Texas" anti-littering message and news about state

wildflowers. Houston Lighting and Power gave home energy conservation tips and the Sierra Club discussed local endangered species.

JSC's Environmental Services Office, which sponsored the center's April 22 participation in the Worldwide Earth Day observance, shared its paper recycling and energy conservation plans.

Four Seasons, the JSC grounds keeping contractor, discussed antique roses and biological controls that are used to inhibit the population of harmful insects on site.

Columbia crew forging ahead with Spacelab

By Kelly Humphries

The seven STS-55 astronauts were forging ahead with Spacelab D-2 experiments that range from studies of how living beings, materials and robotic devices function in microgravity to Earth observations, atmospheric physics and astronomy.

Columbia rose into a 160 nautical mile orbit from the Kennedy Space Center at 9:50 a.m. CDT Monday and since that time has been functioning without any major systems anomalies.

"Today's launch of the Space Shuttle *Columbia* carries with it a clear signal that NASA is deeply committed to the safety and success of our missions," NASA Administrator Daniel S. Goldin said Monday. "Given the options of assuring success or launching on any given date, there is little question that mission success has, is and always will be our priority. The space shuttle's record speaks for itself and is unrivaled in history."

The seven-member crew divided into two teams for 24-hour payload operations, with Commander Steve Nagel, Pilot Tom Henricks, Payload Commander Jerry Ross and Payload Specialist Ulrich Walter on the day shift by Houston clocks, and Mission Specialists Charlie Precourt and Bernard Harris and Payload Specialist Hans Schlegel on the overnight shift.

Activation of the international Spacelab experiments, which went smoothly and the crew continued to work with the Space Operation Control Center in Oberpfaffenhofen, Germany.

"The crew is performing well, doing an excellent job and the cooperation with the ground is excellent," D-2 engineering chief Walter Brungs said Thursday.

For example, Walter used the fluid physics module to vibrate columns of water so that pressure sensors could determine their dynamics. Ross worked with experiments that looked at the diffusion rates of molten salts and used the Holographic Optics Laboratory for investigations of heat

mass and particle transport. A German Space Agency-developed robot arm called ROTEX was powered up for the first time inside the pressurized Spacelab module on Thursday, and crew members and experimenters on the ground took turns controlling its movements in a variety of modes. The device's designers are evaluating how well they have planned for the effects of weightlessness on the various joints and sensors of the arm as well as the joystick controller for it.

The crew was dealing well with several systems problems on *Columbia*, the oldest shuttle in

Please see CREW, Page 4.



'Take Your Daughter to Work' day called smashing success

By Kelly Humphries

They tried a space suit on for size, got dizzy in a dome designed to help astronauts get used to zero gravity, entered a surreal computerized world and heard a special message broadcast just for them from low-Earth orbit.

And all this was a prelude to the main event for about 50 girls ages 9 to 15 who visited JSC on Wednesday, the chance to see where their mothers or fathers work everyday.

Counting their sponsors—some were parents, some were friends, some were volunteers—almost 100 participants shared career experiences in the first of what probably will become an annual

"Take Our Daughters to Work" day.

The day, brainchild of the Ms. Foundation for Women and sponsored here by the JSC's Federal Women's Program, was designed to provide the girls an opportunity to observe engineers, scientists, journalists, paralegals, technicians, lawyers and others, and imagine themselves in careers they might not otherwise have considered.

"I think it was a smashing success because of all the responses from people that were in the program," said FWP Manager Pam Adams. "They all came up after the event and expressed their appreciation and wanted to know if

Please see TAKE, Page 4



NASA Photo

STS-55 Pilot Tom Henricks sends a special message to the daughters who came to work with their sponsors at JSC on Wednesday. The video message was projected on the large screen in Teague Auditorium.

Polka dots, fish and butterflies in Mission Control?

Polka dots, butterflies and fish on the world map in the Mission Control Center?

Yes, but only during Skylab did such unusual critters live among flight controllers who followed three crews through nine months on America's first space station.

The week of May 14 a series of tours, lectures, panel discussions and exhibits at JSC to mark Skylab's 20th anniversary.

The culmination will be a May 14 Mission Operations Directorate Spring Part/Skylab Anniversary Celebration at the Clear Lake Pavilion.

Tickets are \$7; call Bill Schaefer at or Ted Kenny at x40078.

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. For more information, call x35350 or x30990.

- EAA Galveston Historic Homes Tour (May 8-9): \$11.
 Astroworld Early Bird Special — Tickets purchased before May 31 and used before June 30 at \$15.95.
 Sea World in San Antonio — Discount tickets: adult, \$19.75; child (3-11), \$13.15.
 Fiesta Texas, San Antonio — Discount tickets: adult, \$18.35; child (4-11) \$12.75.
 Space Center Houston — Discount tickets: adult, \$7.50; child (3-11) \$4.50; commemorative: \$8.75.
 Metro tickets — Passes, books and single tickets available.
 Movie discounts — General Cinema, \$4.50; AMC Theater, \$3.75; Loews Theater, \$4.

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 photo identification badges from 6:30-9 p.m. Monday through Friday. Dependents must be between 16 and 23 years old.

Defensive driving — Course is offered from 8 a.m.-4:30 p.m. May 15. Cost is \$19.

Weight Safety — Required course for employees wishing to use the Gilruth weight room is offered from 8-9:30 p.m. May 5. Pre-registration is required; cost is \$5.

Aerobics — High/low-impact classes meet from 5:15-6:15 p.m. Tuesdays and Thursdays. Cost is \$32 for eight weeks.

Exercise — Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays. Cost is \$24 for eight weeks.

Aikido — Martial arts class meets Tuesdays from 6:15-8 p.m. Cost is \$15 per month.

Fitness program — Health Related Fitness Program includes medical examination screening, 12-week individually prescribed exercise program. Call Larry Weir, x30301.

JSC

Dates & Data

Today

Cafeteria menu — Special: beef and macaroni. Entrees: ham steak, Parmesan steak. Soup: chicken and rice. Vegetables: green beans, carrots, au gratin potatoes.

Tuesday

Cafeteria menu — Special: Mexican dinner. Entrees: potato baked chicken, barbecue spare ribs. Soup: tomato. Vegetables: squash, ranch beans, Spanish rice, broccoli.

Wednesday

Astronomy seminar — The JSC Astronomy Seminar will meet at noon May 5 in Bldg. 31, Rm. 129. A videotape on "Access to the Space Frontier" will be presented. For more information, call Al Jackson at 333-7679.

Blood Drive — MITRE will sponsor a blood drive from 12:30 to 3:30 p.m. May 5-June 3 in the parking lot at 1120 NASA Road One. For more information, contact Irwin Feig at 333-0935.

Toastmasters meet — The Spaceland Toastmasters Club will meet at 7 a.m. May 5 at the House of Prayer Lutheran Church at the corner of Bay Area Blvd. and Reseda Drive. For more information, call Jim Morrison at 480-9793.

Cafeteria menu — Special: baked meatloaf with Creole sauce. Entrees: baked scrod, liver and onions, ham steak. Soup: seafood gumbo. Vegetables: beets, Brussels sprouts, green beans, whipped potatoes.

Thursday

Cafeteria menu — Special: smothered steak with dressing.

Entrees: chicken and dumplings, corned beef with cabbage. Soup: beef and barley. Vegetables: spinach, cabbage, cauliflower au gratin, parsley potatoes.

Friday

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

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

May 12

Toastmasters meet — The Spaceland Toastmasters Club will meet at 7 a.m. May 12 at the House of Prayer Lutheran Church at the corner of Bay Area Blvd. and Reseda Drive. For more information, call Jim Morrison at 480-9793.

Astronomy Seminar — The JSC Astronomy Seminar will conduct an open discussion meeting at noon May 12 in Bldg. 31, Rm. 129. For more information, call Al Jackson at 333-7679.

Freedom Fighters meet — The Space Station Freedom Fighters will meet at noon and 5 p.m. May 12 in Rm. 160 of the McDonnell Douglas Tower, Space Center Blvd. and Bay Area Blvd. For more information, call David Cochran at 482-7005.

May 19

Astronomy seminar — The JSC Astronomy Seminar will meet at noon May 19 in Bldg. 31, Rm. 129. Dr. Hans Blome of the German Aerospace Research Establishment, will speak about the "Cosmic Black Body Background and the Big Bang Model of the Universe." For more information, call Al Jackson at 333-7679.

Toastmasters meet — The Spaceland Toastmasters Club will meet at 7 a.m. May 19 at the House of Prayer Lutheran Church at the corner of Bay Area Blvd. and Reseda Drive. For more information, call Jim Morrison at 480-9793.

May 20

Technical symposium — The American Institute of Aeronautics and Astronautics Houston Section will present its 18th annual Technical Symposium May 20 at the University of Houston-Clear Lake. For more information, call Dick Bennett at x44532.

May 26

Astronomy Seminar — The JSC Astronomy Seminar will meet at noon May 26 in Bldg. 31, Rm. 129. Al Jackson will discuss "Rockets and Explosions at Black Rock Desert, Nevada." For more information, call Al Jackson at 333-7679.

Freedom Fighters meet — The Space Station Freedom Fighters will meet at noon and 5 p.m. May 26 in Rm. 160 of the McDonnell Douglas Tower, Space Center Blvd. and Bay Area Blvd. For more information, call David Cochran at 482-7005.

JSC

Swap Shop

Swap Shop ads are accepted from current and retired NASA civil service employees and on-site contractor employees. Each ad must be submitted on a separate full-sized, revised JSC Form 1452. Deadline is 5 p.m. every Friday, two weeks before the desired date of publication. Ads may be run only once. Send ads to Roundup Swap Shop, Code AP3, or deliver them to the deposit box outside Rm. 147 in Bldg. 2. No phone or fax ads accepted.

Property

Rent: Galv condo, furn, sleeps 6, Seawall & 61st St, cable, wknd/wkly/daily. Magdi Yassa, 333-4760 or 486-0788.

Sale: LC lot, 82' x 130', \$9.5k. x36514.

Rent: Pecan Forest 3-3-2, FPL, fenced, clean, no pets, \$795/mo. 554-6200.

Sale: Seafarer TH, 2-2.5-1, fans, FPL, priv deck, cath ceiling, refrig/W/D. 326-2981.

Sale: University Place TH, 2-2.5-1, FPL, Dave, x38156 or Herb, x38161.

Rent: Arkansas cottage overlooking Blue Mtn Lake, furn, wooded, 4 ac, screened porch, antiques, \$250/wk, \$50/day. x33005 or 538-4141.

Lease: Pipers Meadow 3-2-2, carpets, drapes, FPL, fenced, built-ins, \$825. 538-3352.

Lease: Egret Bay condo 2-2, approx 1100 sq ft, FPL, new paint/carpet, 2 ceiling fans, W/D, cov parking, storage, no pets, no smokers, \$550 + 1 mo dep. x33340 or 286-7219.

Rent: Southern Colorado 2 BR house, furn, sleeps 5, close to skiing, fishing, no smoking, no pets, day/wk/mo. Bob, x30825 or 998-7372.

Sale: LC 4-2-2Cp, approx 1600 sq ft, new roof, carpet, vinyl, paint, A/C 2 yrs old, no MUD tax, \$63.5k neg. x37837 or 332-7658.

Lease: Heritage Park 3-2-2, formal, high ceil, FPL, garage opener, patio, \$815/mo + dep, pet OK. 486-5527.

Sale: Alvin 3-2 on 2 ac. Katie, x47687.

Sale: Nassau Bay 4-2-2, 2000+ sq ft, 2 blks to water, updated interior includes carpet, tile, refinished den parquet floor, new furnace, fenced. 482-8800.

Lease: Webster condo 2-1, new paint, carpet, FPL, all appliances, patio, avail 6-1, \$495/mo. x31275 or 486-0315.

Sale: Dickinson Bayou Water Front 4-2.5-2, pool, 100 yr old trees, WB, FPL, volleyball and horseshoe setup, \$224k. x34354 or 337-1640.

Rent: Dickinson 4-2-1, formals, FPL, new carpet, paint, \$700/mo. 534-2179.

Rent/Sale: Baywind II condo 1-1, W/D, refrig w/ice maker, dishwasher, FPL, near pool, ground floor, \$425/mo. avail immed. Steve, x49625 or 486-8047.

Sale: Pearlard 4-2.5-2, game rm, formals, sun room, jacuzzi, marble vanities, ceiling fans, \$104k. Gloria, 480-2771 or 485-7555.

Cars & Trucks

'82 Mercedes 300SD, silver, blue leather, loaded, ex cond, \$11.9k. Randy, 996-8471.

'71 Corvette coupe, green, new saddle int, orig engine, \$10.5k. Bob A., x34409 or 393-1670.

'91 Chevy S-10 Blazer, dk blue, lt blue int, ex cond, Tahoe pkg, \$10.5k. Bob A., x34409 or 393-1670.

'80 Mercedes 300SD, yellow, ex cond, \$8.8k. George, x33180 or 479-6330.

'90 Chevy Cheyenne PU, 5 spd manual, cassette player, tilt wheel, cruise, V6, Fleetside, blue, \$5.5k. x36564.

'83 Honda Accord, 5 spd, PS/PB, standard trans, 4 dr, 84k mi, new tires, \$1475. Jim, 474-4506.

'91 Toyota MR2, red, T-tops, leather, ABS, new tires, ex cond, low mi, \$15k. 282-4260.

'82 Corvette, ex cond, 74k mi, glass T-tops, adult owner, \$8k. 474-4421.

'85 Renault Alliance, 4 dr, auto, A/C, ex cond, \$1.3k. 488-2113.

'71 Chevy Nova, V8, orig owner, \$4.5k. 480-1998.

'80 Triumph Spitfire 1500, restored, good cond, two tops, BO over \$4k. x38202 or 992-4081.

'85 Camary LE, BO. 771-1012.

'59 Chevy PU for restoration, BO. 334-2335.

'86 Nissan 4x4 PU, king cab, BO. 334-2335.

Boats & Planes

'19 Aristocrat 165hp Mercruiser, new eng, rebuilt OD, ex cond, \$3.5k. 339-1957.

'85 Bayliner Cuddy 1950, 125 Volvo I/O, depth finder, cover, porta-potie, ex cond, \$5.5k. 427-5967.

Half interest in IFR P-35 Beech Bonanza, \$15k. Steve, 244-9625.

18' Hobie Cat SE Magnum, ex cond, trlr, all extras incl, \$3.5k OBO. Lance, 335-2457 or 996-5658.

'91 Cajun 1850 Fishmaster, center console, V-hull, shallow draft, '93 Merc 135, PT&T, SS prop, trolling mtr, 40 gal fuel tank, 3 batt, 72 qt Igloo aerator baitbox, \$11k. Gary, 534-3080.

Cycles

'85 Honda Nighthawk CB 650 motorcycle, 16.7k mi. ex cond, runs great, helmets, windscreen, \$2.5k. x31484 or 280-8563.

'88 Honda Hawk 650cc motorcycle, 2 helmets, \$2k. 481-0272.

'88 Honda Hurricane 600, new tires/batt, 12k mi, scratched but runs great, \$2.1k. Wally, x36440 or 326-2664.

Man's and woman's Schwinn 10 spd trail bikes, wide tires, \$225 both. x30740 or 645-6958.

'92 XO-Z Bridgestone Hybrid bicycle, 52 cm, pearl white w/blue letters, Mr. Tuffy tire liners, rapid fire shifters, Shimano components, 21 spd, \$350. Deborah, 335-2694 or 338-6733.

Audiovisual & Computers

HP Desk Writer ink jet printer, Mac interface, ex cond, \$275; HP Paint Jet color printer/plotter, unused, IBM interface, \$1.25k, 488-5564.

Mac IICI 8/234 w/coprocessor and accelerator, 14" Sony Trinitron monitor, extended kybd, System 7 SW, was \$5k, now \$3.5k OBO. x37038 or 333-2938.

Mac SE, 4 MB RAM, 20 MB HD, carrying case, \$850. Mike, 333-4028.

Nintendo entertainment system, 3 controllers, pwr glove, pwr pad, light gun, 9 games, \$180 OBO. Keith, 482-5190.

IBM PC XT clone, 640k RAM, 2 5.25" FD, mono CRT, Panasonic printer, \$250. Dave, x36838 or 482-9535.

Brother word processing typewriter, 12k character mem w/unlimited files, auto fonts and formatting, 40 char display, spellcheck, \$100. Beth, x33078.

Mac 8.24 display card, 16.8 million colors, \$160 OBO; MacPaint, \$10; Mark Williams C for Atari ST, \$25. Brian, 333-7695 or 334-1030.

Pets & Livestock

Sheltie, 10 mo old, \$100. 771-1012.

AKC boxer, male, tan and white markings, blk mask face, 9 mo old, good tempered, current shots, on heartwork preventative, \$100. Merrell, x37570.

Household

French Provincial sofa, fruitwood, beige, \$350; 4 lots at Rosewood Cemetery, 282-4849 or 941-3262.

Velor loveseat and matching chair, earthtone colors, good cond, \$75. x53776.

48" diam round glass breakfast rm table, good cond, \$250 OBO; Qn sz waterbed, new heater, dk brn, incl headboard, footboard, padded side rails. Rick, x38088 or 480-0443.

Blue wingback chair, ex cond, \$100. Sharon, 480-2646.

3 pc blk sectional sofa w/small inset stereo, matching 7 pc dinette, 2 yrs old, \$1000 for all, will sell separately. Jerry, x38835 or 474-3931.

White baby bed, no matt, \$40. x47049.

Blk marble base w/glass table top, 4 chairs, cream upholstery, \$600; Lifestyle treadmill, \$150. 334-1773.

Stereo/radio console record changer, \$75; 90" couch brocade and chair, \$300; asst inlay marble tables, \$100 ea. 488-3588.

Wanted

Want set of left handed golf clubs. Steven, x47207.

Want students to join Russian language class taught by a Rice University professor; students should be at intermediate/beginner level w/at least 6 mo to 2 yrs experience. Rick, x47373 or Keith, x38024.

Want inexpensive woman's bike w/pedal brakes. 486-2189.

Want two-person touring kayak. Bob, 482-9576.

Want two children's bicycles, boys age 5 and 7. Andy, 332-9105.

Want used CDs, rock, country, R&B, jazz. 339-1957.

Want Mac II computer or equivalent, Mac only. 280-8796.

Want used encyclopedias, 1985 to present. x45064.

Want Nordic Track ski exerciser, washer, riding mower. 334-2335.

Miscellaneous

Skateboard ramp, \$50. Barbara, 554-6200.

China hutch, \$300; custom couch, \$100; oak table/chairs, \$70; lawn mower, \$100; weed eater, \$50, misc stereo equip and garden tools. x44570 or 482-6879.

Aesthetician equip, contour airlite chair w/back, hi freq machine, steamer, reclining chair, mag lamp w/stand. 486-2189.

450 lb transmission jack, ball bearing rubber caster wheels, 1/2" drive, lifts to 22", \$95. Mike, x58318.

Antique Emerson ceiling fan, rebuilt, \$200 OBO. 488-8493.

Nautilus exercise machine for firming stomach, was \$500, now \$275. 488-8493.

Lady's Nishiki bicycle, small frame, 10 spd, 20 yrs old, heavy but in good cond, \$25; Toro 20 inch self-propelled lawn mower, side discharge, good cond, \$25. Bob Adams, x32567 or 488-3314.

Almost new Franklin planner leather cover, shoulder purse style, blk aniline leather, was \$155, now \$100. Katie, x33185.

Valley Mini skateboard w/Venture trucks, NSK bearings, pink bullets, Santa Cruz rails, \$50. 326-2307.

Kubota L2550, 148 hrs, 5' disk, 5' box blade, 52" Kubota roto-tiller, post hole digger w/9" and 12" augers, 16' tandem drive-on tilt trlr w/brakes, \$11k. 471-4100.

Four mag-style 14" hubcaps, \$25 for all. James, x40045 or 332-1129.

Skateboard ramp, \$75; park sz jungle gym, \$295; Turbo Graphics 16 plus 4 games, \$95 OBO. 554-6200.

RC helicopter, new, never flown, ready to fly, \$625. 480-3424.

President's Gold lifetime membership, \$630 OBO, monthly dues, \$5. Lea, 333-7306.

Scuba gear, complete set, BC, wet-suits, knife, flag, octopus, weight belt, goggles, fins, booties and bag, fits 6' male, \$400. Eddy, x35710 or 286-2958.

Beautiful off white wedding gown, fully decorated w/pearl beads and sequins, lace back w/pearl buttons, chapel length train, fits sz 6-8, was \$900, now \$400. Laura, 335-2388 or 532-1557.

RCA 26" colortrak console TV, 5 yrs old, stereo, cable ready, remote, \$200; Budweiser dart board w/wooden cabinet, \$15; toddler bicycle seat, \$15. x45035.

"The Original STEP" for step aerobics, platform is 4" high w/steps to raise it 6" or 8", incl STEP hand weights and 2 STEP training videos, \$50. Deborah, 335-2694 or 338-6733.

Ajay Octa-Gym exercise system, \$50 or deal for used encyclopedias. x45064.

Golf clubs, 2 sets, 2 PW & metal woods, bag, male sz 10.5 golf shoes, golf balls, one set new Tournament series used twice, other has new grips, \$200. Eddy, x35710 or 286-2958.

Lounge chair, medical type, used for dialysis treatment. E. Rubenstein, x34807 or 532-2211.

Weight bench, \$25. 334-2335.

President and First Lady gold charter membership, 48 hr racquetball reservations, free child care, good all times at all clubs, \$450 OBO. Brian, 333-7695 or 334-1030.

Technics CD player, \$65; Morantz digital monitor amplifier, \$60; Morantz audio digital timer, \$25; Morantz remote control receiver, \$25; Pioneer black walnut 2' speakers, \$60; English wool rug, \$5; Garard AM/FM dual cass boom box, \$50; ironing board, \$5; Eureka canister vacuum w/all attachments, \$65, all items OBO. 332-7201.

Spots on a Globe

HERCULES marries images, geolocation for unprecedented topography study

By Kelly Humphries

As Discovery orbited 160 nautical miles above the Earth earlier this month, its crew snapped some remarkable images that are allowing environmental, oceanographic, meteorological and military observers to study the planet's topography as never before.

What is unprecedented about these electronic still camera images is that they come with precise, detailed information on what part of the globe is in each frame.

More than 100 of the images — taken using HERCULES, or the Hand-Held, Earth-Oriented, Real-Time, Cooperative, User-Friendly, Location-Targeting and Environmental System — were downlinked during the flight and another 500 were stored on computer hard disks that are being processed now.

The HERCULES system is a joint project of about 30 scientists, engineers and technicians — 10 from NASA, seven from the Air Force, five from the Navy, three from the Army and four from the Defense Mapping Agency.

JSC's Don Harris was HERCULES project manager, and Air Force Capt. John Hennessey of the Space and Missile Systems Center Operating Location at JSC; and Naval Reserve Cdr. Hawkes Abbott of the Naval Space Command led the project for the Department of Defense's Space Test Program.

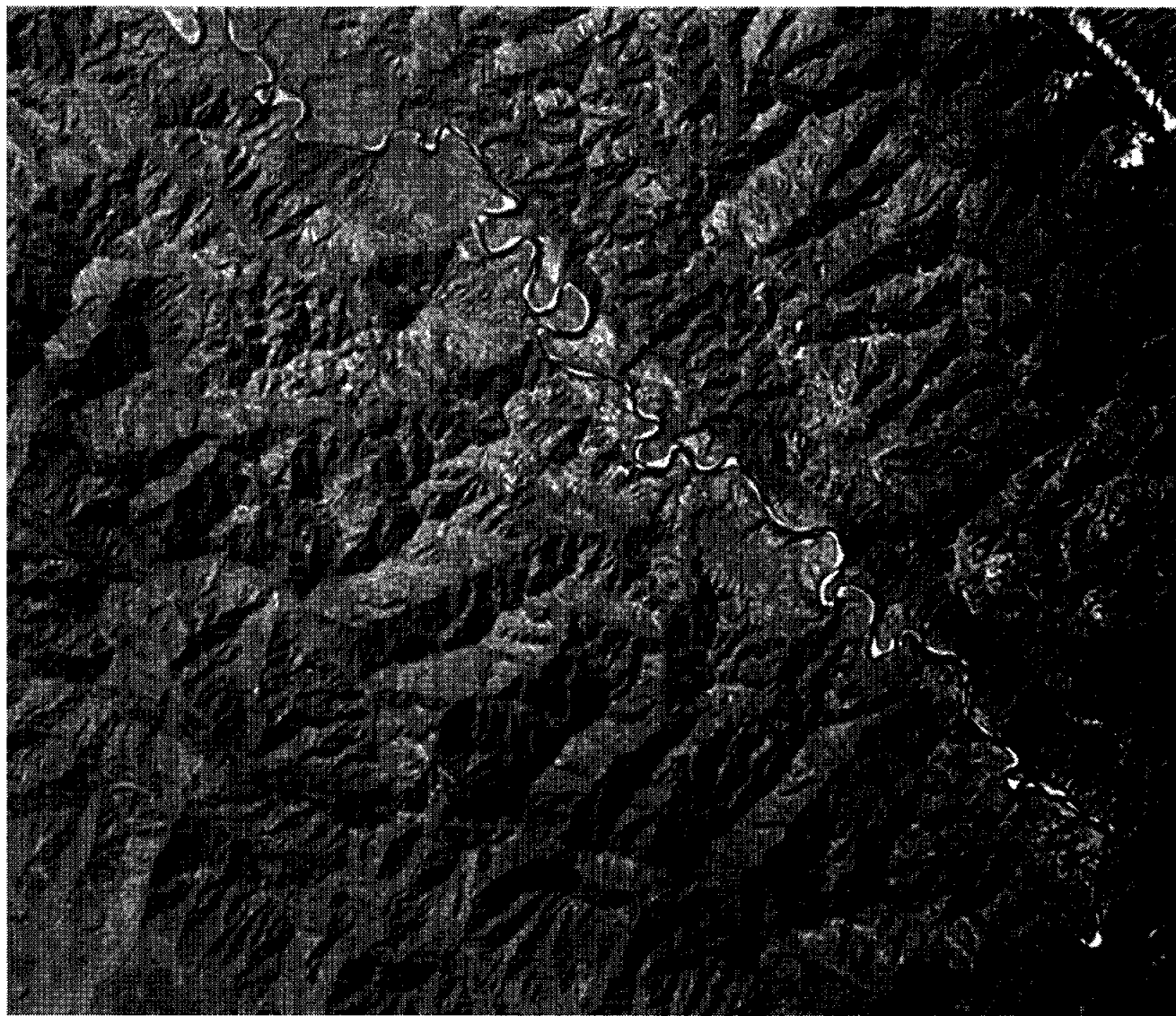
Doug Holland of JSC's Flight Crew Support Division developed the Electronic Still Camera that stores the images in a digital form with a modified Nikon F-4 camera along with a modified GRiD portable computer that serves as the crew interface to the system.

Scientists at the Naval Research Laboratory's Naval Center for Space Technology developed the HERCULES Attitude Processor and the Honeywell ring-laser gyro associated geolocation software that calculates the geographical coordinates of each image.

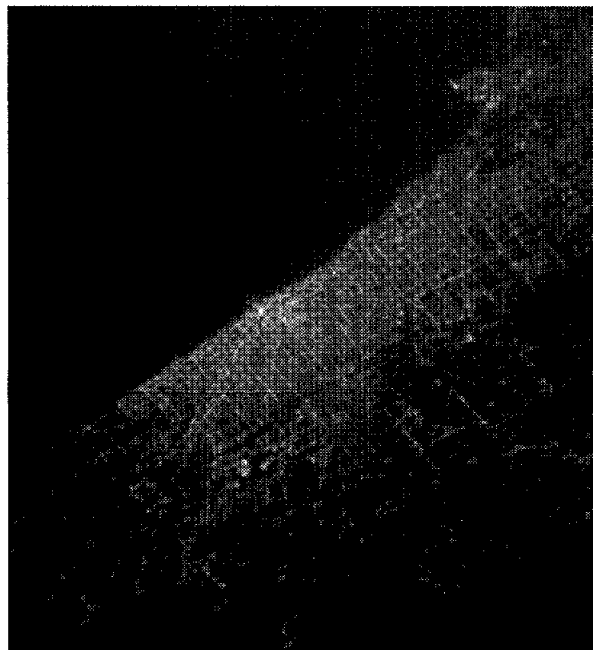
Harris said one of the hallmarks of the project was the cooperation among many organizations within NASA and the Department of Defense, and the ability to make the project work for a total investment of just \$2.5 million.

The test objectives for STS-56 were a retest of the geolocation equipment, which flew successfully on STS-53, to see whether very long lenses can bring areas as small as 2 1/2 miles square into focus, to check the ability of an image intensifier to take night shots, and to send images across the country and to Navy ships in as little as 15 minutes.

"We don't have the full picture back yet, but I think everyone is extremely pleased with what we've seen so far," Harris said. □



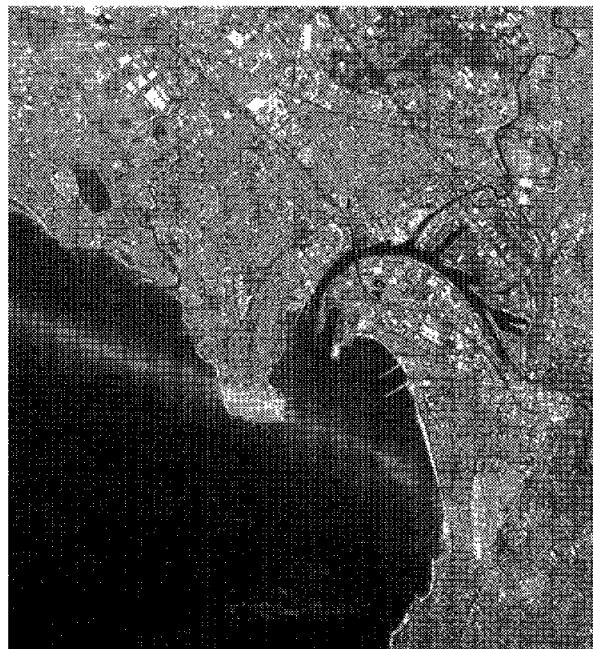
HERCULES
STS-56
WGS-84 Position
27.822 North
84.173 East
04/10/1993
UTC :03:13:48.2500
MET :1/21:44:48/00
ESC01039.IMG
Lens : 180mm
Shutter Speed:
1/500 sec
Mohami Kali River
in the Himalayas
Near Kathmandu



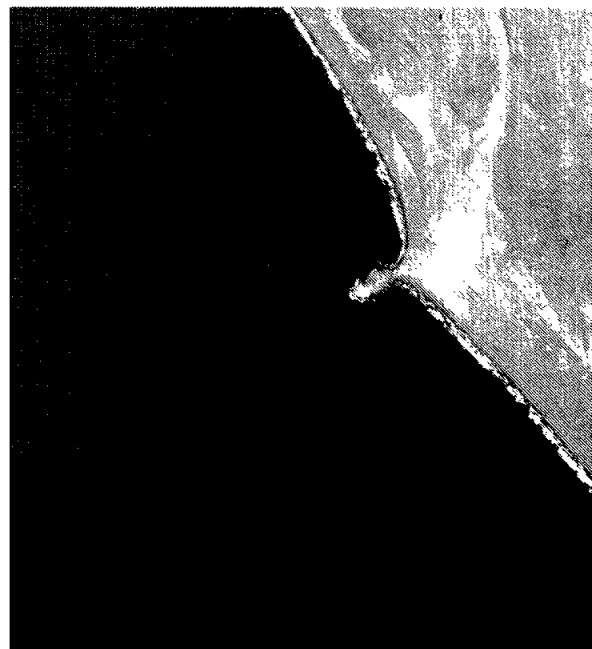
HERCULES
STS-56
WGS-84 Position
41.871 North
87.594 West
04/10/1993
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MET :2/00:21:39/00
ESC03032.IMG
Image Intensifier
Shutter Speed:
1/60 sec
Chicago, IL.



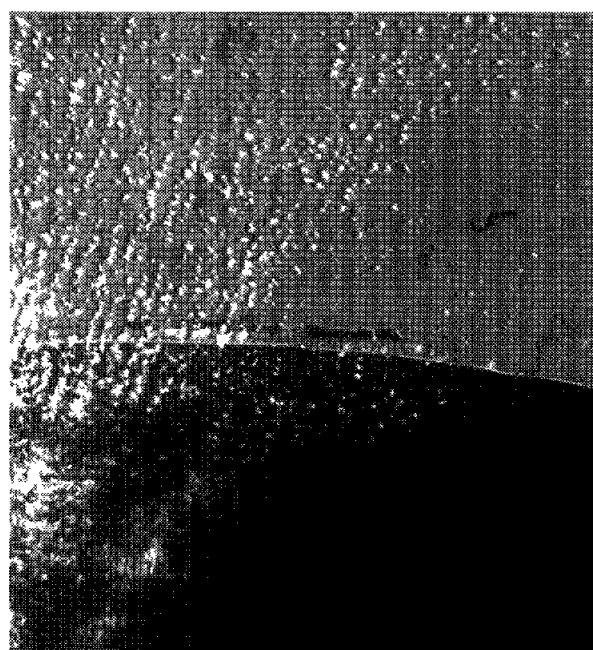
HERCULES
STS-56
STS-56 Shuttle Crew
Clockwise from
upper left :
Kenneth Cockrell
Stephen Oswald
Kenneth Cameron
Ellen Ochoa
ESC07023.IMG
Photo taken by:
Michael Foale



HERCULES
STS-56
WGS-84 Position
37.86 South
144.873 East
04/11/1993
UTC :2:09:50.3100
MET :2/20:40:50/0
ESC07020.IMG
Exp Comp. : -2/3
Melbourne, Victoria
Australia



HERCULES
STS-56
WGS-84 Position
15.593 South
74.851 West
04/10/1993
UTC :15:29:54.3400
MET :2/10:00:54/00
ESC06001.IMG
Shuttle Speed :
1/500 sec
Exp Comp. : -2/3
Lomas Point
Peruvian Coast
near Yauca



HERCULES
STS-56
WGS-84 Position
25.278 South
33.310 East
04/12/1993
UTC :08:13:54.9300
MET :4/02:44:54/00
ESC09004.IMG
Soa Martino,
Mozambique



HERCULES
STS-56
WGS-84 Position
38.491 North
8.897 West
04/12/1993
UTC :07:55: .4000
MET :4/02:26:00/00
ESC09001.IMG
Setubal, Portugal
Harbor area South
of Lisbon
On the Rio Sado

Global ozone levels dip lower than ever before

In the second half of 1992, global ozone levels were 2 to 3 percent lower than any previous year and 4 percent lower than normal, based on extensive data analysis from NASA's Nimbus-7 satellite.

"We are seeing lower global ozone values than we've ever seen before," said James F. Gleason, Ph.D., an atmospheric scientist with the University Space Research Association working at Goddard Space Flight Center. "We predicted lower ozone in 1992, but nothing like the values we actually observed."

The very lowest levels were observed in December 1992 when the global average was approximately 280 Dobson units. By comparison, a normal December value is about 293 Dobson units. Previously, the

lowest level of 286 Dobson units was observed in December 1987.

Ozone, a molecule made up of three atoms of oxygen, is primarily in the upper atmosphere, where it absorbs harmful ultraviolet radiation from the Sun. A Dobson unit is the physical thickness of the ozone layer if it were brought to the Earth's surface (300 Dobson units equals 1/10th of an inch).

Extensive analysis of independent data from the National Oceanic and Atmospheric Administration-11 Solar Backscatter Ultraviolet Spectrometer and the Russian Meteor-3 Total Ozone Mapping Spectrometer confirm the Nimbus-7 TOMS data. Comparison of all systems with the ground-based World Standard Dobson Instrument and the Dobson network indicates that the

satellite instrument measurements are consistent during the period.

The 1992 ozone levels were especially low in the mid-latitudes of the northern hemisphere. The December 1992 mid-latitude ozone levels were 9 percent below normal. The low mid-latitude ozone values continue into 1993.

The January 1993 ozone levels were 13-14 percent below normal. Preliminary observations of March 1993 mid-latitude ozone show that the levels continue to be 11 to 12 percent below normal.

Preliminary results from the Shuttle Solar Backscatter Ultraviolet instrument, flown as part of the recent ATLAS-2 mission aboard the Space Shuttle *Discovery*, also observed low springtime, northern hemisphere ozone

levels in agreement with Nimbus-7 TOMS. Only in the equatorial region were ozone values well within the range of the previous year's data.

Scientists say they can only speculate on the cause of the 1992 low ozone values. While the exact cause is unknown, the low ozone may be related to the continuing presence of particles produced in the upper atmosphere following the eruption of Mount Pinatubo in the Philippines in June 1991.

Mission to Planet Earth is NASA's long-term, coordinated research effort to study the Earth as a global environmental system. It is comprised of satellites such as Nimbus-7 and UARS, shuttle missions such as this month's flight of ATLAS-2 and airborne and ground-based studies.

Space Center Houston hosts Shepard visit

Space Center Houston will host a visit by the first American to be launched into space at 11:30 a.m. Wednesday.

Mercury and Apollo astronaut Alan Shepard will speak to Space Center Houston visitors on the 32nd anniversary of his May 5, 1961 suborbital Mercury-Redstone flight.

JSC employees will be allowed free access to the plaza area by presenting their work badges at the turnstiles.

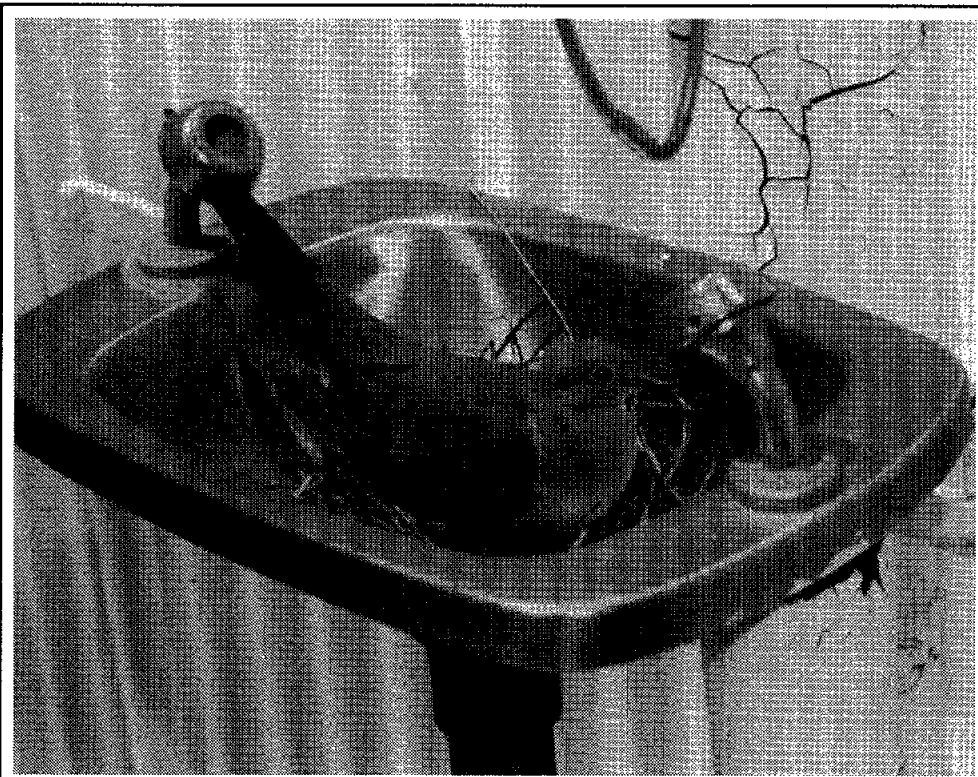
JSC workers also will be allowed access today for the post-flight briefing of the STS-56 crew, which is scheduled for 12:30 p.m.

Lunch celebrates National Contract Managers week

The Space City Houston chapter of the National Contract Management Association will celebrate National Contract Managers Week, May 3-7 with a luncheon at 11:15 a.m. today.

Judith Morehouse, director of government business relations for the Boeing Company in Washington, D.C., will speak, and the Contract Manager of the year Award will be presented.

Social hour begins at 11:15 a.m., lunch at 11:45 a.m. and the program at 12:15 p.m. Government employees should call Lisa Rea at x38395; contractors, Jeanette Holt at 480-7200.



A BIRD IN THE FLUSH—A dove makes a comfortable nest in an eye wash basin outside Hangar 135 at Ellington Field. The bird, which was undisturbed by the photographer's attention, is caring for two eggs in its nest made of scavenged twigs.

JSC Photo by Jack Jacob

Bike to work day coming

A number of JSC workers are planning to participate in "National Bike to Work Day" on May 11, and they're inviting other civil service and contractor employees to join them.

The Center Operations Directorate's Human Resources team discovered the event while discussing ways to help support recent Clean Air Act Amendments, which will put increased demands on employers to encourage their workers to carpool and use other pollution-reducing methods of transportation, said Susan Shellhase.

"When you bike in on Tuesday you will burn those extra calories and support the Clean Air Act Amendments of 1990," she said.

The rules are simple, she said: Be sure to follow all Texas traffic rules and regulations plus all 13 JSC Vehicle Code Rules for bicycles. Those include riding not more than two abreast except on special bike paths, walking bikes across dangerous intersections, not weaving in and out of traffic, riding as near to the right side of the road as practical, having good brakes and a white light and red reflector when riding at night.

Cyclists also are urged to wear helmets and lock their bicycles in racks.

British Airways has donated two round-trip airline tickets to London that will be won by one Houston cyclist who participates in the event. Entry forms are available through Shellhase in Bldg. 45, Rm. 730, and are due by May 11. For more information, call Shellhase at x33199.

Manned Flight Awareness honorees see STS-56 night launch

Sixteen JSC civil service employees, recipients of NASA's Manned Flight Awareness Award, viewed the spectacular night launch of STS-56 on April 8.

The MFA award, given to a small percentage of NASA and contractor employees, recognizes outstanding support of America's space program. STS-56 honorees and the directorate office they

represented were:

Rob Banfield, Mission Operations; Martha Bishop and Nancy Liounis, Administration; Mike Brennan and Hanan Dabis, Center Operations; Gerry Chapman, Office of the Comptroller; Dave Christianson and Bob Davis, Engineering; Sue Ann Corke, Orbiter and GFE Projects Office; Dee Johnson, Space Shuttle Integration and Operations Office;

Phyllis Martz, Safety, Reliability and Quality Assurance Office; Lisa Navy, Space and Life Sciences; Mara Pena, Public Affairs Office; Regor Saulsbury, White Sands Test Facility; Karla Smith, Flight Crew Operations; and Judy White, Space Station Projects Office.

The JSC honorees were among 262 award winners who were welcomed at a reception in their

honor by Kennedy Space Center Director Bob Crippen, Space Shuttle Program Director Tom Utsman and Associate Administrator for Space Flight Jeremiah Pearson. Astronaut Jim Halsell presented certificates and pins to the honorees after a KSC tour and breakfast.

The next MFA honoree event is scheduled to coincide with the STS-58 launch in August.

Hubble repair tools, techniques to be tried this summer

(Continued from Page 1)

space shuttle missions, it is necessary to formulate a work schedule that represents as realistic a timeline as possible to accomplish the mission objectives."

Planning currently calls for at least five water tank training sessions that include support from the Mission Control Center, called joint integrated simulations, lasting

between 10 and 36 hours. In addition, many stand-alone underwater training "runs" will practice individual tasks in each space walk.

Various refinements to the specific tasks on each space walk will be made based on actual training experience during the months prior to the mission. Also, lessons learned from other space walks leading up to the flight will be

valuable in assisting the STS-61 crew in its training techniques.

Endeavour's June flight and *Discovery's* July mission both will include space walks to evaluate some of the unique tools to be used on the HST mission. The evaluations will help in better understanding the differences between the actual weightlessness of space and the ground training in

the water tanks at JSC and the Marshall Space Flight Center.

Also, the in-flight space walking experiences will assist in gaining further insight into the time required for the various tasks and expand the experience levels among the astronaut corps, the flight controllers and trainers.

Designed to be serviced by a shuttle crew, Hubble was built with

grapple fixtures and handholds to assist in the capture and repair procedures.

The telescope was launched aboard *Discovery* in April 1990. At that time the NASA mixed fleet manifest showed the first revisit mission to HST in 1993 to change out science instruments and make any repairs that may have become necessary.

'Take Your Daughter to Work' day urges girls to cultivate high career aspirations

(Continued from Page 1)

we were going to do it again next year and if more people could participate.

"There were girls who said they wanted to come and work at JSC. One wanted to be a mathematician, one wanted to be an astronaut. They all had high aspirations and I think that's good to see," Adams said.

The girls and their sponsors started off the day in Teague Auditorium, hearing brief talks from five women who have risen to the top in fields non-traditional fields for women. One was Astronaut Kathy Thornton. Another was Jeanne Crews, head of the Hypervelocity Impact Laboratory. Still another was Deborah Harm, the head of

the Preflight Adaptation Trainer Laboratory.

Then they got an additional treat, a downlinked message from STS-55 Pilot Tom Henricks, who had planned to bring his daughter, Katie, to work with him but couldn't because his work took him into orbit.

"We on the crew encourage all of you to take math and science as much as you can just as we did during school so that you can join the NASA team," Henricks said.

After the briefings, they visited the labs they had heard about earlier, and after lunch, they paired off and went to work with their sponsors.

When Jennifer Morrison was asked if she would recommend the

experience to someone else, she took time out from looking at lymphocyte cultures with her father, Dennis, in the Bldg. 37 Space Radiation Laboratory, to give an emphatic yes. "It's fun, you get to do a lot of stuff. It's interesting. It's not a boring old day at school."

"This is important to the girls as well as the employer," Adams added. "It gives us an opportunity to see the workers of tomorrow and sparks an interest in them to look at us as a future employer in the math, science and engineering areas."

Also participating in the day were 10 girls from Richey Elementary School in Pasadena, who were paired with volunteer civil servants from JSC.

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.

Dates and Data submissions are due Wednesdays, eight working days before the desired date of publication.

Swap Shop ads are due two weeks before the desired date of publication. Send ads to Mail Code AP3, or drop them off in the deposit box outside Bldg. 2, Rm. 147.

Editor Kelly Humphries
Associate Editor Kari Fluegel

Crew copes with orbiter systems inconveniences

(Continued from Page 1)

NASA's fleet, switching to the backup orbiter refrigerator/freezer, hooking up a backup waste water containment vessel and capping a nitrogen line that pressurized the primary tank.

Flight controllers at JSC had developed an in-flight maintenance procedure to repair the power cable on the refrigerator/freezer, which is used to store biological samples from the Spacelab experiments, and were looking at ways to deal with a shut down of *Columbia's* flash evaporator system.

Landing was scheduled for 7:53 a.m. CDT Wednesday at KSC, but could occur on Thursday if the planned nine-day mission is extended for additional science.