Lyndon B. Johnson **Space Center**

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NASA invention applies heat to cancers

RF applicator used in treatment at St. Joseph Hospital

Cancer research has shown that heat treatments can destroy cancer cells without harm to adjacent healthy tissue. Methods for producing heat have grown steadily in sophistication—starting in 1893 when doctors induced fever in cancer patients to today's techniques such as ultrasound, radiated microwave, and blood perfusion.

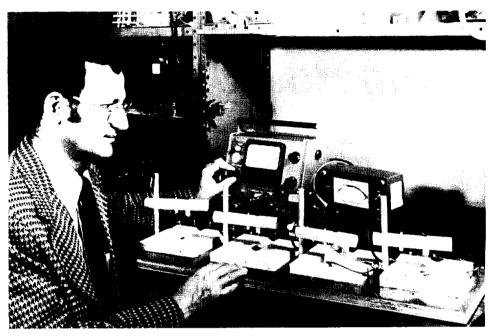
In mid-1978 LBJ Space Center signed a Memorandum of Understanding with the Stehlin Foundation for Cancer Research at St. Joseph Hospital in Houston, saying the space center will provide technical support for the foundation's work with heat, or hyperthermia, treatment of cancer.

Tumors will heat faster than healthy tissue, perhaps because they hold more fluid to contain the heat and fewer blood cells to carry the heat away. Tumors have restricted blood flow. So, heat concentrated on a cancerous area can destroy cancer cells without harming healthy tissue nearby.

The challenge for JSC engineers was to improve radio frequency (RF) heating techniques being used at the Stehlin Foundation. First step was to develop a machine for treatment of small animals.

Then after a year of tests on mice, JSC scientists developed an advanced RF hyperthermia system for treatment of humans.

'The human RF system has performed



Krishen with small animal device—finding optimum frequency

successfully on several cancer patients." said Kumar Krishen of JSC's Experiment Systems Division. Dr. Krishen is technical coordinator of the project.

"Developing the advanced human RF hyperthermia system involved acute concerns about safe and reliable performance."

For work on the machine to be used on humans, Dr. Krishen's team called for assistance from JSC's Safety, Reliability,

and Quality Assurance Directorates. SR&QA monitored and reviewed the overall design and performance of the equipment.

In January 1980 the team delivered an experimental human treatment system to St. Joseph Hospital.

"The RF system for human treatment uses a gradual buildup of power to its preselected value," Dr. Krishen said. 'Two pairs of sequentially driven electrodes provide more concentration of RF power at the tumor and disperse heat at the skin.'

The team also developed a feedback control which allows regulation of temperatures within a specific area to an accuracy of 0.2 degrees Centigrade.

One area of concern was heating of the skin below the electrodes which in some cases causes burns. "Our approach was to circulate temperature-controlled water through metal tubing soldered onto the back of flexible electrodes," Krishen said. "This scheme has been found to be very useful."

A data printer added to the system records temperatures and power levels as a function of time.

'The small animal experimental system we first designed yielded very valuable data," Dr. Krishen said. After trying different combinations, the ESD team came up with an optimum size and shape for the applicator. They determined the maximum heat the animal's body could tolerate, 41 degrees Centegrade, and gave the applicator a convex shape to keep "hot spots" from coming into contact with the skin.

"A notable feature of the small animal system is the ability to apply up to 50 watts at five frequencies from three MHz to 30," Dr. Krishen said. "This helps us to indicate the advantages, if there are any,

Please turn to Page 2

Women in Aerospace. . .

Today women pilot high performance jet aircraft in the military. Women are engineers in Mission Control Center and they fly commercial jets with major air lines. Only five years ago, these occupations were for men only-women have made remarkable progress building careers in the aerospace industry.

March 12 and 13 JSC is hosting a symposium, "Women in Aviation and Space," to examine women's advancements in these professions—both to applaud the progress and to locate and discuss any remaining roadblocks.

The Aviation/Space Writers Association and the America Institute of Aeronautics and Astronautics are sponsoring the symposium, with support from the Federal Women's Program Committee at

Some of the sessions may ignite heated debate. For instance, one member of the "Women in the Cockpit" panel is convinced that women are physically incapable of piloting commercial aircraft. With him on that panel will be female pilots from Continental and Frontier Air Lines.

Another panel, "Transition: You Can Change Careers," will feature women who broke from tradition mid-career: a former nurse who is now studying engineering; a former secretary who is now a NASA Contract Specialist.

The symposium opens Wednesday, March 12, at 1 p.m. with a series of speakers and presentations in the Building Two Auditorium. Thon Griffith, International President of the Ninety-Nines. Inc., will give the keynote address. (The Ninety-Nines is a professional organization for women pilots founded in 1929 by Amelia Earheart.)

Among the women speaking will be a T-37 instructor who is an Air Force Cap-

tain, Carolyn Huntoon who is Deputy for Personnel Development in the Astronaut Office, a Director of Consumer Affairs with United Air Lines, and the president of an aviation firm in Houston.

The two panels will take place Thursday the 13th in Building Two Auditorium from 9 a.m. to noon. Further information is circulating to employees through inhouse announcements.

20 more to JSC next week competing for astronaut slots

plicants will report to JSC March 10 for a U.S. Air Force at the space center. week of physical exams and interviews.

Those among the 20 who are currently Ivins of the Spacecraft Design Division astronaut candidates in July of this year.

The second group of 20 astronaut ap- and Capt. Jerry L. Ross who is with the

Applicants selected from those working at the space center are: Marsha screened will begin a year's training as

Space Shuttle Status

Main engines passing tests; new target November

November 1980 is the current target for the first Shuttle launch date, and all working schedules are geared for that month, according to John Yardley, Associate Administrator for STS Acquisition.

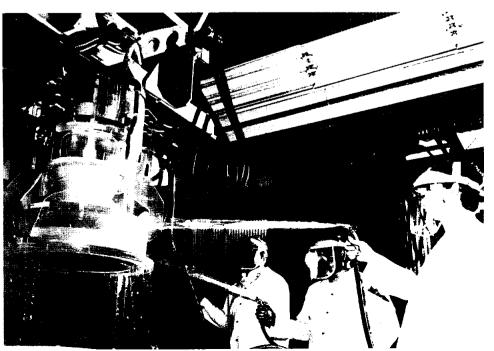
He added that the actual projection for the launch date is between November 1980 and March 1981.

Mr. Yardley was speaking at a press conference at the Cape February 20.

More recently, main engine testing has reached a "milestone." A second full duration test firing of the three main engines went a full 551-seconds, meeting all test objectives. At least five more firings of the main engine cluster are required before the first orbital flight of the Shuttle.

July 31 is the target date for moving Columbia out of the Orbiter Processing Facility and into the Vehicle Assembly Building. The date for mating the Solid Rocket Boosters and the External Tank to the Orbiter is no earlier than June.

The SRBs are ready for mating, but the ET is undergoing some minor "tune up"



Rocketdyne employees in California hose down Shuttle main engine thrust chamber liner. They are between cycles of applying layers of (Rockwell photo) nickel to protect liner from pressure and heat.



The audience at Black History Program February 15

The Sports Scene at JSC

Golf tournaments in heated competition; tennis club on courts, open for members

The JSC Golf Association held its warm-up tournament on a cold Washington's birthday at Willowisp Country Club. This was a team event using Stableford

Our hottest shooters were the first place team of Milt Heflin, Reggan Redman, Vic Zuber, and Bert van Wagoner. The next teams (both missing players) were (second) Wakie Dunham, Daryl Gress, Betty Gabel,

and (third), Joe Nick Villarreal and Tom Dennis. Fourth place consisted of Ted Breezy, John Jones, Al Ligrani, and Jim Hoffman.

Closest to the hole on par-threes were Bob Ross, John Jones, and Wakie Dunham. Jerry Shinkle won a ball by being the only person to hit the green on a par three set up at about 220 yards.

JSCGA's competitive schedule of monthly tournaments begins in March at Goose Creek. Other tournaments will be played at Tejas, Wortham, Brock Park, Newport, Lake Houston, Texas City Bayou, and Atascocita. A mid-summer fun tournament will be at Woodlands.

New members are still being accepted. Anyone interested should contact JSCGA president Mike Gremillion at 3753.

And on the courts. . .

The JSC Tennis Club held its first tournament of the 1980 season on February 22, 23, and 24 at the Friendswood Racket Club. The results of the tournament were Hugh Burris defeating Bill Stetzer 6-3. 7-6 in Men's Championship: John Norris over Fred Hermann 6-1, 6-3 in Men's A; Homer Ahr over Abhijit Gadgil 6-3, 6-2 in Men's B; and Mike Tracy over Bill Schoolmeyer 6-1, 5-7, 6-3 in Men's C.

In the Women's division it was Ann Williams over Ruth Damoff 6-4, 6-4 in Women's Championship; Leona Kain over Dianna Manner 3-6, 6-4, 6-4 in Women's A; Lambert over Lana Highland 6-1, 6-3 in Women's B, and Linda Cassetti over Carolyn Knight 6-2, 6-1 in Women's C.

For Tennis Club membership information contact Lyle White at 483-2686.

Attention All Coops, Come to a Party

Come meet your fellow coops and join in the celebration of St. Pat's. The fun begins at 9 p.m. on March 14 in Clear Lake Forest. Contact Judy Gast, x3681, for more party details. Remember-wear

Bulletin Board

"We Need Your Support" -JSC Bike Club

The JSC Bike Club is small, but growing every week. We need people who are interested in making cycling safe-even if you don't cycle right now. Safe cycling in the Bay Area means change: road striping, bike paths, bicycle racks (a new one has just been installed at the JSC Credit Union), but most of all, public envolvement. Together, we can do it. Don't forget our first Bike R de on March 9. We will meet at 9 a.m. (not 10 as previously stated here) at JK's Cycle Shop for a ride to Morgan's Point and return. Membership is free to all. Call Brian Morris at x-5293, or Sheldon Tucker at x4107.

Williams, 3/20

"A Geologist's View of Lunar Resource Utilization" or "Mining the Moon" will be the topic of an AIAA joint meeting with Sigma XI, Thursday, March 20 at the Holiday Inn on NASA Road One.

Richard J. Williams, Manager of JSC's Geochemistry Branch, is guest speaker. The program begins at 8 p.m. For those who attend the dinner at 7. reservations must be made by March 17. Call Edith Todd at x4121. Social hour starts at 6.

From Page 1 **Treatments**

of treating various cancer types at a specific frequency."

The small animal system is used currently to establish human protocols and to study the effects of hyperthermia at the

'The challenge now is to deliver the heat with minimized side effects." Dr. Krishen said. "We are investigating the possibility of transmitting the radio waves through the patient with electrodes that do not come in contact with the skin. They will function somewhat like anten-

This assignment was a particular challenge for Dr. Krishen and his coworkers, since their specialty is observing the Earth's weather, soil conditions, and agriculture using microwave data from aircraft and satellites.

Dr. Krishen's team coordinated its work with JSC's Medical Sciences Division, who interfaced with physicians at the Stehlin Foundation.

Jim Witter dies

Jim Witter, Assistant Cafeteria Manager in Building Three, passed away February 16, 1980. Jim had served JSC employees and visitors in that capacity since 1973. He also served as a Navy gunner in the Pacific aboard several ships during WWII. Jim will be missed by co-workers and the other JSC employees.



Sheldon Tucker and David Rainey installing new bike rack at C.U.

As the Skies Get Bluer it's Time To Set Sail in the Bay

Basic and Intermediate Sailing Courses sponsored by the Clear Lake Sailing Club, the Lake Houston Sailing Club, and Lido Fleet 40 will be offered for the 13th year this spring. BASIC SAILING will be presented in two series: the Friday night series will be on March 28, April 4, and April 11-7 p.m. to 9:30 the Saturday series will be March 29, April 5, and April 12-9:30 a.m. to noon. INTERMEDIATE SAILING will be held on Saturdays April 26, May 10, 17, 24, 31, and June 14-9:30 a.m. to:noon. Classes will be at the Clear Lake Park Building at Harris County Park on Clear Lake, and included are onthe-water demonstrations. Cost is \$15 for a family (up to four) for Basic, and \$25 for Intermediate. For further information, call 488-3921.

Where and When is The Easter Egg Hunt This Year?

The JSC EAA Easter Egg Hunt will be Saturday, March 29 at 10 a.m. at the Gilruth Center, for children two to eight years of age. Each child is to bring his own basket. Tickets will be \$1 each, and will go on sale on or about March 10.

On Sale at the **JSC Exchange Store**

(Store hours 10 a.m. to 2 p.m.) Dean Goss tickets: \$10 single, \$20 couple (regular \$14.50)

ABC Theatre Tickets: \$2 ea. General Cinema Tickets:\$2.40 ea. Astroworld: Free coupon for \$2.50 discount on Astroworld tickets. (Coupon good from March 8 to April 6.)

El-Baz, 3/18

Tuesday March 18 Farouk El-Baz of the Smithsonian Institute will deliver a lecture, "Journey Into Northern China," in the Building Two Auditorium at 8 p.m. The speech will be based on a trip he made with the National Geographic Society last July into China to study land forms of the deserts and to lecture on applying remote sensing to desert research.

Dr. El-Baz is Research Director of the Center for Earth and Planetary Studies at the National Air and Space Museum. He will be in Houston for the 11th Annual Lunar and Planetary Science Conference.

On any other day in Weedeaters. . .

On any other day of the year if a person were to go to Foley's at Almeda Mall to look for a Weedeater, he would find them on the second floor across from Housewares next to the lawnmowers; but on February 23 in place of the Weedeaters was the Bay Area Refuse Firm Chili Team, and the ContraBand from the Electrical, Mechanical, and Environmental Systems Branch of Flight Control Division.

The chili team, still cooking after the untimely departure of chilihead Sy Liebergot, was invited by Foley's to be one of several teams making appearances at stores in and around Houston as part of its Go Texas Week celebration. Rookie chilihead, Conley

Attention Oiler fans - 1980 Columbia Blue

Tool box for wide bed pickup, \$75.

Sears 48 Car battery 12V size 24C 6 7/8W

Vinyl motorcycle cover, fits large motor cy-

Firewood, Oak, you haul it, \$35 per pickup

Cartoon Calendar, \$4.95. For more information

Fiberglass canoe, \$115. Kayak, \$145.

X 10 1/4L X 5/8H. Purchased Jan 1979, cost

cle with fairing and saddle bags, \$35. Ken

load or will sell in larger quantities. Dave

call Tim Allen x3031 or 332-2279 after 6.

Miscellaneous

334-1983 after 6.

x3229 or 944-6450.

Saucier 585-5816.

\$49.99 sell \$30. 488-1550

Perry, debuted a new recipe at the event. Cooking began at 10 a.m., and free samples were served to anyone unfortunate enough to be in the Housewares area at 1

The activities of the day began at 11 a.m. on the east side of Foley's with a flag raising ceremony conducted by the 12member ContraBand, the chili team's semi-all-purpose entertainment troupe. The band then set up to serenade unsuspecting passers-by in the Weedeater section. A smaller strolling group of musicians wandered the aisles of the department store attempting to lure the innocent and ignorant to the simmering cooking-pot upstairs.

Queried about the significance of the Foley's event EMESB Chief Rod Loe groaned, "It's the first time I've had to eat our chili without a beer. I'm lucky to be alive." Trombonist Milt Heflin was looking to the future, however: "ContraBand views Foley's as a stepping stone. Our long range goal is to play the Lingerie Department of Nieman-Marcus.'

In the near term, both the chili team and ContraBand will participate in the Second Annual FOD Chili Cookoff on March 22 at the Gilruth Center. People with weak stomachs are warned to stav clear of the area.

Roundup deadline is the first

Wednesday after publication.

Swap Shop, from Page 3

gauge shotgun. 534-4603 after 6.

Tire - H78-15, 6 ply belted, never on ground, cost \$87, make offer. 474-4885 after 5. Remington portable typewriter, good cond,

\$25. R. Sanders x3458 or 481-6928. Lawnmower, 4 cycle gas engine, com-

Travel trailer, fully self-contained; 16 1/2', ing, refrig, range, more \$3000/firm, Samouce

Lawnmower, Toro, self-propelled, 21-in. cut, \$50, Sampsel, 334-1278.

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

Editor Kay Ebeling

Custom Savage .22-250 rifle w/scope: Ruger Mark 1.22 target pistol; single barrel 12

Empty 30# freon tanks, \$5. J. McBride x2541 or 534-2066.

pletely reconditioned, 474-4885 after 5. air cond, shower, toilet, hot water, heat, awn-

x2568.

You can never be too careful

Unvented gas space heaters can produce toxic combustion wastes; and because they are not vented to the out-of-doors, the space heaters emit these wastes directly into living areas. Insufficient ventilation or an improperly functioning heater may allow combustion wastes to rise to hazardous levels. When using an unvented gas heater, always leave a window slightly open. Have your heater serviced regularly, and if possible avoid using them in sleeping areas. Remember, early symptons of carbon monoxide poisoning resemble the fluwith headache, dizziness, or nausea.

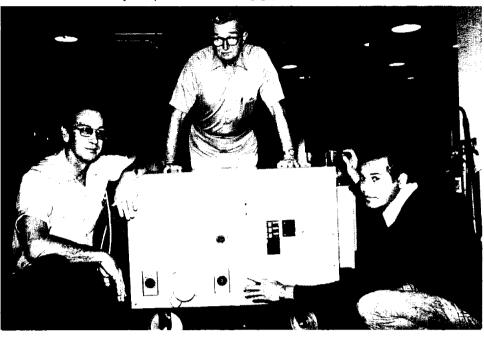
Energy conservation devices which are improperly installed, designed or manufactured can result in fires, carbon monoxide poisoning, electrical shocks, or explosions. Two types of faulty devices are on the market today: the "Automatic Day/Night" thermostat controls and "Home Energy Saver" thermostat controls. Both devices consist of a small rectangular heater and an electric timer—the heater is mounted on the wall beneath the thermostat and connected to the electrical timer which plugs into a household socket. The heaters were manufactured with integral carbon resistors which may overheat and start fires, and the CPSC warns consumers to stop using the two types of devices.

The infant crib exerciser toy is being recalled by its retailer in New York in cooperation with the CPSC. The toy consists of a red elastic cord strung with colored wooden beads and rings. The 17-inch elastic cord poses a potential hazard to infants who could become entangled in it. Consumers who purchased the crib exerciser can receive a full refund by returning the toy to any F.A. O. Schwarz store with proof-of-purchase.

Hot tub temperatures can be a problem. The CPSC warns that drinking and hot-tubbing do not mix. Using a hot tub above normal body temperatures can

cause drowsiness which may lead to unconsciousness and subsequent drowning. The risk of drowning is significantly heightened if individuals consume alcoholic beverages while, or prior to, soaking in hot water. Even if no alcohol is consumed, extremely hot water during hot tub use can threaten life.

Compiled from "News from the U. S. Consumer Product Safety Commision."



R. B. Shoemaker, Ed Petrash, and Akbar Ali Khan demonstrate new power distribution safety cart that reduces number of cables and cords needed to prepare Building 32 chambers for vacuum tests.

What's cookin'

Week of March 10 - 14

Monday: Cream of Chicken Soup; Beef Burgundy over Noodles; Fried Chicken; BBQ Sausage Link; Hamburger Steak (Special); Buttered Com; Carrots; Green Beans. Standard Daily Items: Roast Beef; Baked Ham; Fried Chicken; Fried Fish; Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday: Beef Noodle Soup; Baked Meatloaf; Liver w/Onions; BBQ Spare Ribs; Turkey & Dressing (Special); Spanish Rice; Broccoli; Buttered Squash. **Wednesday:** Clam Chowder; Broiled Fish; Tamales w/Chill; Spanish Macaroni (Special); Ranch Beans; Beets; Parsley Potatoes.

Thursday: Navy Bean Soup; Beef Pot Roast; Shrimp Chop Suey; Pork Chops; Chicken Fried Steak (Special); Carrots; Cabbage; Green

Friday: Seafood Gumbo; Broiled Halibut; Fried Shrimp; Baked Ham; Tuna & Noodle Casserole (Special); Com; Tumip Greens; Stewed Tomatoes.

Week of March 17 - 21

Monday: Chicken Noodle Soup; Weiners & Beans; Round Steak w/Hash Browns; Meatballs & Spaghetti (Special); Okra & Tomatoes; Carrots; Whipped Potatoes. Standard Daily Items: Roast Beef; Baked Ham; Fried Chicken; Fried Fish; Chopped Sirloin. Selection of Salads, Sandwiches & Pies.

Tuesday: Beef & Barley Soup; Beef Stew; Shrimp Creole; Fried Chicken (Special); Stewed Tomatoes; Mixed Vegetables; Broccoli.

Wednesday: Mushroom Soup; Fried Perch; New England Dinner; Swiss Steak (Special); Italian Green Beans; Cabbage; Carrots.

Thursday: Cream of Chicken Soup; Turkey & Dressing; Enchiladas w./Chili; Weiners & Macaroni; Stuffed Bell Pepper (Special); Zucchini Squash; English Peas; Rice.

Friday: Seafood Gumbo; Baked Flounder; 1/4 Broiled Chicken w/Peach half; Salisbury Steak (Special); Cauliflower au gratin; Mixed Vegetables; Whipped Potatoes; Buttered Cabbage.

Roundup Swap Shop

Property & Rentals

Lease: CLC condo, 2 br, 1 bth, exc location, \$375/mo + deposit. 488-0621 or 486-0409. Sale: 3-2-2 Friendswood near NASA, Baybrook mall schools. Very low price, assume or finance. Jeff x7429 or 482-5393.

Sale: Lot at Waterwood on Lake Livingston, golf, tennis, water sports, etc., owner will finance. Bill x6136 or 488-1410.

Lease: CLC Oakbrook 4-2 1/2-2 on golf course, fenced, formals and den, \$650/month. References required. Shown by appointment only. Jack Cohen 488-3171.

Cars & Trucks

79 Camaro Z-28, white, 2000 miles, loaded,

\$7295. Peacock x2208 or 486-0154.
48 Chrysler Windsor, 2 door, exc cond inside and out, hydramatic drive, runs good, \$1900. 486-1151 after 6.
77 Chevrolet Impala 4 door, 6 cyl, 20

77 Chevrolet Impala 4 door, 6 cyl, 20 honest MPG, air, auto, power steering, no rust, wrecks or flooding. Haines x3831.

wrecks or flooding. Haines x3831.
69 Z/28 327, 202 heads, 11 to 1 piston,
Holley, headers, body and exterior good,
spoiler, high rise hood, transmission needs
work, \$990 or best offer. John 946-4827.

79 Chev Silverado pick-up. Take up payments. 538-1391.

78 T'Bird, 23K miles, exc cond, 16 MPG town, 302 V8, AM/FM/tape, college bound, must sell, no equity, pickup app \$4300 note. Williamson 554-2693.

74 Chevelle Sta. Wgn., exc cond, recently overhauled, \$1250. 486-0728.

77 Chev window van, 6 captain chairs, front and rear AC, PS, PB, AT, AM/FM, cassette and 8-track, Sony TV, 4 new radial tires, uses reg gas, \$6500, 486-5236.

78 Camaro LT, maroon, one owner, power brakes, steering, A/C, auto, good cond, bargain at \$4700. Peacock x2208 or 486-0159.

76 Pont Grand Prix, auto, AC-PB-PS AM/FM stereo, 8-track, elec windows, tilt wheel, trailer hitch, good cond and good tires. B. Hollowill 473-5985.

73 VW "Sports" Beetle, extra tires, AM/FM radio, and trailer hitch, yellow. Jerry 333-2778 after 5:30.

65 Ford Galaxie, runs good, \$275. Also 35 gal aux gas tank, van or truck, \$35. 487-1476 after 5.

68 Chevy Impala convertible, 327 V-8, A/C, power windows, AM, new paint, etc. One owner. Bill x6136 or 488-1410.

78 T-Bird, T/top, loaded, low mileage, 5 year warranty, \$5995. Linda x2969 or 479-4463.

68 Ford Galaxy 2-dr, 6 psgr, AC-PB-PS, automatic, reg gas, good tires and brakes, some body work indicated. Al x2621.
79 4-dr Grand Lemans, Small V-8, 17-20

MPG, 6500 mi, many extras, \$6595. 488-1042. 78 Dodge Charger, fully equipped, 18,000 miles, good mileage. 465-5635.

78 Ford F-250 Ranger Lariat, loaded, PS/PB, T.H., AC, 31,00 mi, \$6,500 or best offer. 944-2532.

74 Chevy 1/2-ton PU, auto, PS, V-8 350,

new rings; inserts & valves ground, reg gas, \$1675, 331-5826.

77 VW Scirocco, Air, AM/FM stereo, low mileage, \$4500. Sampsel. 334-1278.

Household Articles

New "Cyclo-matic" auto, adj. bed w/built-in Cyclo-Massage units. \$400. Maxine Hicks x4633 or 944-5290.

Whiripool air conditioner, good BTU, \$90. Kenmore gas dryer, \$75, will demonstrate. 946-4311.

GE built-in dishwasher (white) very clean, \$60. Tappan full size portable dishwasher (white) with cherry cutting board top, \$75. Marlow x3863 or 333-3154 after 5.

Westinghouse 14 cu. ft. refrigerator, \$50. Hendrix x2971 or 487-1273.

Baby high chair, \$10. Baby walker, \$5. Bumper guard for crib, \$2. Cris x5811 or 534-3756

Maple dining room table and 6 chairs, \$225, Wing back \$50, pr. end tables, \$40, 488-5564. Spanish bedroom set, all wood, king-size

headboard triple dresser w/2 mirrors, 2 nightstands, exc cond, \$725. 479-9977. 5 captain chair's bar stools and bumper

pool table. B. Reina 488-1326 after 5. Five camp cots, steel frame with canvas cover, \$10 each. 488-4463.

Built-in electric appliances: Range top and oven unit, coppertone, \$35 each. E. Rubenstein x3116 of 334-2354.

Large metal desk, exc cond. \$50. x2663 or x4005 482-3596.

Pets

AKC Lhasa Apso puppies, golden-lion coloring, males and females, ideal pet for children. McBarron 474-4663.

Lost & Found

Eyeglasses, plastic-rimmed, in yellow case, Feb. 21, in or near Bldg. 1, or in the parking lot in front of Visitor Center. Lillian Naecker x5419

Boats & Planes

Sailboat, 26' American, 1975. Main and jib, tandem trailer, all in exc cond, \$8900. 487-1476 or 474-3319 after 5.

RC Olympic II Sailplane 100" ws, Nimbus 2 ch. control. David 482-5825.

16' glass Falcon w/75 hp Chrysler, trailer accessories, \$1900. x3271 or 332-1396. 1973 19' Starcraft fiberglass Tri-hull boat,

1978 85hp Johnson outobard motor and galvanized trailer, \$2850. Mary Burch x4215 or 331-1279 after 6.
Sailboat, 14' Dolphin, exc cond. Earl

Rubenstein x3116 or 334-2354.
1975 American 26' sailboat, tandem axle

trailer, both excellent, \$8500. 487-1476 after 5.

14' aluminum boat, 33 hp Evinrude, elec start, McLain trailer, swivel seats, depth finder, trolling motor, never in salt water. 645-6267 evenings.

Desire one or two additional partners to share flying & benefits of 1979 Piper Cherokee PA 32/six-300. Full IFR, plush 6 seats. Dr. Austin x6291

Lido 14 Sailboats, one of most popular family and racing boats locally. Over 30 boat fleet. R. Hoover 334-2392 or J. Bonner 482-7305.

Stereos & Cameras

Pioneer KH-5151 compact stereo AM/FM, cassette, phono with 2 speakers, exc cond, \$200. 333-2916

Mamiya NC-100x SLR x/1.7 50mm; polarizer, hood, EC; 1 yr. old, \$225. David Lipson x2694 or 486-8890 1978 Tosiba receiver and auto return

1978 Tosiba receiver and auto return turntable and cart, \$350 or best offer. Pair of Genesis spkrs, 6 mths old, \$300 or best offer. Debbie x4321 or 488-0852 after 5.

Mamiya Sekor 500 TL and 1000 DTL, 35mm SLR w/28 MMWA, 135 mm Tele, 200 mm Tele, and Vivitar 180 flash unit, pkg deal \$595. Jakir x5341

Mamiya NC1000x 35 mm autoreflex camera, Fl.8, polarizer, strap, 1 yr. left on warranty, \$225. D. Lipson x2694 or 486-8890.

Musical Instruments

Hammond M-100 organ w/bench. Rhythm and various special sound section. Fruitwood

Wanted

finish, \$600. Sears Exercycle \$40. Jones

Reasonably priced left handed Bear Whitetail bow and almost any type of accessories for Bear bow. Bradley x6486.

Boys bike and girls bike, 26" or 27" single or 3-speed, Marlow x3863 or 333-3154 after 5. Houston bedroom accommodations for JSC

summer interns. Needed for mid May through end of August. Contact Betty Johnson at x5266.

Lawnmower and edger, running or not. 474-4885 after 5. '66 Mercury 65 hp outboard motor for parts.

George Peters 482-3678.

Baritone ukelele, Jim Bates x4601 or 944-4687 after 5:30.

Carpools

Ads must be under 20 words total per person, double spaced, and typed or printed. Deadline for

submitting or cancelling ads is 5 p.m. the first Wednesday after publication. Send ads to AP3 *Roundup*, or deliver them to the Newsroom, Building 2 annex. No phone-in ads will be taken. Swap Shop is open to JSC federal and on-site contractor employees for non-commercial personal ads.

Non-smoker to join carpool from Hiram Clark/Anderson Road area, 8-4:30. Jeanie x5834 or Doris x2761.

From Bayridge apartments to JSC 8-4:30. Teresa Thomas x6417 or 334-2475. Would like to form carpool from Stafford-

Missouri City area to JSC via Almeda-Genoa Rd. Sally MacArthur x5554. Want to carpool from LaMarque to NASA,

7:30-4. Diane x5883 or x5884.

Would like to be paying rider from Alvin to Bldg. 45, 7:30-4, x5217 or 331-0903 after 5.

Save Gas! Nightshift worker (12-8 a.m.) needs carpool from Pasdadena to NASA. 473-7254 after 12 noon.

Want to join carpool from Almeda Mall area

to JSC, 7:30-4. Rodriguez x5203 or x6449.

Personals

Family membership in Windemere Racquet and Swim Club (Bal Harbour). Dick Colonna x3937.

Brazoria County needs foster parents for children all ages. Be one who cares for children enough to care for children. Call 331-6101 ask for Protective Services.

The Clear Creek Bass Club has openings for new members. If you enjoy bass fishing call 334-2003 after 6.

Cycles

76 Kawasaki KH500, 3200 miles, runs

great, extras. 332-8219

78 Honda Hawk CB400Tw, 3000 miles, 61 mpg, purchased new in June 79, very good cond, \$1200. Bruce Snyder x5384 or 488-1705 after 5.

Boys bikes, two ten speed and one five speed, exc buys. 488-4487.

1972 Yamaha 650, new battery, \$375, ridden daily to JSC. Martin x2197.

Cartoon by Russ Byther

YOUR GOLDEN OPPORTUNITY

MAY PAN-OUT - DIG OUT A

JSC FORM 1150 & SEND IT TO BE-3

Continued on Page 2



by Karen Johnson

TEST CONDUCTOR: "Bring up master gain."

POWER AMPLIFIER CONTROL: "Master gain is up."

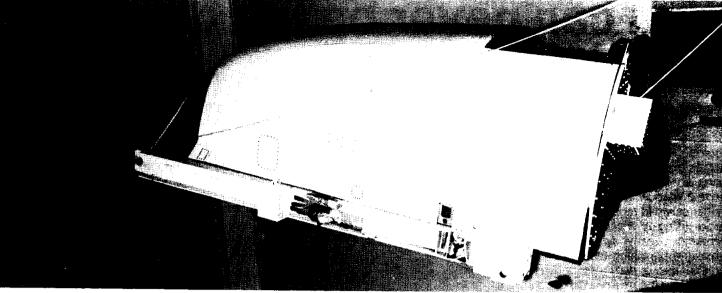
T.C.: "Cycle up to holding level."

DATA: "TC, all instrumentation is ranged."

T.C.: "Roger, go to full modulation." COMPUTER CONTROL: "Showing modulation now."

The massive building quivers slightly and a muffled rumble can be heard from below the control rcom. The test team, engineers, technicians, and observers all seem to hold their breath for the duration of the test run. Weeks of preparing the test article and facility culminate in these few minutes, when an acoustic test in the Vibration and Acoustics Test Facility, Building 49, begins.

Before the Shuttle can fly in space, it must be certified through an extensive program which includes acoustic testing.



OMS Pod test article is installed in Building 49 for acoustics testing

You think your neighbor's stereo is loud. . .

Photos by
Ralph Payne
and Jack Jacob

Under the Orbital Structural Fatigue Test Program, these runs simulate the acoustically-induced loads that the Shuttle Orbiter experiences during launch and ascent. These loads can cause such failures as structural fatigue, tile damage, broken rivets, or propellant leaks.

A test article, a representative portion of the Orbiter which is built to flight configuration, is subjected to the launch and flight acoustic environment in a large reverberant chamber. The runs last from a few minutes to half an hour. After each sequence, the article is inspected for any structural or configuration changes.

By the end of a typical test, the article will have experienced an approximate accumulation of stress from 500 missions.

A typical sound pressure level produced for these tests is 160 decibels, which is orders of magnitude greater than the most powerful rock concert sound system. To produce the environment, two compressors of 4000 and 4500 hor-

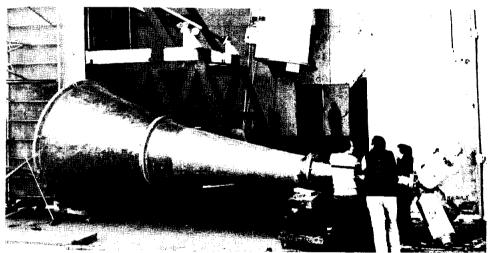
sepower supply air at 21,000 to 27,000 cubic feet per minute and 28 to 32 pounds per square inch to air modulators which are connected to acoustic horns.

It takes a great deal of power to "fire up" this facility. In fact, during summer months, runs take place only on the night shift to avoid interference with center electrical demands during normal work hours

Presently being prepared for testing is the OMS Pod (Orbital Maneuvering Subsystem). This test article differs significantly from recent ones such as the Nose Cap or Wing Leading Edge. For example, the OMS Pod test article will contain 2000 gallons of propellant simulants (alcohol and freon) and it will be pressurized at 100 to 4600 pounds per square inch depending on the system or component. Also, in order to produce localized acoustic fields, two "hot spot" horns will be suspended to within a few inches of the article.

Testing begins in March and is to continue for three weeks.

After Orbiter testing is complete, other acoustic tests in support of the Shuttle program will include anomaly investigations and payload dynamic testing.



Scientists to analyze new planetary data Lunar Planetary Conference to cover year's encounters, more lunar samples

The Year of the Planets will be the theme for the 11th annual Lunar and Planetary Science Conference March 17 through 21 at JSC. Concurrent sessions in the Visitor Center Auditorium and two halls at Gilruth Center will cover results from the numerous planetary encounters that took place in 1978-79.

The science sessions, during the day, will cover recent reports from data on the Jupiter moons obtained by Voyager, new data from Pioneer Venus, recent analyses of data from the Viking orbiter and lander which is still transmitting from Mars, and details on meteorites recently collected from the Antarctic.

Two evening sessions will cover topics of interest to the general public. Monday at 8:30 p.m. a panel will discuss "Application of Remote Sensing Techniques" in Room 104 of Gilruth Center. Wednesday at 8 p.m. there will be public lectures on the Galilean satellites, the planets, and "Hunting for Meteorites in Antarctica"—in the Building Two Auditorium"

The United Nations' "Draft Agreement Governing the Activities of States on the Moon and Other Celestial Bodies" will also be a topic at the Wednesday evening session.

Two groups of lunar samples are being given special attention at this year's conference: complex fragmental rock (breccias) from the light-colored lunar highlands are being examined to understand the early history of the Moon and the Earth. Long cores of "lunar soil," the

powdery rubble that covers the mare's surface, are being carefully dissected to trace the history of the Sun—a history written by tiny solar atomic particles that have been trapped in the lunar soil for millions of years.

New theoretical, experimental, and analytical studies of the Moon, based on lunar sample analyses and on continued Apollo data analysis, will be the topics of several conference sessions. Detailed models of the Moon's interior structure

and composition are being developed for comparison to Earth and other planets.

The conferences, begun in 1970, were originally used to share the knowledge gained from the lunar samples returned by Apollo missions. The first six Lunar Science Conferences were almost entirely devoted to lunar studies.

More recently, lunar research has become increasingly important for helping to understand the other planets of the solar system, and the last three conferences included much more information about comparative studies of such other bodies as Mercury, Venus, Mars, and the asteroids.

The name of the conference has been changed to "Lunar and Planetary" to reflect the continuing trend for combined studies in planetary exploration.

This year, "poster sessions," in which authors of papers will use graphic displays to discuss their work informally during breaks in the schedule, will be featured for the first time. The posters will be displayed in the Rec Center gym.

More than 700 scientists from all over the world are expected to attend this year's conference.



AAS passes hat

The Viking landers can continue sending weekly bursts of data and pictures from Mars until 1987. In order to assure funding, and to show public support for the project, The American Astronautical Society, San Francisco Section, is taking contributions to "The Viking Fund." Their goal is to raise \$1 million by July. Contributors (minimum \$1) will receive an open invitation to the presentation of the Fund to NASA in Washington on or before July 20, 1980, the fourth anniversary of Viking's Mars landing. Send to The Viking Fund, P. O. Box 7205, Menlo Park, CA 94025.