

# Space News Roundup <br> Vol. 34 



Top: Kuiper Airborne Observatory Mission Director Wendy Whiting demonstrates for students how the scientists and air crew communicated with
ground-based students during last Thursday's mission to observe the planet Jupiter. Left: Science students get up close and personal with one of the control consoles used for the KAO's astronomical observation missions. Students from Seabrook Intermediate Science Magnet School, Bellaire High School, the High School for the Engineering Professions, E. E. Worthing High School, all of Houston, Mae Smith ElemSavala Elementary School, Austin, toured the observatory at Ellington Field.


## Students tour airborne observatory

By Billie Deason
Following their virtual trip aboard Ames' Kuiper Airborne Observatory via live television downlinks and real-time Internet connections, local area students were treated to a tour last Friday of the KAO at JSC's Ellington Field. Visiting the KAO were about 200 science students from Seabrook Intermediate Science Magnet School, Bellaire High School, the High School for the Engineering Professions, E. E. Worthing High School, all of Souston, Mae Smith Elementary Elementary School, Austin.

On Thursday, the students had participated in the "Live from the Stratosphere" interactive astronomy education program. During my education program. During
Thursday's flight to observe the
planet Jupiter, two-way contact with the astronomers aboard the C-141 airborne astronomy observatory enabled students to work real-time with the scientists and flight crew and to interact with each other. Student participants at the Houston Museum of Natural Science joined students and teachers from schools, planetariums and museums in North Dakota, Mississippi, Georgia, Illinois, New York and Washington, D.C.
Participants in the live education activities prepared for their astronomy work by tuning in to a briefing from Ames Research Center, and by completing handsi-on classroom activities prior to the Jupiter mission. The world's only airborne astroThe world's only airborne astronomical research facility, the KAO is a modified C-141 aircraft carrying a typical mission, the KAO flies at

41,000 feet, above 85 percent of the Earth's atmosphere and more han 99 percent of the Earth's water vapor. In this clear, dry environment, astronomers can study radiant heat patters from stars, planets and other celestia sources-radiation normally absorbed by atmospheric water vapor before reaching the Earth's surface.
The KAO ended its Texas visit with a late Friday night departure or a five-hour live flight observing he star-forming regions M17 and W51, the Rig Nebual-a place where a star has died in spectacular fashion-Saturns and its moon, Titan and the face-on spiral galaxy, M33.
Following that mission, the KAO returned to home base at Ames Research Center in California.

## Columbia tries for lucky seven

By James Hartsfield
Columbia is now scheduled for its seventh launch attempt at 8:50 a.m. CDT today on STS-73 following a scrubbed launch attempt last Sunday due to weather and a four-day delay to allow a commercial Atlas rocket to attempt launch.
The Atlas Centaur, carying a Navy communications satellite, was unsuccessful in launch attempts Tuesday and Wednesday mornings due to weather. Columbia's launch attempt Sunday was p.m. CDT after a cold front p.m. CDT after a cold front Space Center, creating Space Center, creating ain showilings unacceptable for launch. The crew -Red Team members Commander Ken Bowercommander Ken BowerCommander Kathy Thornton and Payload Specialist Albert Sacco and Blue Team members Mission Specialists Cady Coleman and Mike Lopez-Alegria and Payload Specialist Fred Leslie-remained at KSC during the delay this week. The crew's around-the-clock inflight schedule remains the same for a launch today, with Red Team members approximating a Houston day shift and the Blue Team working what would be a night shift here.
For today's launch, the count down was scheduled to resume a
the T-minus 11 hours mark at 6:30 p.m. CDT Thursday. Fueling of the external tank with liquid hydrogen and oxygen was planned to begin at 12:30 a.m. CDT today.
If unsuccessful today, Columbia could try to launch Saturday as well. After Saturday, however, the AtlasCentaur again moves to the front of the Eastern Test Range line for a launch attempt on Sunday. Shuttle managers would meet folNTSTR $\begin{aligned} & \text { managers would meet fol } \\ & \text { lowing a Saturday scrub to } \\ & \text { determine the future plans }\end{aligned}$ for Columbia, including a possibility of rescheduling the mission to launch after STS-74 completes its November flight to the Mir station.
An on-time launch of Columbia today would lead to a landing at KSC at 5:45 a.m. CDT Nov. 5 Prior to the weather scrub las Sunday, Columbia also had been delayed 24 hours from what had been a scheduled launch attempt on Saturday, Oct. 14, while technicians replaced a faulty general purpose computer in the spacecraft and inspected welds on the main engines. The main engine inspections were due to a crack that developed in a main engine being tested at the Stennis Space Center last week. The crack, in an outlet duct of a high pres sure oxidizer turbopump, was caused by a defective weld. The ultrasound

Please see ATLANTIS, Page 4

## Nominations now due for quality recognition awards

Nominations are now being
accepted for the Quality Assurance Special Achievement and Recognition Program.
This program recognizes NASA contractor and government employ ees who demonstrate and exhibit exemplary performance in contribut ing to high quality products and services in their assigned position Recipients will be presented a certificate, lapel pin and coffee mug with the QASAR logo.
The following criteria should be used in nominating individuals for the recognition:

Recommendations that significantly improve the product process, quality methods, procedures, and/or result in significant quality cost savings and/or significant pro

## Parazynski too tall for Soyuz capsule <br> the safety margins against injury respect in the Russian system."

By Kyle Herring
Astronaut Scott Parazynski, who has been training as backup to Jerry Linenger for a four-month stay on the Russia Mir Space Station, will discontinue his training due to concerns over his ability to safely fit in a Soyuz descent vehicle for landing. At the time Parazynski was assigned, both NASA and the Russian Space Agency understood he was slightly outside the nominal height to fly on the Soyuz capsule that could be used as a contingency that could be used as a contingency
vehicle for returning the Mir crew to Earth. Even though a preliminary evaluation cleared him for training, it evaluation cleared him for training, it was shown during a recent detailed discussion between U.S. and loads and sitting height issues, that
would be unacceptably reduced. "At the time Scott was assigned, we understood there were modifications that could be made that would allow him to use the descent vehicle if that became necessary," said Frank Culbertson, acting director of the Phase I Program. "After discussing all our options and reviewing the available data with the Russians, it is clear that they do not have the latitude or sufficient modification capability on the Soyuz to allow Scott to return to Earth in the vehicle with a level of risk we would be comfortable with Our Russian bollow disappointment in this situation since Scott has achieved such high level of performance and

After a review of the data, NASA and the RSA made a joint decision to discontinue Parazynski's training Parazynski has returned to the U.S Parazynski also was scheduled for a later mission aboard Mir.
"E3ased on the new parameters recently provided concerning the Soyuz capsule, we will be reviewing all crew members currently assigned for training in Russia," Culbertson for tra
said.
Ano
Another astronaut will soon be nominated to replace Parazynski as Linenger's backup.
Parazynski, 34, was a member of Atlantis' STS-66 crew which flew in November 1994. He completed medical school at Stanford Univers ity in 1989.
gram dollar savings.

- Recognizes outstanding performance in promoting/fostering NASA contractor "teamwork" relationships.
- Extended to those who have excelled in contributing actively to support the goals of the NASA cen ter and its programs.
- Recognize exceptional performance including finding problems that were undetected, and provided extraordinary effort in bringing about a corrective action

Recognize personnel who are distinguishing themselves in the quality area by: teaching quality relation courses in colleges/univer sities, serving on technical advisory committees and participating in self-improvement training courses please see NOMINATIONS, Page 4

## Galileo's tape can't rewind



Engineering data returned from NASA's Jupiter-bound Galileo NASA's Jupiter-bound Galleo
spacecraft last week indicates a problem with the spacecraft's tape recorder, project officials reported. recorder, project officials reported.
Project officials say a week Project officials say a week or
more may be required for the problem to be isolated or well-understood, but that the spacecraft remains otherwise healthy and in contact with controllers on Earth. The problem was detected shortly after Galileo took an image of Jupiter and its major moons from 22 million miles away. After taking the three images required for a color photograph to be produced, the tape

Please see GALILEO, Page 4

## Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Store from 10 a.m.-2 p.m. Monday-Thursday and 9 a.m. -3 p.m. Friday. For more information, call x35350 or x30990.
Houston Rockets Basketball: Houston Rockets vs. Minnesota Timberwolves 7:30 p.m. Nov. 11 at the Summit. Tickets cost $\$ 16.50$ and $\$ 22.50$.

Texas Renaissance Festival: Sept. 30 -Nov. 12. Tickets cost $\$ 10.50$ for adults and
$\$ 5.25$ for children $5-12$ $\$ 5.25$ for children 5-12.
Texas Renaissance Festival Bus Trip: Nov. 11. Tickets cost $\$ 17$ for adults and $\$ 12$ for children 5-12.
Deep Sea Fishing: Nov. 5. Fishing tickets cost $\$ 40$ for adult and $\$ 20$ for children. Ride tickets cost $\$ 20$ for adults and children under 12 free.
Halloween'
Children's Halloween Party: 10 a.m.-noon Oct. 28. Tickets cost $\$ 4$ for children and $\$ 2$ for adults.

## Wurstfest: Nov. 4. Tickets cost $\$ 17$ for adults and $\$ 12$ for children. Children 12 and

 under free.University of Houston vs. University of Texas football: Nov. 11, Astrodome, $\$ 15.50$. Houston Aeros Hockey: Houston Aeros vs. Atlanta Knights at 7 p.m. Nov. 17 in the Summit. Tickets cost \$12.5
Sea World: Tickets cost $\$ 23.50$ for adults and $\$ 16.25$ for children 3-11.
Space Center Houston: Discount tickets, adult, $\$ 8.75$; chid
Movie discounts: General Cinema, $\$ 4.75$; AMC Theater, $\$ 4$; Sony Loew's Theater, $\$ 4.75$.
JSC history Suddenly Tomorrow Came: A History of the Johnson Space Center Cost is $\$ 11$.
Upcoming events: Book Fair 9 a.m.-3 p.m. Oct. 24-26 in Bldg. 3 cafeteria

## Gilruth Center News

Sign up policy: All classes and athletic activities are first come, first served. Sign up in person at the Giiruth Center and show a NASA badge or yellow EAA dependent badge. Classes tend to fill up two weeks in advance. Payment must be made in full, in exact change or by check, at the time of
EAA badges: Dependents and spouses may apply for photo identification badges from 7 a.m. 9 p.m. Monday-Friday; and 8 a.m. -4 p.m. Saturdays. Dependents must be between 16 and 23 years old.
Women's self defense: Martial Arts training for women only from 5-6 p.m. Tuesdays and Wednesdays. Cost is $\$ 25$ a month
Weight safety: Required course for employees wishing to use the weight room is offered from 8-9:30 p.m. Oct. 26 and Nov. 14. Pre-registration is required. Cost is $\$ 5$.
Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays.
Aikido: Martial arts class meets from 5-7 p.m. Wednesday. Cost is $\$ 25$ per month. New
Ballroom dancing: Cost is $\$ 60$ per couple. For additional infomation call the Gilruth enter at x 33345 .
Country and Western dancing: Beginner class meets 7-8:30 p.m. Monday. Advance lass meets $8: 30-10 \mathrm{p.m}$. Monday. Cost is $\$ 20$ per couple.
Fitness program: Health Related Fitness Program includes a medical examination screening and a 12-week individually prescribed exercise program. For more information
call Lary Wier at $x 30301$.

JSC

## Today

NMA meets: The Texas Gulf Coast Council of the National Management Association, will sponsor a joint chapter meeting at 5:30 p.m. Oct. 20 at the South Shore Harbour Resort and Conference Center. Local NMA chapters including the Bay Area Community chapter, Hernandez Engineering, HTI-Link, Johnson Controls, Krug Life Sciences, Lockheed Martin, Loral Space Information Systems, JSC, Rockwell, Grumman, Unisys and the U. S. Postal Service will gather for the presentation of the prestigious Gold Knight of Management Award. Bryan Townsend will discuss "Life is an Adventure." For more information, Rhea Ann Saylor at x 32412 .

Cafeteria menu - Special: meat sauce and spaghetti. Total Health: baked potato. Entrees: rainbow trout liver and onions, beef cannelloni, ham steak, fried cod fish, Reuben sandwich. Soup: seafood gumbo. Vegetables: steamed broccoli, breaded okra, cut corn, black-eyed peas.

## Monday

Cafeteria menu - Special: turkey and dressing. Total Health: herb flavored steamed pollock. Entrees: breaded veal cutlet, chicken fajitas, steamed pollock, beef, French dip sandwich. Soup: beef and barley. Vegetables: Brussels sprouts, mixed vegetables, egg plant casserole, winter blend vegetables.

## Tuesday

Space Exploration conference its Nixth Alumni League will host its sixth annual Space Exploration Conference Oct. 24-26 at Space Center Houston. For more inform
Photo club meets: The Bay Are Photo Club will meet at $7: 30$ p.m Oct. 24 at the Faith Covenant

## Dates \& Data

Church. For more information call Kelly Prendergast at x37655

Cafeteria menu - Special: pepper steak. Total Health: barbecue chicken. Entrees: baked lasagna, pork chop and fried rice, turkey a la king, baked chicken, fried cod fish, French dip sandwich. Soup: black bean and rice. Vegetables: breaded squash, steamed spinach, baby car-

Wednesda
Toastmasters meet: The Spaceland Toastmasters will meet at 7 a.m. Oct. 25 at House of Prayer Lutheran Church on Bay Area Blvd. For additional information, contact For additional informa
Astronomy seminar: The JSC Astronomy Seminar will meet at noon Oct. 25 in Bldg. 31, Rm. 129. An open discussion meeting is planned. For more information, call Al Jackson at 333-7679.
Cycle club: The Space City Cycle Club will meet for a 25 -mile ride beginning at 6 p.m. Oct. 25 at the University of Houston Clear Lake soccer field. For more information on this ride and weekend rides call Mike Prendergast at x45164.

Cafeteria menu - Special: Mexican dinner. Total Health: steamed pollock. Entrees: broccoli cheese quiche, spare ribs and sauerkraut, steamed fish, Reuben sandwich. Soup: seafood gumbo. Vegetables: Spanish rice, pinto beans, peas, broccoli.

## Thursday

Radio club meets: The JSC Amateur Radio Club will meet at noon Oct. 26 in Bldg. 16 Rm. 253. For more information call Larry Dietrich at x39198
NASACOM meets: The NASA Commodore's User's Group will meet at 7:30 p.m. Oct. 26 at the Clear Lake Park Bldg. For informa-
on call Glenda Souliere at x31764. AIAA meets: The American Institute of Aeronautics and Astronautics will meet at 6 p.m. Oct. 26 at the Gilruth Center. Steve Lombardi will discuss "Hot Air Ballooning." Tickets cost $\$ 10$ for members and $\$ 11$ for nonmembers. For information call Tanya Bryant at $\times 31175$ or Sarah Follett at 282-3160.
Cafeteria menu - Special: hamburger steak with onion gravy. Total Health: baked potato. Entrees: corned beef, cabbage and new potatoes, chicken and dumplings, meat ravioli, French dip sandwich. Soup: broccoli cheese and rice. Vegetables: navy beans, cabbage, cauliflower, green beans.

## Friday

Chili cookoff: Center Operations will hold its annual chili cookoff at 4 p.m. Oct. 27 at the Giiruth Center. Tickets cost $\$ 5$. For more information call Ginger Gibson at x30596.
Cafeteria menu - Special: tuna noodle casserole. Total Health: broiled chicken breast. Entrees: deviled crabs, broiled pollock, liver and onions, broiled chicken with peach half, Reuben sandwich. Soup: seatood gumbo. Vegetables: Italian green beans, cauliflower au gratin, steamed rice, vegetable sticks

## Oct. 28

Halloween dance: The JSC Employee Activities Association's annual Halloween dinner/dance will be at 7:30 p.m. Oct. 28 at the Gilruth Center. Tickets are $\$ 15$ per person. For additional information
Mavis Ilkenhans, 244-9644

Star gazing: The JSC Astronomical Society invite the public to view the autumn skies through telescopes from dusk till 10 p.m. Oct. 28 at Challenger 7 Memorial Park. For more information call Bill Williams 339-1367.

## Swap Shop

Property
Sale: Clear Lake Forest, 4-2.5-2, glass walled den family room, FPL, whic ceiling, formals, new roof \& paint/carpet/paper. 326-230
Sale: Holly Hall townhome, 2-2.5-2, security, 1649 sq ft , immediate occupancy, $\$ 79.9 \mathrm{k}$. Jack
Cohen, $488-3171$ Sale: Santa Fe,
ty. 409-943-5232.
Rent: Clear Lake City, Oakbrook, on golf course
4-2-2, \$975/mo. 488-7860.
Sale: Taylor Lake Estates wooded lot $90^{\circ} \times 135^{\prime}$
can finance can finance, $\$ 39.5$ obo. Don, $\times 38039$ or $333-1751$ Rent: Crystal Beach cabin, 2-1, unfurnished Rent: Beach house Cryo2-1168. county, furnished, sleeps 10 , wkend/wkly rates 486-1888.
Rent: Galveston condo, furn, sleeps 6 , Seawall Blvd \& 61st ST, wknd/wkly/dly rates. Magdi Yassa 333-4760 or 486-0788
Rent: South Lake Tahoe cabin, 3-2, modern
kitchen, W/D, TVNCR microwave sle, nightly except holidays. 244-1065 or 326 -2866. Rent: beach front condo, Cancun Mexico, bath, sleeps 4, kitchenette, daily maid service, available year round, $\$ 300 /$ wkly. $\times 37990$ or 33185 Rent: Cancun Sunset Club, $1-2$, sleeps kitchen, jacuzzi, swimming pool, tennis courts boating avail, beachfront, avail 11/18-11/25 or
other weeks, $\$ 750$. Paul x41063 or $338-4535$. Rent: Ski condo, Winter Park, CO, 2-2, sleeps 6 hot tub/heated pool, ski season \& spring break available. 488-4453.

## Cars \& Trucks

'88 Dodge Aries wagon, 2.2L, 5 spd, TBI, PS/PB rear wiper/defrost, cruise, new clutch, A/C evap water pump, 7.9 k mi, $\$ 2.8$ obo. Lane, 280-0437.
' 85 Pontiac Bonneville, 4dr A/C, PM, ires and battery, $100 \mathrm{k}+\mathrm{mi}$, $\$ 995$. Jim, $\times 38624$ or 475-9671.
'92 Toyota MR2, black, w/black leather interior, fully loaded, T-tops, CD player, new tires, $\$ 15 \mathrm{k}$ ' 66 Mustang, 289 , 4 spd, dual exhaust, good cond, \$3.5k. 331-9255
' 86 Chevy Sprint, $4 \mathrm{dr}, 5$ spd, AM/FM/cass, A/C '88 BMW 3251 M . sunroof, PW/PS, AM/FM/cass, 85k mi, \$11k obo $549-7311$.
'84 Toyota Celica, 80 k mi, red, ex cond, new
tires, $\$ 3.5 \mathrm{k}$. Melissa, x41928 or $338-6798$.
86 Jeep Cherakee Laredo,
' 86 Jeep Cherakee Laredo, 5 spd, 4 WD, 4 $\mathrm{AC}, 100 \mathrm{k} \mathrm{mi}$, AM/FM/cass, wht/tan, 1
cond, $\$ 5.4 \mathrm{k}$ obo. 448541 or $538-3444$.
cond, 85 Pontiac GrandAm, $89 . \mathrm{k} \mathrm{mi}$, auto, pwr dr lean, $\$ 1.7 \mathrm{k}$; ' 87 Chrysler New Yorker. 81 k mi auto, pwr, new tires, $\$ 2.8 \mathrm{k}$. 212-1474 or $996-6735$. $\$ 79$ Datsun 280 ZX, Coupe, 5 spd , 97 kmi , 22.8k. Jeff, 330715 or 280-8606. '89 Mazda Cab Plus truck, B2200 series, red
w/charcoal int, auto, AC, AM/FM/cass siding bat ind bedtiner, now batt/ires $\$ 596$. 482-8820
' 84 Mazda RX-7 GSL-SE, blk/red, 5 spd, sunroot, AM/FM/ cass, good cond, $\$ 2,950.582-0415$. new soft top Wrangler, $83 \mathrm{k} \mathrm{mi} 6 \mathrm{cyl},, 5 \mathrm{spd}, \mathrm{AC}$ new soff top, ex cond, \$7.5k. 334-7143. cond, $\$ 6 \mathrm{k}$ obo. Cory, 280-9274 or 814-3580 ' 55 Chevy Belaire, 396 big or 814-3580. Posi-Track, AM/FM/cass, red \& wht. $334-2908$. ' 91 Olds Cutlass Ciera, 4 dr sedan, V6, aut A/C, pwr windows, cruise, 63 k mi , good cond $\$ 5.5 \mathrm{k}$. Andy, $\times 31596$.
70 Chevrolet CST/10 PU, 350 V8, auto, PS/PB,
factory A/C, tint, ex cond $\$ 3.5 \mathrm{an}$, factory AC, tint, ex cond, \$3.5k. 923-4301. ' 88 Merkur XR47T, white, turbo, leather int, load${ }^{2} 85$ Camaro body, race setup, $\$ 350$. Tony, 946 9090.
'90 Mustang GT, $5.0 \mathrm{~L}, 79 \mathrm{kmi}$, 5 spd Hurst, white, A/C, PL/PW, ex cond, $\$ 7.5 \mathrm{k}$. Warren $\times 45714$ or $949-5675$.
' 91 Explorer, Eddie Bauer, leather int, $C D$, sunroof, kill switch,
or $486-5503$. or 486 - 5503.
PW, stereo, \$5,950. 488-777
' 78 Granada, new engine, ex
car, $\$ 1 \mathrm{k}$. $\times 32933$ or 486 - 5478 .
'87 Nissan Pulsar NX, pwr, tilt, T-tops, 5 spd, needs ACC compressor, runs great, $\$ 2.6 \mathrm{k}$. Merrell,$~$
$\times 37570$ or $286-9123$. $\times 37570$ or 286-9123.

## Cycles

'86 Honda
$\$ 2.5 \mathrm{k} .488-6526$ cond Honda Elite 80 cc scooter, red/white, ex $488-743$
'79 Harley Sportster, very good cond, many
new patt 5 k -479-4463.

## Boats \& Planes

Sailboat, 18' Hobbie catamaran w/trailer, all access, $\$ 900$ obo. 474-4742.
' 95 SeaRay BR, 18', 135 hp Mercruiser, $1 / 0$ galv trailer, skis, vest, low hrs, $\$ 11 \mathrm{k}$ obo
$\times 37739$.

Audiovisual \& Computers
Citizen printer "CSX-140" W/GSX color option, 333-4760 or 486-0788. lbs, 386 processor, matte blk case, monochrome screen, new battery, $\$ 500$. Box, x 32404 or 484 0898.

Hands-free speaker phone w/LED indicator 13-number memory plus 3 emergency "oneouch" buttons, redial, flash, extras, desk wall Bear Cat 210 scanner

## 484-2050

w/remote $\$ 120$ player, single obo; Pioneer \#PD-4550-8FS CD 40213 or Steve $554-4440$
player, $\$ 60 /$ both. $\times 37739$.
IBM/SW
IBM/SW, Paradox for Windows, $\$ 75$; Paradox book w/examples, $\$ 50.282-3570$ or 474-3820. 4VGA DX2-80, 8 MB RAM, 540 MB HD, 15 SVGA, 14.4K modem, $\$ 925 ; 286 \mathrm{pc}$, EGA, 3.5 \& 5.25 FD, 40MB HD, $\$ 160 . \times 35549$ or $554-7104$. Fisher 1-bit 24 CD changer, $\$ 160$; audio con-
cepts stereo speakers $\$ 70$ Magnavox $15^{" ~}$ floor cepts stereo speakers, $\$ 70$; Magnavox 15 noin
model $T V$, needs work, $\$ 70$; rack equip, movin mox, $\$ 50$. Chris, $334-6898$.
486 DX computer, non-interlaced Super VGA monitor, $210 \mathrm{MB} \mathrm{HD}, 4 \mathrm{MB}$ RAM, 5.25 \& 3.5 FD , modem, 3 button mouse, 210 watt pwr supply Gameport, modem, sotit
or 480-85t1. or 480-8511.
Complete P.A. equipment including mixing board, amps, E.Q, spkrs, \& more, \$1.5k. Ernie,
 $\times 33500$ or 480-9329.
Mac SE computer, $\$ 395.488-7771$
Sy Quest 44 meg, SCSI drive, \$150. 480-3424

## Musical Instruments

Hondo electric bass guitar w/case, $\$ 200$.

## Photography

B \& W video camera, $\$ 80.282-3570$ or $474-$
3820 .

## Household

Loveseat, black/brown/tan, \$100. Liz, 244 1819 or 484-2050.
Large dining set, oval table, 6 chairs, lighte china cabinet, all solid wood, 2 table leaves, cus 0876.

Sofa bed, loveseat, end tables, $\$ 400$; GE W/D, $\$ 300$; 21cu ft refrigerator wfice maker $\$ 300$ Kim, x32687 or 332-4375.
Simmons crib w/matt \& matching chest, natural maple, all in very good cond, $\$ 550$; large wood executive desk, $42^{\prime \prime} \times 788^{\prime \prime}$, medium stain,
$\$ 175.482-4590$. Maytag W/D, large capacity, ex cond, $\$ 670$. M32686.
Small
Small color TV by Sharp, 9" screen, \$45. 486-
8266 . 8266.
Antiq

Antique dining table, $45 \times 70$, oak/pine inlay, $\$ 550$; antique white iron baby bed, $\$ 225.488$ -
Childcraft Crib-n-Bed converts into toddler bed/chest of drawers, white w/pastel drawer han dles, \$450. 244-7951 or 486-5959.
Caloric dishwasher, porcelain lined. Brian, 96-8567.
Sofa w/qn size sleeper, white w/pastel colors, pink throw pillows, matching pink s
avail $11 / 1, \$ 200 . \times 41036$ or $333-4577$
Sanyo refrig, 11 cu ft , white, $\$ 100$; Whirlpool 3 cycle electric diyyer, apart $s z, \$ 75$; GE auto washer, almond, apart $s z, \$ 75$; all work great, avail Desk chair $\$ 25$; 2 mat
lamps, $\$ 50 ; 2$ matching couches, $\$ 60$, chair, $\$ 20$; coffee table, $\$ 40 ; 2$ end tables, $\$ 50$; dining room table, $\$ 100$; chairs, $\$ 100$; ceiling fan, $\$ 20$ obo. 280-3230 or 333-5782.
King size bed, matt/box springs/frame, $\$ 100$.
Curt, $\times 41065$ or $326-2866$ Curt, $\times 41065$ or 326-2866.

# Technical Test Bed New JSC testbed to study 'living off the land' in space 



Top: The Mars ISRU Sample Return mission is proposed to send a small robotic lander to Mars in order to col lect Martian rock, soil, and atmospheric samples, and then return those samples to Earth using propellants man factured while on Mars. The picture shows the return vehicle ascending trom Mars as it begins its journey homeward. Bottom left: Standing on the steps of the proposed Mars environ mental test chamber is the team of engineers and technicians supporting the MIST testbed. From top to bottom, leff to right are Todd Peters of the Power and Propulsion Division; David Kaplan of the Earth Science and Solar System Exploration Division; Victor Spencer, Jerry Sanders, Scott Burge, Mark Falls and Leah Pate of the Powe and Propulsion Division: Noah Blizar and Kidd and Bary Allen of Lockhed Bobby Kidd and Barry Allen of Lock Martin; and Jack Hensley, Denni Miler, Lonnie Ray, Jimmy Poils Booker Canit, Yony Parish, hudy Molina, Mike Kocurek and Robert Fulmer of GB Tech. Not shown are Scott Baird and Howard Wagner of the Power and Propulsion Division. Bottom left: Shown with the first MIST testbed hardware to be procured from left are Pate, Spencer, Sanders, Falls, Peters, Blizard and Burge.

Arist Concept by Pat Rawlings
JSC Photos by Robert Markowitz
f the pioneers had been forced to carry all of their raw materials-water, food and fuel for fires-in their covered wagons. they probably wouldn't have made it over the Appalachian Mountains.
For the same reason, scientists and engineers at JSC are beginning key research into how to use extraterrestrial resources in the same way that the pioneers gathered firewood. That research has led to the formation of a new JSC technology testbed called the Mars In -Situ Resource Utilization System Technology Breadboard Program.
The new testbed is springing from the study of a mission that would send a small robotic spacecraft to Mars to collect rock soil and atmosphere samples and bring them back to Earth. That mission, called the Mars ISRU Sample Return, provides one potential answer to NASA Administrator Daniel S. Goldin's challenge to look for new technologies and management approaches that would significantly reduce the cost of human exploration of the Mioon and Mars
"JSC is rising to that challenge," said MISR Study Manager David Kaplan, of Space and Life Sciences' Earth Science and Solar System Exploration Division. "One new technological approach that may lead to dramatic reductions in mission costs and risks is In-Situ Resource Utilization.
Basically, ISRU encompasses any process which uses indigenous resources on an extraterrestrial surface as feedstock to manufacture needed products."
JSC has had a long-term interest in the processes associated with extracting oxygen from the lunar soil, Kaplan said. Only recently, however, has Mars become the focus of attention for ISRU technology.
The MISR study was conducted over the past year by a team from the Engineering and the Space and Life Sciences
Directorates. The 30 -person team came up with a mission that would land on Mars with
essentially empty propellant tanks and then use Martian resources to manufacture its Mars-ascent and Earth-return propellants.
"To minirnize the complexity of this small, robotic lander, we chose not to require it to dig into the soil for raw materials," Kaplan said. "Rather, MISR will use carbon dioxide taken from the Martian atmosphere. From the Viking Mars lander missions of 1976, we know that the atmosphere is 95 percent carbon dioxide:"
Scott Baird of Engineering's Power and Propulsion Division said there are three facets to the propellant production plan: (1) carbon dioxide is extracted from the atmosphere and properly conditioned; (2) this carbon dioxide is fed into a chemical reactor; and (3) the resultant products are liquefied and cryogenically stored for later use in the Mars-ascent and Earth-return stage engines.
Based on the initial results of the MISR mission study, Kaplan approached the Mission From Planet Earth Study Office and the Solar System Exploration Division at NASA Headquarters and obtained funding for the Power and Propulsion Division to initiate the MIST breadboard testbed.
The purpose of the MIST facility is threefold. One, it allows the ISRU processes and hardware to be examined at a system level so that interactions, capabilities and limitations of the total ISRU propellant production process can be understood. Two, it provides a central location for ISRU technologies being worked elsewhere to be tested and compared under realistic Mars environmental conditions. Three, it provides "hands on" experience for engineers so that future testbed improvements and flight system designs will benefit from the testing performed and the problems solved.
Incremental upgrades, hardware swapouts, and configuration modifications are currently planned for the testbed. Eventually,
full-scale testing inside a vacuum chamber configured to duplicate Mars environmental conditions will be performed.
"With several viable options to consider, such a testbed is essential in order to compare and test the different ISRU propellant production components," Baird said.
In addition to the propellant production applications, the testbed can be expanded to explore general ISRU enabling technology and scaling issues applicable to human exploration missions. During the same time when the MISR mission study was occurring, NASA Headquarters was writing the Human Exploration and Development of Space Enterprise Strategic Plan. In that plan, it states:
"Use of extraterrestrial resources is critical for human exploration and settlement of the solar system. We will plan a coordinated -grouind program of prototype hardware development leading to technology flight demonstrations. A central aim will be incorporating the use of extraterrestrial resources into mainstream solar system exploration mission planning. Accordingly, initial emphasis will be on working with the Space Science Enterprise to enhance the science return of near-term missions."
A subsequent briefing about MISR and the JSC MIST breadboard testbed to personnel in the Advanced Projects Office resulted in that office's decision to support the testbed work in FY'96.
The JSC MIST testbed will be located in the Power and Propulsion Division's Energy Systems Test Area. Initial testing of various breadboard elements will occur in the ESTA Fluid Systems and Propulsion Test Facilities, with eventual simulated Mars atmospheric testing of the entire system occurring in the subsystem test chamber at ESTA. The engineering team for the research is still being assembled and will combine a variety of internal JSC expertise
with external government, academic and industry expertise. Although JSC will lead the systems test effort, involvement from other organizations, including the Jet Propulsion Laboratory, Lewis Research Center, the University of Arizona and Lockheed Martin in Denver, is presently being developed. Inclusion of other organizations will occur as appropriate to the program's objectives of enhancing and developing ISRU processes into viable operating systems.
Current plans for the build-up of the MIST system breadboard will allow testing to begin by the end of the year.
"The breadboard will allow us to be very flexible. Other organizations can develop technologies in parallel and we can drop them into the testbed when they become available," Baird said. "As we do the testing, we're going to find out all kinds of surprises. That's what this project is all about. Ne want to find all the surprises before we build the flight system.'
The capabilities to be provided at JSC via the testing breadboard may also have payoffs outside of NASA.
The MIST facility development has just been initiated. Hardware components are being procured, borrowed or loaned from other programs. Contacts with other indusry, academic and NASA organizations working on ISRU technologies are under way. Laboratory space has been allocated and is being cleared. Vacuum chamber facilities for future Mars environment simulation tests have been identified. Codes $\mathrm{X}, \mathrm{S}, \mathrm{M}$ and $U$ are watching closely.
ISRU is a technology which is emerging as a key element to answering Goldin's challenge to explore the solar system "for an order of magnitude less cost." And JSC s positioning itself to be the preeminent eader in this newly emerging field for human exploration.


Hubble captures ejection from comet

New pictures from NASA's Hubble covered comet, Hale-Bopp, show a remarkable spiral "pinwheel" pattern and a "blob" of free-flying debris near the comet's nucleus.
Although this comet is still well outside the orbit of Jupiter it looks surprisingly bright, fueling predictions that it could become the brightest comet of the century in early 1997. The Hubble observations will help scientists determine if HaleBopp is really a giant comet or rather a more moderate-sized object whose current activity is driven by outgassing from very volatile ice which will "burn out" over the next year.
The bright clump of light along the spiral may be a piece of the comet's
by cust hat was ejected into space and the comet's rotation which then disintegrated into a visible cloud of particles.
Although the ejected "blob" is about 3.5 times fainter than the brightest portion of the nucleus, the clump appears brighter because it covers a larger area.
Ground-based observations con ducted over the past two months have documented at least two separate episodes of jet and pinwheel formation and fading. By coincidence the first Hubble images of Hale Bopp, taken Sept. 26, immediately followed one of these outbursts and allow researchers to examine it a unprecedented detail. For the firs time, they saw a clear separation
between the nucleus and some of the debris being shed.
By putting together information from the Hubble images and those taken during the recent outburst using a telescope at the Teide Observatory in Spain, astronomers found that the debris is moving away from the nucleus at a speed of about 68 miles per hour 68 miles per hou
Even more detailed Hubble mages will be taken with the Planewary Camera in late October to foll, the for more outbursts place limits on the size of the nucs, place limits on the size of the nucleus, and use spectroscopy to study the enigmatic comet's chemical composition Comet Hale-Bopp was discovered on July 23, by amateur astronomers Alan Hale and Thomas Bopp.


This Hubble Space Telescope image shows debris from the Hale-Bopp comet follows a spiral pattern because the solid nucleus is rotating like a lawn sprinkler, completing a single rotation about once per week.

## UH graduate on-site sign-up begins soon

In cooperation with the Cullen School of Engineering at the University of Houston, JSC is again offering graduate engineering courses on-site via satellite for Spring 1996.
On-site registration for these and all other UH engineering courses will be from 10:30 a.m.-2 p.m. Nov. 9 in Bldg. 45, Rm. 128. Payment is required at the time of registration. JSC employees may submit a completed Form 75 as payment for their courses. Contractor employees will receive an invoice from the university.
Applications will be available for those interested in applying for admission to UH. All applicants for admission and new students must bring their undergraduate transcript with the degree posted. New students should keep in mind that only six hours taken as a postbaccalaureate student may be transferred to UH for graduate credit.
The satellite course that will be offered onsite include, Computer Networks, from 5:30-7 p.m., Monday and Wednesday; Advanced Computer Architecture, from noon-1:30 p.m. Monday and Wednesday; Parallel Architectures, 11:30 a.m.-1 p.m., Tuesday and Thursday; Management Issues in Systems Engineering, 4-5:30 p.m., Tuesday and Thursday; and Legal Aspects of Engineering, 5:30-7 p.m. Tuesday and Thursday.
For additional information, contact Kazuko Hall of the Human Resources Development Branch at $\times 33075$.

## Galileo's tape recorder on standby mode

(Continued from Page 1) recorder used to store the data was commanded to rewind. Data received from Galileo suggest the tape recorder did not stop as expected after rewinding.

Galileo engineers have commanded the tape recorder to a standby mode while they investigate further," said Galileo Project Manager William O'Neil of the Jet Propulsion Laboratory.
Project engineers are proceeding slowly and cautiously to understand the problem according to O'Neil, and are avoiding sending unnecessary commands to the spacecraft. In addition to analyzing spacecraft telemetry, engineers are working with an identical tape recorder in a laboratory spacecraft mockup on the ground.

## Space Exploration '95

Tuesday, Oct 24
8:10-10 a.m. Reusable Launch Vehicles - DC-XA, X-33 and X-34 Programs
10:30-11:30 a.m. High Speed Research and the Advanced Subsonics Technology Program
1:30-2:30 p.m
X-31 Results and Lessons Learned
3-5 p.m. Space Technology panel discussion
5-6 p.m. Self-guided tours: the Sonny Carter Training Facility with formal presentation at 5:30 p.m. and the new Mission Control Center with formal presentations in the MCC viewing room at 5:15, 5:30 and 5:45 p.m.

Wednesday, Oct 25
8:30-10 a.m. Pathway to Exploration panel
10:30-11:30 a.m. The View From the Bridge
12:30-1:25 p.m. Lunch
STS-71 Mission Overview

- Hoot Gibson, commander of the STS-71 mission

1:30-2:30 p.m. Mir Phase 1: Building Block to Space Station
3:00-4 p.m. Enriching Life on Earth
4-5 p.m. The day's sessions will end with a discussion of technology transfer and utilization lead by Hank Davis, director of JSC"s Technology Transfer and Commercialization Office.

6:30-8 p.m. Reception and Banquet at Space Center Houston
Thursday, Oct 26
8-10 a.m. International Space Station
10:30-12 a.m. Enabling Steps to the Future
12:30-1:25 p.m. Lunch

- Astronaut Bonnie Dunbar is the featured speaker

1:30-2:30 p.m. Understanding and Using Space
3-4:30 p.m. NASA Science Strategies
4:30-5 p.m. Wrap Up Round Robin

- Nancy Holland of KHOU-TV

Tram shuttle service will be available during the three-day conference. Trams will run every 20 minutes from Bldgs. 1 and 30 beginning at $7: 30$ a.m. untill 5 p.m. Complete conference registration is $\$ 150$ for three days, and $\$ 45$ a day for government employees and students. Retired NASA Alumni League members may attend free. For more information, contact Gotthard Jansen at 280-2708, or Jennifer Casey at 244-2133

## Quality forum to air on NTV

The Safety, Reliability and Quality Assurance Directorate is sponsoring the Quality Forum XI on NASA Television from Quality Forum XI on NASA
The Quality Forum XI is the highligh event of National Quality Month, attracting over 250,000 participants nationwide.

The theme for the Forum is "Quality Happens Through People." and will be broadcast live from the Westin Hotel O'Hare in Chicago to over 1000 sites, including JSC.
Leaders from a broad spectrum of business sectors will discuss the latest issues and trends in the quality field and talk about what it means to stay competitive in today's market.
Gary Tooker, vice chairman and chief executive officer of Motorola and chairman of National Quality Month, will present the keynote address to kick off the program that will focus on Leadership, Life-Long Learning and Empowerment.

All civil servant and contractor employees are encouraged to follow this broadcast as work load permits. Consult the daily television schedule for channel information.

## Franklin planners available

Although the JSC Supply will not be provid ing Franklin Planners for the next calenda year, employees may order them through the JSC Exchange Store
Compact prices are: $\$ 15.80$ for Standard; $\$ 22.00$ for Seasons; and $\$ 22.00$ for the Monticello. Classic prices are: $\$ 17.60$ for Standard; $\$ 24.20$ for Seasons; and $\$ 24.20$ for Monticello. These prices are about $\$ 5$ cheap er than the Franklin Catalog price.
Employees may want to order early due to a six week delivery date. The Exchange Store is open from 9 a.m.-1 p.m., Monday through Friday. For more information call $\times 35350$.

## Nominations due soon

(Continued from Page 1) expected.

Nominations must include name, organization, paragraph describing the candidate's tion, paragraph describing the candidate's qualifications phone number and signature of approving manager.
Submit nominations to Jeff Evans, mail code NA. The nominations must be received by Nov. 15. For more information call, Evans by Nov. 15.
at x 39295 .

## Atlantis' engines checkout

## (Continued from Page 1)

 inspections of Columbia's simila equipment found no problems.Meanwhile, the crew of STS-74 Commander Ken Cameron, Pilot Jim Halsell and Mission Specialists Chris Hadfield, Jerry Ross and Bill MacArthur-traveled to KSC this week for dress rehearsal launch countdown for Atlantis.
Atlantis, on Pad 39A, completed the Terminal Countdown Demonstration Test at 10 a.m. CDT Wednesday. Other activities to prepare Atlantis for launch this week included a health check of the Russian-built Docking Module in the cargo bay Also, ultrasound checks of Atlantis three main engines identical to those performed on Columbia, were completed and found no problems with

## the oxidize

## duct welds.

Elsewhere, Endeavour is in KSC's Number 3 shuttle processing hangar being readied for an early 1996 launch on STS-72. Work on Endeavour this week included preparations to install the Remote Manipulator System mechanical arm Manipulator System mechanical arm aboard the spacecraft. Also, stack ing continues on the STS-72 solid rockets in the Vehicle Assembly Bldg. with work this week focused
To round out the shut
To round out the shuttle fleet Discovery is at Rockwell's Palmdale, Calif., shuttle factory beginning a nine-month series of inspections and upgrades that will include modifica the International Space Station.

Space News Roundup

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Editor

## MCC open for viewing of STS-73

ing room will be open to JSC and contractor badged omployees and contractor badged employees and STS
STS-73 mission
Employees will be allowed to visit the MCC from $1-5 \mathrm{p} . \mathrm{m}$. Oct. 22 and 11:30 a.m.-2:30 p.m. Nov. 1.
Employees must wear their badges and escort family members through the lobby of BIdg. 30

South. Children under five will not be permitted. No flash photography or loud talking will be permitted at any time.

Because of the dynamic nature of shuttle missions, viewing hours may be changed or canceled without notice.
For the latest information on the schedule, call the Employee Inforschedule, call the Employ
mation Service at $\times 36765$.

## New dates available for flu shots

The 1995 flu season is fast approaching and the JSC Clinic will offer vaccinations for all NASAbadged and on-site contractor personnel for a limited time this fall.
The clinic will offer influenza

3 p.m. the week of Oct. 23; Nov. 6; Nov. 20; and Nov. 27. Other weeks will be available during December and January and will be printed in the Daily Cyber Space Roundup. the Daily Cyber Space Roundup. For information, call the clinic at x34111.

