



ROUNDUP

NASA LYNDON B. JOHNSON SPACE CENTER

HOUSTON, TEXAS

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First manned captive test flight is delayed

The first manned test flight of the Space Shuttle Orbiter scheduled for June 9 at the NASA Dryden Flight Research Center, Edwards, Calif., has been delayed.

The exact date of the flight is expected to be one to two weeks beyond June 9, but is dependent upon successful completion of Orbiter ground tests currently underway at DFRC.

This flight begins the second phase of the Shuttle Approach and Landing Tests, a program designed to verify the aerodynamics and flight control characteristics of the Orbiter while still attached to the 747 carrier aircraft.

This postponement is due to the malfunction, during tests June 2, of equipment associated with the vehicle's auxiliary power system. A leak developed in fuel pump seal in one of the three auxiliary power units causing a small amount of APU fuel (hydrazine) to vent overboard.

Some have forgotten dangers of hurricane

It has been 16 years since a major hurricane has struck the Upper Texas Coast - Carla in 1961.

There has been only one longer period in this century without a damaging hurricane - 17 years between 1915 and 1932.

This long respite from the destructive effects of a hurricane may carry its own dangers, some experts feel.

A study conducted among residents of the Mississippi coast after Hurricane Camille in 1969 showed that those who had lived in the area the longest were less likely to have heeded warnings, taken precautions and evacuated the area.

Long-time coastal residents, the study seemed to show, became calloused to storm warnings and lost that healthy respect and fear for hurricanes that new coastal residents showed.

The moral seems to be: just because it's been 16 years, don't think hurricane dangers are not so great. Follow the advice of the National Weather Service.

Hurricane season began June 1 and runs through November 30.

Here at JSC, the Center Operations Directorate has a hurricane plan that calls for shutdown of all non-essential on-site activities when a hurricane threatens. All employees not part of the ride-out crew would be evacuated.

All major JSC organizations have

This problem in APU No. 2 developed during a "mission run" of the Orbiter APU system, one of the final tests scheduled before the first manned flight. The test was halted when the leak was noticed about 30 minutes into the one-hour long scheduled test.

APU No. 2 will be replaced and a full mission run will be rescheduled at DFRC. This work is expected to take between four and seven days.

Astronaut application deadline approaches

The Astronaut Candidate Program Office had received 3,380 applications from civilian Space Shuttle astronaut hopefuls as of June 2. Deadline for submitting applications is June 30.

Of those applications already

designated Emergency Planning representatives who will work with the Hurricane Plan manager and other emergency preparedness people in setting preparations in motion.

JSC employees needing assistance and information should contact their representatives or call the Emergency Preparedness Planning officer at X-4441. In an actual hurricane threat the local representative likely will be more accessible than will the plan manager who will be involved in readying the center for riding out the storm.

During duty hours hurricane threat information will be available on a recorded message at X-6281 and on the on-site closed-circuit television system.

Any decision by the center director to close the center will be relayed through supervisory channels and on the telephone recording and TV system.

Before evacuating the center, employees should unplug nonessential electrical appliances in the work areas, such as coffeepots, heaters, typewriter and clocks. Also, doors should be closed, valuable files moved from outer offices and bottom drawers, venetian blinds raised and any other action taken to minimize property damage.

Employees not members of the ride-out crew or assigned a specific

(Continued on page 2)



Dr. Robert A. Frosch

Subcommittee hears Frosch's nomination

Hearings on the nomination of physicist Dr. Robert A. Frosch as new NASA administrator began Monday at 9:30 a.m. Washington time before a United States Senate subcommittee.

Final recommendation to the full Senate on the Frosch nomination is not expected before June 14. The hearings are conducted by the Subcommittee on Science, Technology and Space of the Committee on Commerce, Science and Transportation.

Frosch, 49, was nominated for the position by President Carter on May 23. He is presently associate director for applied oceanography at the Woods Hole Oceanographic Institution on Cape Cod, Mass.

If confirmed, Frosch will succeed Dr. James C. Fletcher who resigned May 1 after six years' service as NASA administrator. Dr. Alan M. Lovelace is current acting administrator.

Frosch has held his current position for two years. From 1973-75 he was assistant executive director of the United Nations Environment Programme with the rank of Assistant Secretary General of the United Nations.

From 1966-73, Frosch was Assistant Secretary of the Navy for Research and Development. In

earlier years, he served in various posts involving government research and development projects.

Frosch's professional career began in 1951 with the Hudson Laboratories of Columbia University where he worked on Naval research projects.

There he progressed from research scientist to assistant director and finally director in 1956, remaining in that post until 1963.

Frosch was born May 22, 1928 in New York City. He earned his A.B., A.M. and Ph.D. degrees from Columbia University. He is a member of Phi Beta Kappa and Sigma Xi.

He received the Arthur S. Flemming Award in 1966 honoring young men in the federal government and was awarded the Navy Distinguished Public Service Award in 1969. He is a member of the National Academy of Engineering.

Frosch is a fellow of the American Association for the Advance of Science, and Acoustical Society of America and the Institute of Electrical and Electronics Engineers (IEEE). He is a member of six other scientific professional organizations.

He and his wife, Jessica, are the parents of two teen-aged daughters. They presently reside in Falmouth, Mass.

submitted, 2,849 were for mission specialist candidate positions, 531 were for pilot positions, and 305 were for both. Women applicants totaled 513.

NASA will announce selection of at least 15 mission specialist candidates and 15 pilot candidates by December 1977.

The astronaut candidates selected will report to JSC on July 1, 1978, to begin two years of training and evaluation. Final selection as an astronaut depends on satisfactory completion of the evaluation period.

As of June 2, a total of 16,620 applications had been mailed out, including 443 to NASA personnel. At JSC, 257 employees had requested and received applications.

NASA is committed to an affirmative action program with a goal of having qualified minorities and women among the new astronaut candidates.

Civilian personnel seeking information or applications should contact the Astronaut Candidate Program Office right away, Code AHX.

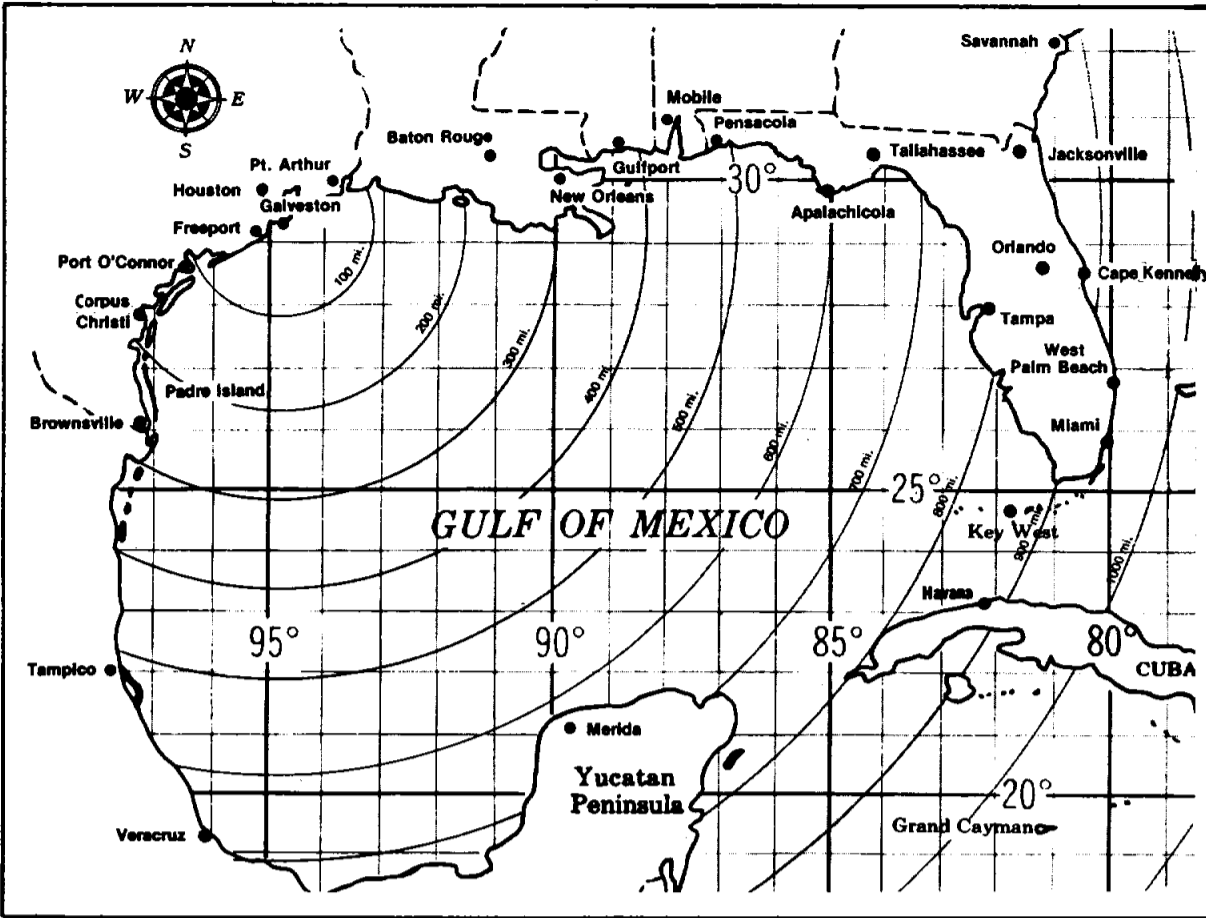
Orbiter contract expanded

JSC has signed a supplemental agreement to the contract with Rockwell International Corp. Space Division, Downey, Calif., covering engineering changes in the Space Shuttle Orbiter.

The \$1.1 million addition covers 10 changes in the Orbiter flight control system and relocation of the remote manipulator system, and brings the total estimated value of the cost-plus-award fee Rockwell contract to \$3,052,386,391.



SHUTTLE SPACE SUIT - Space Systems engineer Ed Brisson models the undergarment that will cool and ventilate Space Shuttle astronauts when they wear the Shuttle Extravehicular Mobility Units. Excess body heat is removed by water circulated through the thin plastic tubing woven into the fabric and by oxygen carried through hose-like tubes. Brisson has slipped into the lower portion of the suit.



SCHOLARSHIP WINNERS — Recipients of the 1977 NASA Exchange-JSC scholarships are shown here with Center Director Dr. Christopher C. Kraft Jr. Left to right are Mark G. Riley, Clear Lake H.S., who received the Joseph N. Kotanchik Scholarship; Randall L. Patterson, Clear Creek H.S.; and Jean D. Fulton, J. Frank Dobie H.S. An article on the students appeared in the May 27 issue of the Roundup.

Hurricane information (See also page 1)

Hurricane Season June 1 thru Nov. 30
Peak months are Aug. & Sept.

Number of Tropical Storms and Hurricanes, by month, that has affected the Galveston-Freeport Area in the past 100 years.

June 4 July 8 August . . . 12
 September 14 October . . 4 November . 0
 Ten of these were considered major storms, that inflicted heavy loss of life and property damage. Winds were in excess of 100 MPH and tides above 10 feet. The 1900, 1909, 1915, 1932, 1943 and Carla of 1961 were the most severe in this century. They killed over 6,000 persons.

Recommended Actions Prior to Hurricane Season or Before a Watch

1. Know the elevation above MSL of your home or place of business.
2. Familiarize yourself with past flooding in your area. Is your home subject to tidal flooding with 6 foot tides? 8 foot? 10 foot? etc.
3. Have your route picked out or planned, if it becomes necessary to relocate to a place of safety or higher ground.
4. If you live in a Mobile Home, Pre-arrange for safe shelter.
5. Know the locations of storm shelters in your area.
6. Check your insurance coverage.

Hurricane Watch

Does not mean that hurricane conditions are imminent but there is a real possibility that the hurricane will threaten this area within 24 hours.

RECOMMENDED ACTIONS WHEN A WATCH IS ISSUED FOR THIS AREA and SOME SUPPLIES YOU SHOULD ARRANGE FOR

1. Fresh batteries for your radio and flashlights.
2. Candles, lamps and matches.
3. Non-Perishable foods, canned goods and drinking water containers.
4. Materials for boarding up windows & other glass openings such as boards, lumber & tape.
5. Gas-up your automobile.
6. Prepare to moor your boat or move it to safer shelter.
7. Monitor progress of storm via radio or TV.

Hurricane Warning

When a warning is issued, it means that hurricane conditions are expected within 24 hours. High tides, winds in excess of 74 MPH, heavy rains and flooding and the possibility of Tornadoes.

Take the following actions immediately

1. If in mobile home, check tie-downs and leave. Never remain in mobile home if hurricane winds are expected.
2. If home is subject to flooding, prepare to leave for higher ground.
 - a. Board-Up large windows and other exposed glass.
 - b. All outside loose objects should be placed inside.
 - c. Move your most valuable possessions that you cannot take with you, to higher points within your home.
3. If you remain at home
 - a. Stay indoors, on leeward or downwind side of house and away from windows or glass doors.
 - b. Beware of the Eye of the Hurricane. Do not be fooled by a lull in the wind, it could be that you are in the eye; if so, extremely high winds, above hurricane force, will rise rapidly from the opposite direction in a matter of minutes.

There are many other actions that can be taken prior and during a storm. Conditions will vary considerable, depending on the strength of the storm, your particular location, type of building construction, and the ever-changing road

building and elevations due to the land subsidence.

After the Storm

Frequently, persons who have weathered or survived a storm venture outside and are electrocuted by blown down power lines.

1. Do not touch or go near fallen utility lines.
2. Make sure you see where you are walking. If it's dark stay inside or if water remains, take no chances in wading unless absolutely necessary.
3. Drive with extreme caution, especially where roads are still under water.
4. Poisonous snakes and insects are always a threat in this area during the post-storm clean-up.
5. Guard against spoiled food, contaminated water and fires.

Hurricane Terms That Are Commonly Used
Tropical Disturbance—An area of disturbed weather in the tropics that has the potential of storm development.

Tropical Depression—A closed low pressure circulation at the surface in the tropics with winds up to 39 MPH.

Tropical Storm—A closed low pressure circulation at the surface in the tropics with winds 39 to 73 MPH.

Hurricane—A closed low pressure circulation in the tropics with winds in excess of 74 MPH.

Small Craft Advisory—When issued in conjunction with possible hurricane conditions for this area, advises small craft operators to take precautions and not to venture into the open Gulf.

Gale Warnings—When winds of 38 to 55 MPH are expected.

Storm Warning—When winds of 55 to 74 MPH are expected. Normally, not used in the Gulf or this area, usually Hurricane warnings follow Gale warnings.

Hurricane Watch—Hurricane may threaten this area within 24 hours.

Hurricane Warning—Hurricane force winds or high tides and seas are expected to strike this area within 24 hours.

When a Hurricane Threatens the Texas Coast

An Emergency Hurricane Information Center is established at the National Weather Service in Galveston to disseminate hurricane warnings to persons along the Upper Texas Coast. The long range radar, tide stations and other meteorological sensors along with the NWS vast communications network affords the news media up-to-date information on the storms progress and its potential effects to this area. In addition to providing the latest storm information to the media, frequent hurricane briefings are conducted for Community Preparedness Officials for this area.

Sources For The Public to Obtain the Latest Hurricane Information

1. Virtually all commercial radio and TV stations have a direct teletype line to the National Weather Service Offices and broadcasts are made soon as received.
2. Radio Station KGBC, 1540 KHz, Galveston, in addition to their teletype connections, has a direct radio link between the Weather Office and the station, both on emergency power. All other commercial stations are encouraged to rebroadcast KGBC's messages, if land lines are disrupted from Galveston Island.
3. The NOAA National Weather Service Radio Stations; 162.55 MHz at Galveston and 162.40 at Houston broadcast the latest information on a continuous basis.
4. Law enforcement Agencies, Civil Defense, Red Cross and other local Community Officials are kept abreast of the storms progress and are continually disseminating storm related information.

Joy Robertson picked Outstanding Secretary

Joy L. Robertson of the Systems Evaluation Office, Engineering & Development Directorate, has been named JSC's Outstanding Secretary for May.

She was nominated for the award by Harold E. Benson, deputy manager, and Edward L. Hays, former manager of the Systems Evaluation Office. Hays has since retired and been replaced by Larry Bell.

"Mrs. Robertson is an extremely hardworking and efficient secretary who has consistently displayed high qualities of loyalty, motivation and skills," the letter of recommendation stated.

"She can be relied on to accomplish large volumes of documentation or presentation material on very short notice to meet tight deadlines."

Robertson's supervisors said she "exhibited truly outstanding performance" over a two-month period when both the division secretary and program control/administrative officer were on extended sick leave.

"This involved much heavier secretarial responsibility in addition to administrative duties," they wrote. "Apprehension first anticipated by division management with these two key employees out at the same time was quickly allayed by her performance."

"Not only did she retain her own calm and pleasant attitude in face of this adverse situation, she was able, by her performance and attitude, to relieve the rest of the office staff of its concerns," the supervisors said.

Robertson "simultaneously handled administrative and private secretarial assignments far above those expected of a branch secre-

tary on a completely voluntary basis because she knew they had to be done."

Benson and Hays concluded: "In essence, Joy is one of the most dedicated, competent and pleasant secretaries it has been (our) pleasure to work with" and she "is truly deserving of the term 'outstanding.'"




Joy L. Robertson

Hurricane planning...

(Continued from page 1)

hurricane job are expected to evacuate the center. Guards will check and secure buildings.

Employees sent home because of hurricane threat are expected to return to work the following work-day unless advised otherwise through the news media.



ROUNDUP

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EAA ATTRACTIONS

TICKETS

The following tickets are available at the Bldg. 11 Exchange Store from 10 a.m.-2 p.m., Monday - Friday:

Astroworld - Adult & children tickets available for \$6.95 each. That's a \$1 discount.

Dean Goss Dinner Theater - Comedy production, *Agatha Christie Made Me Do It*. Tickets \$16/couple available for any night except Monday, Saturday, through July 3.

Disney Magic Kingdom Club - Free membership cards.

Sea-Arama Marineworld - Tickets on sale, \$3.75 for adults, \$2.50

for children. Open until dusk, year round.

Six Flags - Adult & children tickets, \$6.75 each. That's a \$1.20 discount.

SKEET LEAGUE FORMING

Interested in sharpening up your shotgunning skills for greater effectiveness afield this fall? Hunting season will be here before you know it! Even if you've never shot a scattergun before, you can now get in on the ground floor.

The JSC Claybusters Skeet League will begin Thursday, July 7, for 10 weeks at the Clear Creek Gun Range, located on FM 1266 in

League City. Shooting hours will be flexible. Call Bill Simon at X-4027 if you are interested in signing up.



NASA DAY COMING AT ASTROWORLD

The EAA is sponsoring a NASA outing at Astroworld on Sunday, June 26, from 10 a.m. to midnight.

Admission tickets will be sold at the Bldg. 11 Exchange Store for \$5.45 each. That is a big discount

of \$2.50 off the regular price of \$7.95.

The EAA wants to sell at least 500 tickets so they'd like to see big participation in this. Get your tickets on or before June 24.

Here's your chance, both civil service and contractor employees, to take the family to Astroworld at a substantial savings and put yourself in the middle of fun.

(Editor's note: Lots of thrill-seeking Astroworld visitors think one white-knuckled ride on the Texas Cyclone is worth the price of admission.)

KARATE CLUB

Congratulations are in order for

those in the Kung Fu Section who successfully completed a series of promotion tests. Earning new rankings were: Dick Arndt, blue; Lou Deluca, green; Margaret Gotsch, green, and B. G. Smith, blue.

The ranking system in the Kung Fu Section is black, brown, blue, green, yellow and white.

The JSC Karate Club consists of two sections. The Taekwondo Karate Section meets in the gym on Monday and Wednesday evenings. The Kung Fu Section meets on Tuesdays and Thursdays. For information, contact Lynn York, Taekwondo, X-5381, or Bud Culbertson, Kung Fu, X-3511.

Roundup Swap Shop

Swap Shop advertising is open to JSC federal and on-site contractor employees. Goods or services must be offered as advertised, without regard to race, religion, sex or national origin. Non-commercial personal ads should be 20 words or less, and include home telephone number. Typed or scribbled ad copy must be received by AP3/Roundup by Thursday of the week prior to publication.

CARS & TRUCKS

76 Olds Cutlass Special. Brown w/white Landau roof, white vinyl inside, 19K mi. \$4,400. 776-3417 or 333-2869.

74 LeMans Luxury Sport. Bukt seats, 34K mi, xInt. NADA wholesale. 334-3364.

74 Dodge Custom Van. 318, std, no air, plush interior, CB, stereo, icebox, custom paint, 29K mi. \$4,900. 488-5037.

75 VW. Orange, 52K mi, whitewalls. \$1,850. Dan, X-3021 or 331-3719.

68 Merc Montego. 8 cyl, good cond, 4 dr, 2 new tires, auto, radio, pwr steer. \$800. X-5156 or 474-4359.

72 Pont Grand Ville. Vinyl top, stereo, steel radials, pwr incl windows, seat, tilt whl, cruise. Orig owner, wife's car. \$2,000. Sterling, X-4524 or 488-1380.

71 Olds Cutlass. 350, all pwr, air, good cond. \$600. 332-4206.

72 Subaru GL Coupe. Air, real good cond. \$1,000. Murrell, 482-7968.

74 Chevy Impala Sta Wgn. Auto, air, pwr, cruise, tint, roof rack, batt 6 mos old. \$2,850. Norm, X-5954 or 482-3739.

64 Plymouth 4 dr. Slant 6, std, radio, heat, looks bad, runs good. \$150. Pruet, X-4491 or 487-4914 after 5.

72 VW bus. Air, good tires, 18K mi on new eng. \$2,495. Sampsel, 471-0172.

72 Ford Gran Torino Brougham. V8, auto, all pwr, air, AM/FM stereo, vinyl top. \$1,295. Larsen, X-2118 or 334-3432.

73 4-dr Pont Catalina. \$1,300. McCown, 488-1559.

Executive Jr. 22-ft mini motorhome. Fiberglass, rear bath, loaded, xInt cond. 482-1582.

CYCLES

75 Honda SS. Windjammer III, adjustable backrest, 2 helmets, 72 mi, garage kept. \$1,550. 488-3319 after 4:30.

73 Kawasaki 900. 1013 cc's, special options. Better than new cond. 471-2646.

Honda CL175. 1971, xInt, 700 mi, adult rider, 2 helmets. \$250. Smith, X-4468 or 488-3238.

75 Kawasaki KZ-400D. XInt cond, elec start, front discs, 50 mpg, red. \$795. Malone, X-3216 or 488-1580.

PROPERTY & RENTALS

Lease: Middlebrook, 3-2-2. Landscaped, fenced, fam rm w/firepl, carpet, etc. Appliances & water incl for \$425/mo 488-5165 or 652-6694.

Rent: Lake Livingston, Cape Royale. New 2 bdrm waterfront home compl furn. Facil incl tennis, pool, golf, boat launch. By wk or mo. 488-3746 after 5.

Galveston West End. 2 bdrm By-the-Sea Condo apt, full furn. \$180/wk off season, \$260/wk in season. Clements, 474-2622.

Sale: 2 acre wooded lot, Dayton Lakes Estates. Access to 8 fishing lakes, Trinity R., 700 plus acre hunting area, swim pool, 8 parks, clubhouse. Leach, X-3584 or 474-3386.

Rent/sale: Mobile home lot, League City area. 554-6601 after 5.

Sale: Webster/Heritage Pk, brand new L-shape contemp 3-2-2. Xtra lg cul-de-sac lot, huge firepl fam rm, bar, formal dine rm, master suite w/vanity bath, lots closets. \$40s. 332-4206 after 5.

Rent: Luvly 3 bdrm home, Camino So. Landscaped, amenities. Avail June 15. \$450/mo. Allgeier, 474-3961.

Rent: Lake Livingston, Cape Royale, Compl furn 3-2-1. Fishing, hunting, ten-

nis, golf, etc. Reserve early. Wk/mo/yr rates. 488-4487.

Reserve for vacation now. Jamaica Beach, Galveston, new 2 story. \$175/wk. 334-1640 after 5.

PETS

Miniature Schnauzer pups for sale. AKC. Lousma, 482-2360.

Cocker Spaniel pups, blond, AKC. Champ bloodline. 6 wks old. \$125. 482-7858.

MUSICAL INSTRUMENTS

Bundy clarinet, plastic, xInt cond, used 2 yrs, good for beginner. \$50. 471-2665 after 5.

Suzuki acoustic guitar. \$35. John, X-2181 or 334-5191 after 5.

Beginner's guitar. Cortley, in good cond. \$15. 665-4001 after 5 or Lenett, X-2128.

CAMERAS & TELEVISIONS

Konica 35mm f3.2 Auto Hexanon lens for Autoreflex T or TC model cameras, \$75. Patterson 8X10 print washer, like new, \$30. Pruet, X-4491 or 487-4914 after 5.

Sony 3" miniportable TV. Power from 120 V wall line, battery pack or auto batt. \$50. Pruet, X-4491 or 487-4914 after 5.

HOUSEHOLD ARTICLES

Working Lady Kenmore Elec Dryer. 471-0262 after 5.

Kenmore dryer, white, reg size, good cond. \$40. Kaltenback, X-2666 or 331-5751.

6-yr-old Singer Touch & Sew machine & cabinet. \$100. Sherron, X-6278 or 334-4288 after 5.

Like new Hoover floor polisher w/brushes & pads, \$20. 36" tall white wrought iron birdcage, \$15. 334-3370.

Light maple bunk beds w/foam mattresses & box spgs, can be twin beds, \$45 all. 7-ft couch w/reversible cushions, blue w/gold design, \$50. Wood, X-2831 or 4361.

MISCELLANEOUS

New Wilson Sam Snead Blue Ridge golf clubs. 1,3,4,5 woods, 3-9 irons, pitching wedge, bag. \$125. 946-7415.

Oxygen meter for fishing, like new. Over \$100 new, sell for \$85 or best offer. 482-1582.

Fresh, natural honey from Friendswood bees. Quart, \$2.50; 1/2 gal, \$4.50; gal, \$8. Helen Statz, beekeeper. X-3821 or 482-7607.

Retired racing go-kart, gearbox, hyd disc brakes, 100cc eng, centrif oil clutch, fast. Also, camper boot, \$10. Stake pocket camper tiedowns, \$20. Lindsay, X-3186 or 488-1493.

Spaulding Top Filte golf clubs. 1-4 woods, 2-8 irons, pitching wedge, putter, bag. \$50. John, X-2181 or 334-5191 after 5.

Class 1 trailer hitch, 1973 Chevy wgn. Used once, bolt assembly. \$25. Smith, X-4468 or 488-3238.

Shotgun, Kleingunther over/under. 12 gauge, 1C/1M bbls, vented rib, xInt pigeon/field gun. \$295. Milligan, 534-6133.

King KX160 Nav/Com w/pwr supply but no head. Recently recertified on all channels, \$500. Also rear speaker kit, two 6X9s w/grills, wire, mounts. \$20. Pruet, X-4491 or 487-4914 after 5.

McCullough Mini Mac 10" chainsaw. XInt cond, spare chain, not used since

dealer tuned May '77. \$65. 334-5949 after 6.

Four ER 78-14 Goodrich Life Saver radials. Used 8000 mi. 554-3885 after 6. Paint the easy, pro way. Rent 1HP spray compressor incl 3-gal paint tank & 25 ft air hose. Discount rates. 334-1138.

WANTED

College student needs desk at reasonable price. Robert, 488-5431 evngs.

Someone to roughly appraise inherited stamp collection. 99% mounted. Allgeier, 474-3961 or X-4027.

Want shop manual for 68 Ford Mustang. McCormick, X-3584 or 481-2158.

Someone to join carpool from Baytown to JSC, 8-4:30. Brenda, X-3479 or 573-1449.

Membership for the Bay Area Racquet Club. Kelso, X-2254 or 935-6823.

Need riders for carpool from W. Loop, SW Fwy, Bellaire area. 8-4:30. McLaughlan, X-5536 or 661-2974.

Firefighters need for CLC Vol Fire Dept. Men & women adult residents of CLC. Call 488-0023 anytime.

LATE ENTRIES

Free: Pure black male kittens. 534-4900.

Sale: Islander East Condo. Top floor efficiency, xInt Gulf view, balcony. Beach & swim pool, furnished. 481-3397 after 6.

73 MG Midget. 26K mi, good cond, new tires, FM radio. \$2,300. 334-5449 after 5 & weekends.

LOST: Reading glasses in black case lost June 2 somewhere on site. Eggleston, X-5584.

JSC Crossword

(See answers, page 4)

ACROSS

1. Unit of electric current (abbr.)
4. Layer
7. Decree
9. Chopper
10. Workshift
11. Exclamation
12. JSC's parent center
13. Preposition
15. Some women prefer it
16. Longest manned missions
18. Note of scale
19. Sour
22. Article
23. Worn by 5 Down
24. Safecracker (colloq.)
25. Young flew on Gemini & Apollo missions with this number

DOWN

1. Not fore
2. Mine (Span., masculine)
3. Astronaut _____ Weitz
4. Orbiter payload area
5. Draft animal
6. Biological experiment containers

1	2	3			4	5		6
7			8		9			
10							11	
		12						
13	14						15	
16						17		
18					19		20	21
		22			23			
24						25		

8. Wing's backside; _____ edge
11. Stitched border
13. Analyze, as ore
14. Technical knock-out (abbr.)

17. Edinburcher
20. Dwight's nickname
21. Lair
22. Attorney General (abbr.)

Science flies high in JSC's WB-57F

An aircraft which is among the most sophisticated high altitude scientific platforms in the world is presently being flown by JSC.

The plane is a long-wing version of the U.S. Air Force Canberra and is designated a WB-57F. It can carry a 4,000-pound payload above 60,000 feet and has a range of 2,500 nautical miles with a 6-1/2 hour endurance.

JSC has recently completed a

major modification to the Earth survey WB-57F which provides multi-mission capability with minimum out-of-service time for sensor payload change.

This is achieved by having interchangeable sensor pallets with standardized power and control connections.

The pallets are 5 feet wide, 2 feet deep and come in lengths of 3 and 6 feet. Any combination of pal-

lets which totals 12 feet of pallet length can be flown.

When a project or experiment is approved for flight on the WB-57F, one of the empty interchangeable pallets is provided to the investigator who installs the flight equipment in the pallet at his facility.

Standardized engineering procedures and electronics connections are specified to insure compatibility and safety. The integrated pallet with its cockpit control panel is returned to JSC, installed and flown on the WB-57F.

Since the pallets, connections and control panels are interchangeable, the complete sensor complement and mission can literally be changed overnight.

In addition to the two-ton palletized payload capability, the WB-57F has sophisticated data support systems. A data annotation system formats the data, flight parameters and inertial guidance information for two 14-track tape recorders.

The scientific equipment oper-

ator in the back cockpit operates the inertial and omega navigation systems, on optical vertical tracker, and has control and monitoring capability of all sensor and data support systems. This leaves the pilot free to fly the aircraft.

In contrast, the single place U2 can carry 550 pounds of total payload and all data systems, recorders and inertial guidance systems have to be included in that payload.

Although the U2 can fly 5,000 feet higher than the WB-57F, that amounts to less than 2 percent of the atmosphere at those altitudes.

NASA Langley Research Center was the first organization outside JSC to take advantage of this capability. Their Measurement of Atmospheric Turbulence (MAT) system pallet was ready for installation when the aircraft modification was completed in late January.

This MAT system is a piggy-back investigation which collects clear air turbulence data while the aircraft is being utilized for other missions. Several successful MAT data flights have been completed.

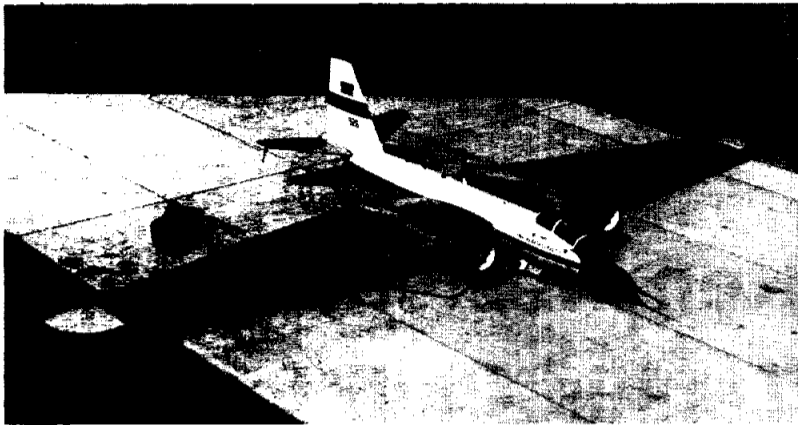
The MAT system will be replaced with a side looking radar in the fall of 1977. NASA Goddard Space Flight Center is installing sensors in two other pallets for weather and cloud studies.

JSC has a photographic pallet and a five-channel scanner pallet operational. Both of these pallets and the MAT pallet are being flown simultaneously.

The total capability of this configuration is impressive. Two metric cameras, six multispectral and one high resolution camera, a five-channel scanner covering thermal and visible channels and the MAT system can be operated simultaneously or independently.

JSC operates two WB-57F's. The other one is flown under contract for the Energy Research and Development Administration (ERDA) to collect high altitude air samples and data.

It was recently used to collect samples of the Chinese nuclear explosion debris and has collected much of the data used to determine the ozone layer deterioration.



EARTH SURVEY AIRCRAFT — Pictured here is NASA 926, the JSC-operated high altitude WB-57F. This photo was taken at Langley Research Center during system calibration for the Measurement of Atmospheric Turbulence experiments. The reconfigured nose is part of the MAT system. Another three-foot pallet contains the MAT electronics.

Microwave sensing: a promising future

Remote sensing of the Earth from space became operational with the launch of Landsat 1 in 1972 which provided repetitive visible and infrared data for resource management.

But many experts, including Dr. Kumar Krishen, microwave project scientist for the Science Payloads Division, feel that the full potential of remote sensing will be realized only through development of microwave sensor systems.

"We have just scratched the surface, just begun to make progress and see real, far-reaching implications of this type of sensing," said Krishen.

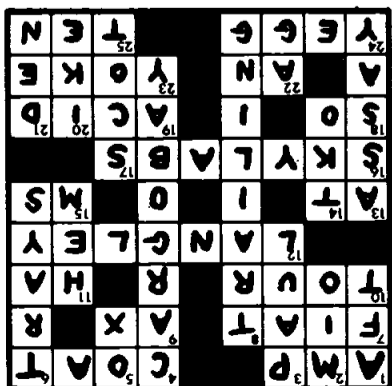
To date, Krishen said, "optical and infrared sensing have proved to be of great value to the management of Earth resources. With the addition of active and passive microwave sensors, greater improvement can be achieved as a result of their unique and supplementary capabilities."

Krishen mentioned five capabilities of microwave radar devices which offer particular advantages. These are their ability:

- To penetrate clouds and some precipitation.
- To view a scene by day or night independent of sunlight.
- To provide deeper penetration

JSC crossword answers

(See puzzle, page 3)



than other sensors through vegetation or snow and even into soil.

- To produce high resolution images.
- To provide polarization-dependent information.

A satellite with microwave sensors can, for example, view a field of crops at night, beneath overcast skies, and, according to the angle of view and wavelength, look at the crops, the ground surface or the subsurface.

The following, according to Krishen, are applications for which microwave sensors have already proven to have strong potential:

Ice surveillance — The Nimbus satellite series and aircraft experiments have shown application for gathering such information as ice thickness, age and hardness, determining the ice/water boundary or freeze line and locating leads or breaks in the ice. All of these things benefit shipping and sea transport.

Project Ice Warn, a joint project of several federal agencies including NASA, is already using such aircraft ice surveillance techniques.

Soil moisture — Nimbus and Skylab experiments showed that microwave can predict antecedent precipitation indices which are useful in inferring potential soil moisture. Ground-based experiments have also indicated a strong correlation between microwave observables and soil moisture.

The reflectivity at microwave frequencies is strongly influenced by the moisture content of the soil. Since this is a key item in the cycle of vegetation development, this information can be used to predict crop establishment and assist in estimating crop yields.

Ocean and weather phenomena — Microwave devices can penetrate

clouds to monitor oil spills or to measure wave activity from which wind velocity can be inferred. They can measure fault lines on the coast caused by wave diffraction.

Because these devices can look at clouds or through clouds, the data can be used to determine precipitation and size and extent of storms, as proven by the Skylab S193's detection of Hurricane Ava and Nimbus microwave data.

Geology — Microwave is routinely used with aircraft for geological applications, particularly because of

its ability to penetrate cloud cover and vegetation. It can also provide information on soil moisture and surface roughness and, with controlled view angle, generate radar-stereoscopic images.

Krishen acknowledges the validity of the criticism that microwave is still too expensive and too heavy for weight-sensitive spacecraft.

"In the past," he said, "radar was used primarily for airport traffic and defense. They were not as concerned about such things as frequency and polarization. Passive de-

vices were also relatively unexplored. Now we're into total Earth monitoring sensing and microwave is presently underdeveloped for Earth resources," he explained.

But these are problems which can and surely will be worked out, Krishen said.

"The major microwave scientific community envisions that in future years, microwaves will either have a unique role or a definitely strong complementary role in the discipline of remote sensing," he concluded.



ICE MONITORING — Microwave sensing of ice formation in North Dakota's Garrison Reservoir is shown in these comparative images taken Sept. 1 (left) and Dec. 14, 1970. Note the



ice "marbling" in the right photo and the formation of ice around the small island. Photo courtesy of Goodyear Aerospace.