ROUNDUP

Lyndon B. Johnson Space Center

NASA

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Engines OK for flight

The last of the Space Shuttle Orbiter *Columbia's* three main engines successfully completed its second flight acceptance test June 16 with an eight minute and 40 second ground test run that exceeded the time required to put a Shuttle into orbit.

All three engines are now being returned to the Kennedy Space Center, Fla., where they will be mounted on the vehicle before its maiden flight into space.

During the firing, Engine Number 2007 underwent throttling and gimballing exercises to test its ability to change speed and direction after lift-off. The other two flight engines, Numbers 2005 and 2006, successfully completed their second flight acceptance test on June 2 and June 5 respectively, reaffirming the readiness of the three engines for flight.

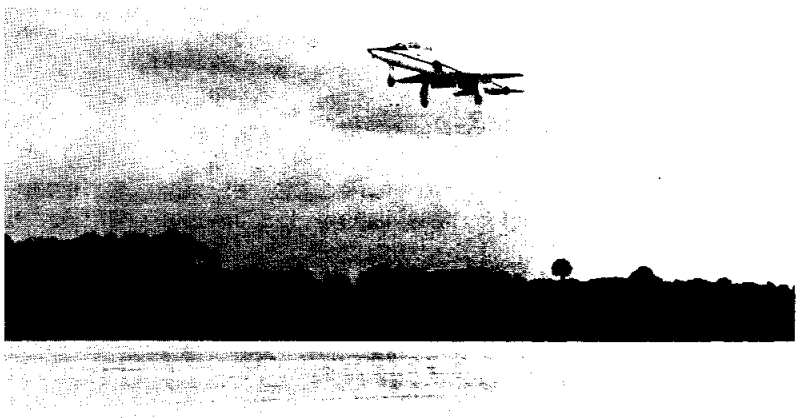
The three engines had previously demonstrated their flight readiness in test firings last year. Since that time, several modifications were made and NASA felt it advisable to retest the engines.

While the *Columbia's* engines have completed their checks, runs with the Shuttle engine test articles and associated main propulsion equipment design will continue through the summer at the National Space Technology Laboratories near Bay St. Louis, Miss. NASA's Marshall Space Flight Center at Huntsville, Ala., is responsible for engine and propulsion system tests.

Single Shuttle engines have accumulated more than 73,000 seconds (20 hrs. plus) of static test firing thus far, and engines clustered in main propulsion system testing have accumulated an additional 7,000 seconds (110 minutes).

One of the single engines being tested, Number 2004, has completed two series of preliminary flight certification tests at 100% rated power level, a series of three full-power tests at 109% and it will begin a series of tests at 102% later this week.

This particular engine has accumulated almost 13,000 seconds of firing time, enough for more than 25 flights of the Space Shuttle.



T-38 in orbiter configuration at Cape

T-38s sim landings

Last month JSC astronauts flew training runs at Kennedy Space Center to simulate orbiter approaches at the Shuttle Landing Facility. Tests began on May 29 with three T-38 aircraft, one to simulate the orbiter gliding in for a landing and the other two to act as chase planes.

Pilot-astronauts Jon McBride, Dave Walker, and Hoot Gibson flew the T-38's during their return-to-landing-site approaches. Also in the cockpits were astronauts Bo Bobko and Dick Scobee, and NASA pilot Dick Gray from JSC.

The purpose of the trial runs is to provide practice for the pilots of the T-38 chase planes; to acquaint the prime and backup orbiter crews with the KSC runway configuration; to develop coordination techniques between the radar tracking personnel and the aircraft pilots; and to determine ways to minimize hazards posed by KSC's bird population.

A Shuttle orbiter landing will be a precise and complicated event. The 180,000-lb. orbiter will glide to a touchdown. Because it is unpowered during reentry, there is no circle-and-try-again capability.

As it approaches for landing, the orbiter will have an outer (initial) glide slope of 22 degrees. When the orbiter descends to an altitude of 1,700 to 1,800 feet, the astronauts will pull the orbiter's nose up, a maneuver called a "flare." This causes airdrag on the orbiter's body to increase, and its forward speed and rate of descent to decrease. This is the first, or pre-flare, of a two-flare landing.

The glide angle changes to an inner (second) glide slope of 1.5 degrees. At the beginning of the runway the astronauts continue to raise the noise of the orbiter — actually the second flare — in order to land on the main landing gear.

The inner glide slope would bring the orbiter to touchdown 1,500 feet down the runway, but the second flare carries it to about 3,000 feet. The 1,500 feet target is called the aimpoint for the inner glide slope. The aimpoint for the outer glide slope is 6,500 feet north of the beginning of the runway.

For the tests with the T-38's, a 28-foot diameter parachute marked the outer aimpoint. In the future, this northern aimpoint may be a permanent structure, perhaps serving a double duty as the bright orange roof of a pavilion on a nature trial.

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STS Update

Tests prove structure, avionics, procedures; March launch possible with Sept. rollout

Over the past months tests have continued on the orbiter in the processing facility at the Cape, with a major run taking place two weekends ago— pyrotechnic shock tests which proved the thermal protection system, orbiter avionics, and other onboard and structural equipment can withstand the shock of pyrotechnic explosives that will fire separation of the external tank from the orbiter inflight.

Preliminary analysis of data from the pyrotechnic ET separation tests shows no adverse effects either on the TPS or avionics.

Other tests in the past months have proved all systems run satisfactorily: navigation, guidance, communications, coding, environmental, hydraulics, and control systems have all been checked and "we are satisfied with all systems," said Robert H. Gray, Manager of the KSC Shuttle Project Office in a recent press briefing.

He said that all avionics systems have been installed on the orbiter, that mechanical and structural modifications have been made, and that all remaining manufacturing work that was needed since the orbiter's arrival at the Cape have been completed "with the exception of thermal protection system tile installation."

A September rollout

Without additional tile work to what is expected, *Columbia* should be ready for a September rollout from the OPF, Astronaut Robert Overmyer said at the briefing. Overmyer is on detail from JSC at the Cape as Deputy Manager of the OV-102 Vehicle.

Gray added that the orbiter needs six weeks in the Vehicle Assembly Building as opposed to the previous estimate of four weeks, and the orbiter needs 15 to 20 weeks on the launch pad for preparation, as opposed to the previously estimated 13 weeks.

He said that with a mid-September rollout from the OPF, NASA

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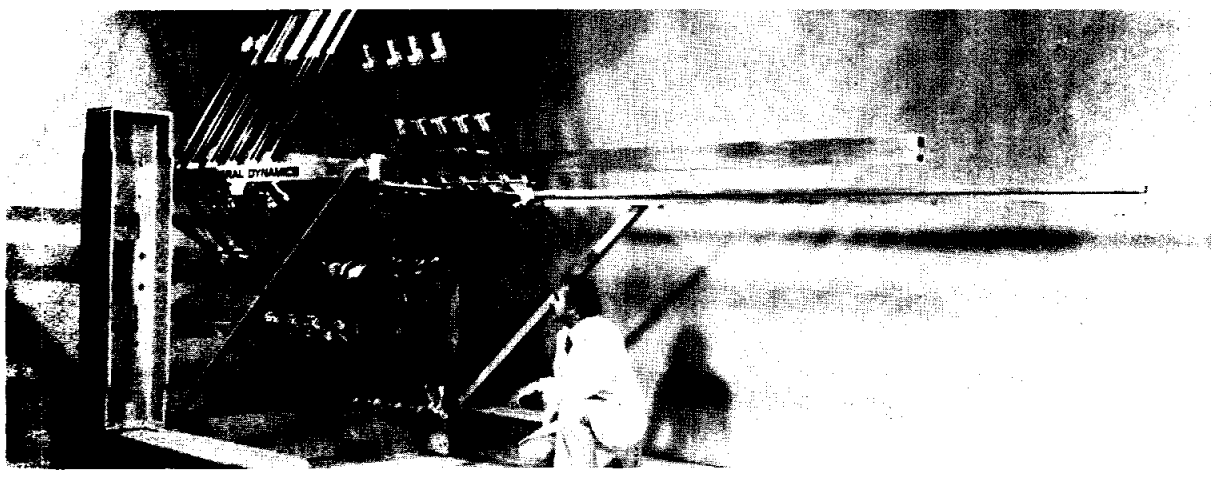
Future construction in space calls for innovations today

The construction of large structures in space requires innovations in manufacturing processes years in advance of the first space application. Engineers at the Johnson Space Center are working on automated systems for "space fabricating" structural beams and trusses in orbit, for building these construction projects of the future.

A truss much like those which would be produced by a "beam builder" in space recently arrived at JSC where engineers will run structural evaluation tests with it in early July. In these tests a hydraulic cylinder will apply varying loads to the truss to test its stiffness and strength.

The test truss was made by General Dynamics-Convair Division and is a product of three years' analysis, design, and testing of the automated fabrication approach to space construction.



A construction package the Space Shuttle carries into orbit has to be lightweight and compact, yet able to carry materials with the strength and durability to comprise a communications array or large antenna that remains in space for years, or the first beams for a structure that will house personnel on tour of duty assignments in Earth orbit.

With the space fabrication beam builder being evaluated by JSC, approximately 918 meters of graphite composite flat strip material is coiled in a roll inside a storage canister. The roll turns on bearing-mounted rollers and unwinds uniformly as material is used. An access panel in the hinged half opens to allow the material to route over the heating section guide rollers which form it into the required shape.

After forming, the material passes into the cooling section where aluminum platens cool one complete bay length of cap section during a 40 second pause period. During the pause, crossmembers are ultrasonically welded in place to complete the truss.

The drive section—four friction rollers—provides the force to pull the material from the storage roll, through the heating/forming/cooling sections, and to advance the beam out of the beam builder.

Other methods besides space fabrication are also being studied. One approach is to make specially designed structures which can be folded into dense packages for stowage during launch and then deployed on-orbit into larger, lightweight space systems. Another approach is to use prefabricated, tapered tubular members and connectors which can be "nested" inside each other for packaging during launch, and then "erected" piece-by-piece in orbit into a large structure using a remote manipulator or a suited crewmember.

Research into automated beam building in space technology will continue at JSC over the next few years. The project is now in predevelopment stages. In the next three to five years, JSC engineers hope to have a prototype flight machine at the space center for more specific development testing.

Spaceweek '80 events planned

Space Week '80 will begin July 14 and culminate July 20, the 11th anniversary of mankind's first step on the Moon. The celebration will include a variety of public events in the Clear Lake and Houston, Texas, areas.

Scheduled are a lecture series, exhibits, space voyage nights, a polo tournament, and other colorful activities.

A main event at Space Week will be a daily lecture series at JSC. The five noontime lectures will feature important national and local literary and technical figures addressing the ways space can open up possibilities for the future of man.

The public will have a chance to take a voyage through space on two planned space voyage nights, when there will be unusual movies of the outer planets and a chance to view the night sky through telescopes.

There will also be a special exhibition set up by local aerospace industry companies.

The Houston Polo Club has joined the celebration by establishing the International Space Cup. This event will be held Saturday, July 19, at 4 p.m. on the grounds of the Polo Club in Houston.

Other events will be announced as Space Week approaches. If successful, Space Week will become an annual affair, spreading to other cities across the country.

The goal is to get people everywhere to understand how the dreams of the famous space planners such as Wernher von Braun are closer to reality than most people think.

NASA advisory system will help pilots keep track of other craft at small airports

Testing begins this month at a Virginia airport of an experimental NASA computer advisory system which will expand the information available to pilots using smaller airports without control set-ups.

The Automated Pilot Advisory System went into operation June 23 and will continue through July 26 at Manassas Municipal Airport, Va.

Designed as an extension of the procedural Visual Flight Rules system used at uncontrolled airports, the experimental system will help pilots keep track of other aircraft in the vicinity by supplying them with air traffic information.

Computer-generated voice, radar, and weather sensory equipment will broadcast an airport advisory every two minutes and a traffic advisory every 20 seconds.

To receive these advisories, the pilot need only to tune his radio to the proper frequency.

The airport advisory will provide the airport identifier, broadcast time, wind speed and direction, favored or active runway, altimeter setting, and ambient and dewpoint temperature. The traffic advisory will provide the number of aircraft on each pattern leg (final, base, downwind, crosswind, or upwind) and position and heading of arriving or departing aircraft.

NASA's objective in performing the flight demonstration tests at Manassas is to obtain an evaluation from pilots using the system in an uncontrolled high-density environment.

The Manassas airport is especially suited for this demonstration because it is estimated that this airport handles approximately 200,000 operations per year — landings and/or takeoffs.

Pilots who want to take part in the demonstration can get the test schedule, information on using the system and an evaluation form at Manassas airport. There will be a van open to the public, and questions concerning the system can be addressed to the project manager, John L. Parks, Jr.

Principal elements of the experimental system are a radar set, a mini-and micro-computer, weather sensors, a very high frequency (VHF) transmitter and an operator control panel.

The computers provide target detection and tracking, pattern classification, evaluation of weather sensory data and generation of the several audio voice messages for transmission to aircraft.

The technology is being demonstrated by NASA's Wallops Flight Center, Wallops Island, Va.

Saturn Encounter Coming

The Voyager 1 spacecraft is approaching Saturn. As of June 9 its distance to Saturn was 128,278,129 miles, and it has traveled 1,177,465,664 miles since launch, taking it 756,559,008 miles from Earth.

Voyager 1 will reach Saturn November 12, 1980. Its sister ship, Voyager 2, follows next year, having its closest approach to the planet August 27, 1981.

Voyager 2 is now 261,623,345 miles from Saturn.

Relative to Earth, Voyager 1 is traveling at 101,429 mph and Voyager 2 is traveling 93,085.

Controllers behind the controllers

In a room to the right of the control center a team backs up each main console, shown here during this month's 56-hr sim.

Bowlers knock 'em down

The NASA mixed bowling league recently completed a successful 1979/80 season with their annual awards banquet.

Individual women's winners were **Kit Michels**, High scratch series; **Pauline Tiner**, high scratch game; **Dianne Robinson**, high handicap series; and **Sharon Stein**, high handicap game.

The men's awards went to **Dan Kennedy**, high scratch series; **George Johnson**, high scratch game; **Henry Kaupp**, high handicap series; and **Jim Dupree**, high handicap game.

Prospective bowlers are invited to participate in the fun and friendly competition. For more information contact Steve Paddock at x4271 or 482-8781, or Leona Kain at 477-8821 or 488-3726.

Practice Landings

Continued from Page 1

Three C-band radar tracking facilities were used in the tests with the T-38's. One was located at Patrick AFB, one south of KARS Park, and another on the Cape Road.

The T-38's pick up the outer at about 25 miles out, at an altitude of about 35,000 to 40,000 feet. Since the T-38's don't carry radar screens, it's an eyeball procedure for the pilots.

To simulate the drag of the orbiter, the T-38 acting the orbiter's part has its landing gear and speed brake down and its flaps extended to 45 percent. The gear on the actual orbiter will be dropped at about 200 feet altitude, or 10 seconds before touchdown.

For the orbiter simulation, the T-38's fly at 322-334 miles per hour in the outer glide slope, and at about 213 mph for the orbiter's landing speed. In comparison, a T-38's normal touchdown speed is 167 mph; and F-104 is 196 mph.

According to astronaut Bruce McCandless, who assisted in ground operations during the tests: "The initial orbiter landing will be made under manual control, leading up to the development of an automatic landing capability. But a manual landing still has a lot of assistance from the onboard computers."

He also stated that even with a fully automatic landing, the pilots will be busy checking to make sure that the computer is doing its job, and will be ready to assume control if necessary.

Reprinted from Spaceport News, newspaper of the Kennedy Space Center.

STS Update

Continued from Page 1

could have a late-March launch of the first Space Shuttle mission.

Work is taking place at the launch pad to prepare a structure that will flow dry air through the OMS (Orbital Maneuvering System) pod when the orbiter is mated and on the pad—to counteract a minor moisture problem that was discovered with the OMS pod material.

SRB Retrieval Runs

At *Roundup* press time, ocean Solid Rocket Booster retrieval runs were scheduled for this week. During these runs, Cape workers tow SRB models into the ocean and float them in the vertical position the SRB's will be in after parachuting to the water.

Cape workers take the SRB models from the vertical position, put de-watering systems in the nozzle, and take the models to the horizontal position, what Gray called an "all up total mission simulation."

'The ET Icing Problem'

"We are also doing some work on what we are calling the 'icing problem,'" Gray said, referring to the issue of ice building up on the external tank which could cause damage to the tiles during ET separation.

Gray said they are installing insulation on the nose of the tank to keep it from icing, and the ET should be ready for mating with the orbiter some time in August, by his timeline.

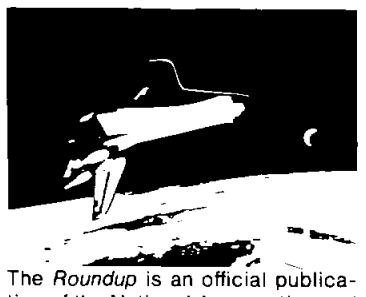
Ellen Crippen

Katherine Sullivan

Kayla Covington

All three graduated No. 1 in their class. Out of 57 applicants, three children of JSC employees are 1980 NASA JSC Exchange Scholarship winners: Ellen Crippen, daughter of Bob Crippen; Katherine Sullivan, daughter of Henry Sullivan; and Kayla Covington, daughter of Clarke Covington. Applicants are evaluated by an Exchange committee.

Roundup **deadline is the first Wednesday after publication.**



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

Ted Hays dies

The NASA community lost a very special friend on Saturday, June 7, with the passing of E. L. (Ted) Hays. Ted had a distinguished government career with the U.S. Navy and NASA, and served as Chief of the Crew Systems Division and Chief of the Urban Systems Project Office at JSC.

In recent years, following his retirement, Ted was active as a consultant and in the NASA Technology Utilization program.

Ted was active in the AIAA locally, and served as chair of the Houston Section. He spearheaded the Houston celebration of the 10th Anniversary of the Apollo 11 Lunar Landing.

Ted had a capacity to enjoy life which touched all who knew him. He will be missed both personally and professionally by all his many friends.

Bulletin Board

Fly with Films With Aero Club

The Aero Club will show the following aviation films in Building 30 Auditorium at 11:30 a.m.: "All It Takes Is Once," on July 9, and "Density Altitude," on July 16. Both films are less than half an hour long, and everyone is invited.

Seminars to Take Place Throughout the Summer

Here is the Summer ASEE Faculty Seminar Series schedule for the next few weeks. June 27, C. Lin will speak on "Dual Passage Heat Pipe Math Models," and July 11 Robert Peck and Brenda Taylor will speak on "Unsolicited Proposals and University Contracts." Both programs will be in the Building 30 Auditorium.

Friday July 18 is the mid-program meeting with Dr. Robert H. Page, Dean of the College of Engineering at Texas A&M speaking at Gilruth Center.

Seminars start at 10:30 a.m. in Building 30.

Special Shuttle Program At July NARFE Meeting

Houston-NASA Chapter 1321 of the NATIONAL ASSOCIATION OF RETIRED FEDERAL EMPLOYEES will hear Scott H. Simpkinson from the NASA-JSC Space Shuttle Program Office. He will present a special program featuring SPACE SHUTTLE PROGRESS followed by a Q and A session at the regular monthly meeting on Wednesday, July 2 at 1 p.m. in the Clear Lake Park Building, NASA Road One. For more information call A. B. Olsen at 334-3270 or Jack Kinzler at 334-2449.

Stamp Club Taking Part In Spaceweek 80 Events

Spacepex '80, the 10th annual philatelic exhibition of the JSC Stamp Club will be held July 12 and 13. Theme of this year's show is Spaceweek. A pictoral cancellation will be used during the exhibition. Spacepex '80, a juried stamp show exhibition and dealer bourse will take place at the Nassau Bay Resort Inn on NASA One. Admission is free.

A temporary postal station will be in operation making the pictoral cancellation available to visitors. It may also be requested by mail.

A banquet will be held July 12 at 7 p.m. at Gilruth Center. Guest speaker, D. Larry Crumbley, will talk on 'Taxing Toads and Philatelists" or "Some Important Tax Aspects for Stamp Collectors." For additional information contact George Brooks through the Stamp club at P. O. Box 58328, Houston 77058.

Bring a Rocket To Rocket Park

Saturday and Sunday, July 5 and 6, the Tex-Regional '80 meets. This is a National Association of Rocketry sanctioned contest open to both NAR and non-NAR members. But the Big Event is the Big Demonstration Launch on Sunday July 20, to help NASA celebrate Spaceweek 80. Time is 1 to 4 p.m.

Launches are held at JSC a half-mile behind the Saturn 5 Rocket on Avenue E, and the public is invited. Contact Frank Bittinger at 481-5541 or x2796 for further information.

On Sale at the JSC Exchange Store

(Store hours 10 a.m. to 2 p.m.)
Dean Goss tickets: $10 single, $40 couple (regular $14.50)
ABC Theatre tickets: $2
General Cinema tickets: $2.40
Astroworld tickets: $8 (regular $9.95)
Six Flags over Texas discount tickets
Magic Kingdom Cards: Free
Sea Arama Marineworld Fun-Time Cards: Free

Learn Communications And Leadership Skills

Toastmasters International, a communications and leadership organization, wishes to announce new officers for its Spaceland Club for June - December, 1980: President: Stephen Jacobs; Educational Vice President: Tony Zertuche; Administrative Vice President, Emmit Fisher; Secretary: Darrell Boyd; Treasurer: Eddie Lemons; and Sergeant at Arms: Anngie Johnson.

They all welcome participation in this dynamic, educational, and motivational group.

If you're interested in an exciting, entertaining, and rewarding manner of improving your communications and leadership skills, join the club at Franco's Real Italian Restaurant (next to Red Lobster on NASA One), at 11:30 a.m. on the first and third Wednesdays of each month. Contact Steve Jacobs at x3561 or Emmit Fisher at x4202 for further information.

Cookin' in the cafeteria

Week of June 30 - July 4

Monday: French Onion Soup; Beef Chop Suey; Polish Sausage w/German Potato Salad; Breaded Veal Cutlet (Special) Okra & Tomatoes; Green Peas. Standard Daily Items: Roast Beef; Baked Ham; Fried chicken; Fried Fish; Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday: Split Pea Soup; Shrimp Creole; Salisbury Steak; Fried Chicken (Special); Mixed Vegetables; Beets; Whipped Potatoes.

Wednesday: Seafood Gumbo; Fried Catfish w/Hush Puppies; Braised Beef Rib; BBQ Plate; Weiners & Beans; Shrimp Salad; Stuffed Bell Pepper (Special); Corn O'Brian; Rice; Italian Green Beans.

Thursday: Chicken Noodle Soup; Beef Stroganoff; Turkey & Dressing; BBQ Smoked Link (Special); Lima Beans; Buttered Squash; Spanish Rice.

Friday: Seafood Gumbo; Broiled Turbot; Liver w/Onions; Seafood Platter; Fried Shrimp; Meat Sauce & Spaghetti (Special); Green Beans; Buttered Broccoli; Whipped Potatoes.

Week of July 7 - 11

Monday: Beef & Barley Soup; Beef Chop Suey; Breaded Veal Cutlet w/Cream Gravy; Grilled Ham Steak; Weiners w/Baked Beans (Special); Whipped Potatoes, Brussels Sprouts, Buttered Rice. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches & Pies.

Tuesday: Celery Soup; Fried Shrimp; Turkey a la King; Pork Chop w/Applesauce; Chinese Pepper Steak (Special); Au Gratin Potatoes; Breaded Squash; Buttered Spinach.

Wednesday: Seafood Gumbo; Fried Catfish w/Hush Puppies; Braised Beef Ribs; Mexican Dinner (Special); Spanish Rice; Ranch Beans; Buttered Peas.

Thursday: Green Split Pea Soup; Corned Beef w/Cabbage & New Potatoes; Chicken & Dumplings; Tamales w/Chili; Hamburger Steak w/Onion Gravy (Special); Navy Beans; Buttered Cabbage; Green Beans.

Friday: Seafood Gumbo; Deviled Crabs; Broiled Halibut; Liver & Onions; BBQ Link (Special); Buttered Corn; Green Beans; New Potatoes

Roundup Swap Shop

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.

Property & Rentals

Lease: Almeda Mall, 3-2-2, clean, fenced, references, $425/month, deposit. 482-8827.

Brookforest, 16434 Larkfield, 3-2-2 contemp, brk, lg rms, vaulted ceilings, formal din. WB, fenced 10% VA, by appt. 488-2177 eves.

Sale: Country Club lot at Lago Vista Estates on Lake Travis near Austin. Class A resort, golf, tennis, marina, etc. Sacrifice. Steve x3561.

Rent: Vacation at Lake Livingston, Cape Royale custom furnished home, 3-2-1; fish, ski, tennis, pool, golf, etc. Reserve early. 488-4487.

Lease: CLC/University Green, new 3-2-2, dining, den, fireplace, cath ceiling, lots windows, microwave, deck, pool, tennis, $550 488-3840.

Vacation cottage on Gulf, exc surf fishing, very private, Bolivar Peninsula. $25 weekdays, $60 weekend, $175 week. Horton x5266.

Rent: Lake Livingston resort 3 br lake front cottage, all amenity's 554-6093 or x4207.

Galveston, West End, 2 bdrm, By-the-Sea condo, run $210/wk off, $300 wk in season. Clements 474-2622.

Sale: no flooding, brick 4-2-2, CA-CH, carpet, drapes, fenced backyard, extra storage space inside and out. Call collect a/c 713 291-2502 Hansen.

Rent/Lease: Oakbrook, CLC, 4-2-2, close to schools, $550 + deposit, available now. 488-4181.

Lease: Friendswood, 3-1 1/2-1, custom interior, fenced, water paid, yard work done. $380/month. 6 month minimum, July 1. Morgan x5983 or 482-2356.

Rent: CLC, Baywind II condo, 2-2, fp, open view, ice maker, etc., $400. Billingsley 488-5970 days; 333-3665 or 486-1925 nights.

Unfurnished house for lease, 3-1 1/2-2, carpeted, close to NASA, $425 month. Betty 482-4360.

Rent, Lake Livingston, Cape Royale 3 br waterfront cottage by marina, tennis, pool, golf, boat ramp. 3 day min. 488-3746.

Lease: Camino South, 4-2-2, near schools, quiet street, well landscaped, $500 month (first/last/deposit) available early August. 488-2695.

Cars & Trucks

78 Mustang II, air, cruise, AM/FM stereo, warranty, extras, $3800 or best offer. x3905 or 482-2286, ask for Reg.

77 Ford F-250 4x4 45,000 miles, exc cond. $5,000. Custom slide in camper, $2,000. x4065 or 474-2319.

75 Austin Marina, 4 door, 4 speed, 27 mpg, 50,000 miles, $14,000. Porter x5073 or 534-4645.

54 Ford Victoria. James 481-4312, no calls after 9 p.m.

77 MGB convertible, 4 speed, exc cond, 23,000 miles, 946-6419 after 5.

78 Monza Spyder, sports package edition, 305 V8, 32,000 miles, new tires, brakes. Best offer over $3,500. 488-0875 or 488-5010.

77 Silverado pickup, ac, FM cassette, power, automatic, $2500. x2693 or 488-7807.

78 Chevy van, fully loaded, captain's chairs, etc, reg gas, cruise control, AM/FM stereo, tape deck, $5,900. Win x2968 or 554-7353.

47 Willis Jeep, 4 wheel drive, rebuilt motor, '81 license, needs some bondo and paint, $1,000 cash or trade. Pam x4512.

73 Vega FT wagon, rough body, reasonable engine, AC, auto, OK work car, $350. Ramon 488-1238.

76 Ford Elite, 2 dr AM/FM, PS/PB, AC Silver blue, 7500 actual miles, $3200. 337-5106.

79 Horizon Eco car exc cond and mileage 28,000 mi., front wheel drive, standard, 4 dr, owner off to school, $4600 or best offer. 474-2622.

73 Ford F100 PU 6 cyl. good cond, w/topper, $1600. Keith x6121 or 480-1343 after 5.

Household Articles

Kingsize Sears Supreme foam bed and frame, used 7 mos only like new, Sears portable top load dishwasher, clean, $50. 946-6419 after 5.

Dyna PAS-3X preamp, Dyna stereo 35 power amp, Fisher FM-100 MPX tuner, all units exc, $95 for all. 488-3966.

Modern rectangular dining table with 6 chairs, all wood, black finish. 488-3377 after 5.

79 25" RCA Controua TV, PA tuning, purchased in Mar 80 for $1100; sale $750. 485-1303 nites, 877-4594 days.

Antique drop leaf dining table, recently refinished, $130. Kaltenback x4505 or 331-5751.

Baby bed with mattress, twin stroller, 10 speed bicycle. 774-4321.

Slow scan TV converter, robot 400, less than 6 month old, perfect cond, $600 each or two for $1000. Vincent x4188 or 488-2148.

1970 RCA 23 in color TV, nonworking, exc cabinet, 1 1/1 year old picture tube, make offer, Boyd x5437 or 991-0361.

7 ft. York pool table with cue sticks, cue balls, wall rack, stools and overhead light, like new, $395. 333-3279 after 5.

Black and white 17 inch Westinghouse TV exc picture, $20. Joan x4393 or 488-0559.

Pets

Free puppies, perfect age for adoption. Adorable, Mother poodle. 488-2695.

Siamese kittens, friendly, affectionate, registered blue points and seal points, females and males, $75 each or $135 pair. 333-2935.

Free kittens, 6 weeks old July 4th. Burlison 554-6339 after 5.

Wanted

Used Johnson or Evenrude 85 hp to 115 hp boat motor, working or nonworking. Debbie x4321 or 488-0852 after 5.

Good bird/deer lease Austin or 200 mi radius Houston, Leisenring x2831 or x2161.

Boats & Planes

18' Hydrodyne ski boat, 1972, with trailer and 220 hp inboard-outboard, $2500 or trade. 487-8633.

Jet boat, Southwind 18 ft., 455 olds, custom trailer, full instruments, exc cond, $3800. 488-1104.

8 ft. "sting ray" design plywood racing boat kit. Hull and bottom complete, $60. 488-1326 after 5.

Stereos & Cameras

LEICA 35mm camera with 50 mm Summarit lens. Make offer. Horton x5266.

Musical Instruments

Like new, Armstrong alto sax, $300. Carolyn x4321 or 333-4829 after 5.

Miscellaneous

Heavy 2" galvanized plumbing pipe swing set, ten ft. high and fourteen feet long, Joan x4393 or 488-0559.

3 bee hives, $35 each, J. Hartman x5247.

Selling all of my beekeeping equipment for $250. Please call for details. 487-8633.

3 windows 32 x 72 inches, $25 each. 20 inch boys bike, $25. Pool table lamp $50. 488-2652.

Diamond ring, lady's solitaire, 0.80 ct. diamond in yellow gold mounting, also girl's promise ring. Paul Richardson at x4205 or 337-4748.

Complete set of shop manuals for 1977 Ford van, $20. Lattier x5561.

78 Playmor travel trailer, 18', lavatory, shower, air, 2 L.P. tanks, plenty storage. R.A. Segovis, Westwood Shores, Trinity, TX 594-5700.

5 hp riding lawnmower, runs good, $125. Don x5989 or 554-7014 after 6.

Portable sewing machine, exc cond, used 5 times, good for beginner, student, $50. x2407 or 488-6292 after 6.

Piano Vose and Sons spinet, walnut, 1 year old, perfect condition, $900. Astology ephemerides 1900-200 AD, books. 488-4892 after 5.

ABWA selling Astros tickets $5.00 cash for scholarships after July 1st. Stemrick x3803, Whitecotton x4251, during lunchtime. Final wed. game.

Carpools

Would like to join or form carpool from Deer Park area (Red Bluff/San Jac College). Non-smokers, 8-4:30 or can change hours. Donna x4571.

Carpool from Pasadena Strawberry-Rayburn area. Drive one day a week, every fourth week drive twice. 7:30 - 4. Morton x2351.

Want to join/form carpool from southwest Houston (N. Braeswood Blvd) to NASA, 8-4:30, Robert x2175, Bldg. 45.

Want to form or join carpool from Quail Walk Apts., CLC to Bldg. 45 area. Prevett x5495 or 480-1650.

Want to join/form carpool from Alvin to EAFB, 7:30-4 shift. R. Stokes x7261.

Motorcyclist needs to share ride/gas with a covered vehicle. West Almeda Genoa area to NASA. 8-4:30 shift with 1 hour flexibility. Claudio x2861.

Cycles

Honda Twinstar, 1979 model, 185 cc, 75 mpg, like new, 3,800 miles, $995 firm. Steve x3057 or 554-2435.

74 Honda 125 mt, exc cond equipped for street, tires and rear sprocket for dirt incl. $450 334-3170 eve.

Flight engineers keep the planes flying

They keep the planes flying and they fly as crews on the planes. Half a JSC flight engineer's job is quality assurance; the other half is flying NASA airplanes at Ellington, performing routine flight engineer tasks as well as the unique tasks required by NASA's missions.

On the Shuttle Training Aircraft the flight engineer operates computers and inertial labs aiding astronauts in Shuttle-like test-landings. On the KC-135 zero-g plane, flight engineers run some of the equipment designed for reduced gravity experiments.

And on the Super Guppy the flight engineer controls "everything on the aircraft inflight" except the actual piloting.

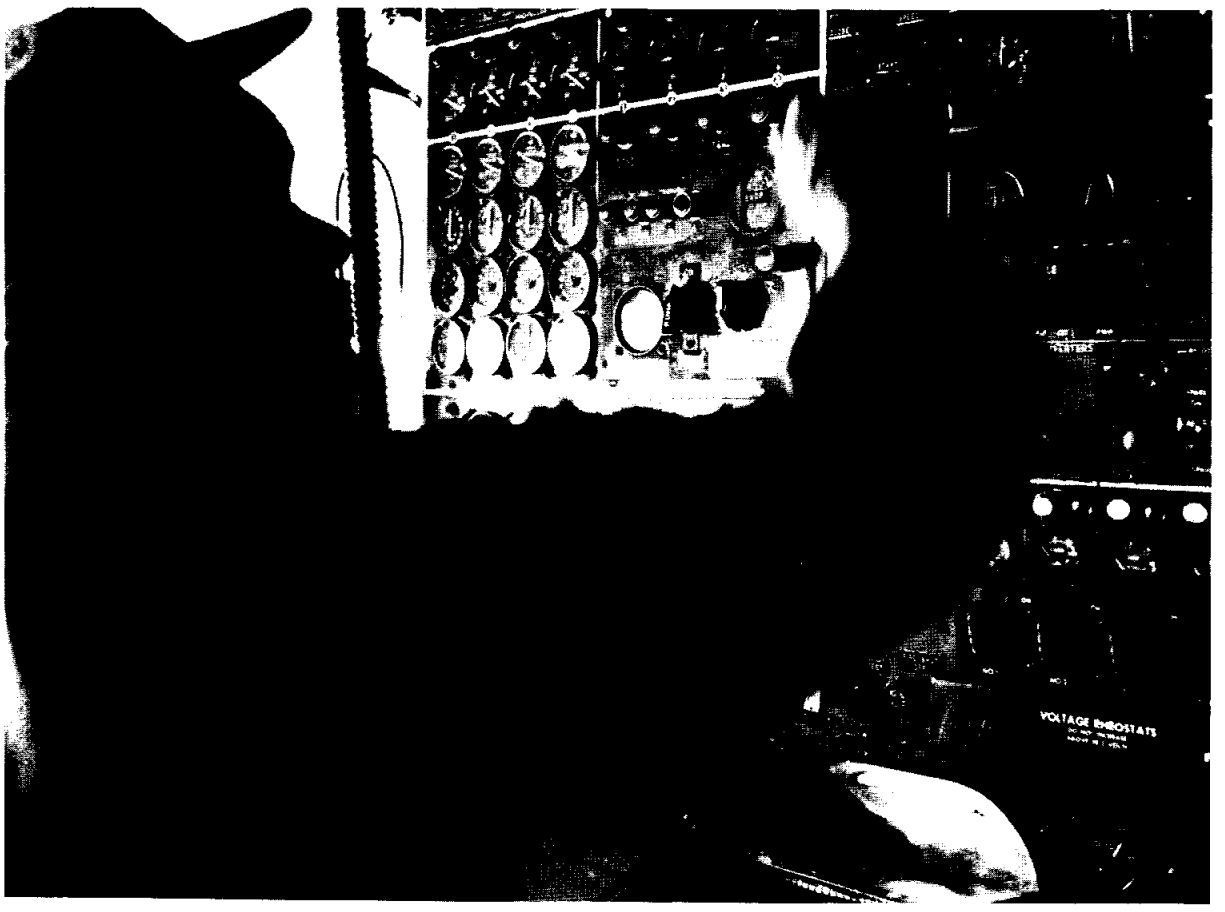
A day in the life of a flight engineer at JSC begins early in the morning when he checks the schedule for his plane. If he is to fly that day, next task is to get the aircraft ready.

"We follow behind the ground crew for inspection," says Chuck Gillespie. "We check everything the ground crew checks. We shouldn't find anything wrong as the ground crew has just completed a four-hour checkout.

"But if we do find something, we fix it—like tightening screws, or replacing cracked panels. Then the pilot does the final preflight inspection."

Flight engineers also make sure the fuel, oil, and oxygen tanks are full. After that their assignment depends on the plane on which they crew.

On the Shuttle Training Aircraft, a Gulfstream reconfigured to land like an orbiter, the flight engineer sits in the center behind and between the astronaut and pilot.



Gillespie at the Super Guppy controls

Because the left-hand seat on the STA has an orbiter-type stick for astronaut flight training, there is only the right-hand seat for a full-time pilot. The engineer has to be able to assume copilot duties.

During an STA mission, when the aircraft reaches altitude, the flight engineer enters the simulation profile data, and the astronaut assumes control until touchdown. During the profile the flight engineer monitors aircraft instruments and backs up the cockpit crew. At appropriate times during the landing, he calls out altitudes and air speeds for the astronaut. The flight engineer also operates the data tape recorder.

After touchdown the flight engineer logs the touchdown parameters for the STA flight log onto computer tape. His job is integral to Space Shuttle pilot astronaut's training.

On the Super Guppy the flight engineer is "the focal point for the brains of the airplane," says Skip Guidry. "He operates the engines more than any other crew member, controlling the power, fuel distribution, electrical distribution, air conditioning, propulsion. . ."

The Guppy is pilot-controlled and flown; but by design, controls for many of the systems are in the center of the cockpit out of the pilot's reach—thus the crucial role of the flight engineer in flying the Super Guppy.

When the Guppy is not flying, the flight engineers put on their quality assurance hats, as they maintain the plane by the "progressive inspection" technique.

"We inspect one section of the aircraft each week, making two total inspections of the craft each year," Gillespie says. "This week we checked out the Number Two engine. Next week it'll be the left landing gear. Last week it was the left wing and the Number One engine."

Ordinarily, the KC-135 can be flown without a flight engineer, but because of its unique NASA mission—flying parabolas to simulate weightlessness—the flight engineer has specific zero gravity assignments. The pilot has to work pitch control for the parabola, so flight systems are on the engineer's panel.

Most important, all electrical systems in the back—lighting and circuits for the scientific experiments flying weightless—operate through a master switch on the flight engineer's panel.

Plus, the flight engineer monitors the gravity level the plane will fly with each parabola, at the scientist's request.

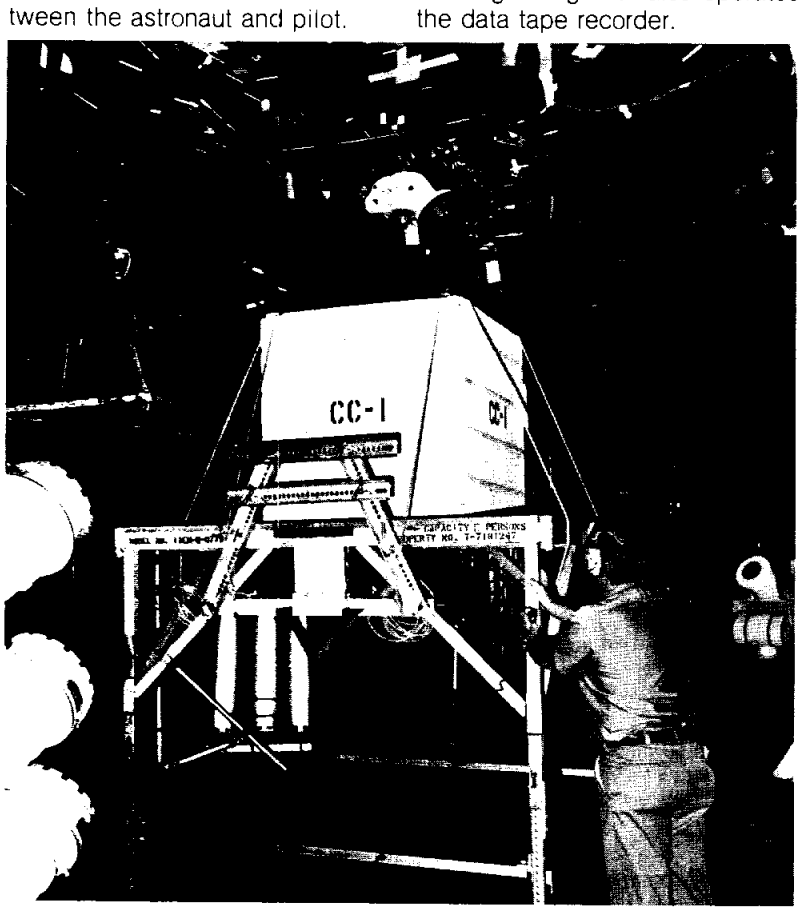
"If they want to fly a Lunar-g, we dial up one-quarter gravity," Guidry says, pointing out the black box on the right of the panel—the acceleration monitor—which feeds information to the pilot.

"Most everyone is requesting zero gravity these days," Guidry adds.

Guidry says NASA hires flight engineers with quality control and military flying experience. At JSC they fly on the Super Guppy, the STA, the KC-135, the Gulfstream, the NC130B Earth Resources plane, and the 747 which is hangared at Edwards in California.

"During the Approach and Landing tests in 1977, flight engineers operated flight tests systems and data acquisition on the 747," Guidry says. "When it's in the ferry mode, the engineer's job is the same as in a commercial craft: monitoring electrical systems, the engines, fuel, hydraulics. . ."

Flight engineers are the operators behind the pilots—the ones in the back who don't always have "Right Stuff" books written about them. But without them the planes don't fly.



ET separation tests (See story Page 1)

NASA radar finds Mayan canals

Extensive Maya-built irrigation canals, hidden for more than 1,000 years beneath dense rain forest in Guatemala, have been revealed by a new radar system developed by the Jet Propulsion Laboratory, Pasadena, Calif., for NASA.

The radar's unveiling of the ancient canal systems, dug by the Maya between 250 B.C. and 900 A.D. in Guatemala and the neighboring country of Belize, may answer a question that has long puzzles archeologists: How did the Maya, whose population numbered between 2 to 3 million citizens, feed their people?

The canals were recently found in images taken during an early test (1977-78) of the new radar from an aircraft over the cloud-covered jungles of Guatemala and Belize—once the center of the Maya empire.

The new radar (called SAR for Synthetic Aperture Radar) can penetrate clouds and provide higher resolution for comparable antenna size than other radars. It has been developed by NASA and the military.

JPL's version was designed to penetrate the dense cloud cover of Venus and provide map-like images of the planet's hidden surface. The radar provides high resolution images by "remembering" what it has scanned and adding the collected data together.

Archeologists and anthropologists have evidence of the Maya's huge cities, their government and justice system, their religions, mathematic and astronomical sciences. But no one has ever been able to find where the Maya grew enough food to support such an enormous civilization, set in a land characterized by either arid and mountainous territory or swampy jungles—settings where crops are difficult to grow.

Playin' at the Rec Center

These notices are in from the Rec Center.

Runners Needed: for the next EAA/BARC Fun Run. Entry fee is a whopping 50 cents for the 8 a.m. run, June 28. Distances are over 5 km and 1 km. The entire family can run.

Saturday Morning Fever: is an exciting new program for children which premieres July 23 at 10 a.m. It features a full-length movie, cartoon, popcorn, and cokes. Cost is $1, and the first movie is *Superman.*

Registration: is now being accepted in the following Leisure Time Classes at Gilruth Rec Center: Aerobic Dance, Photogenisis, Women's Exercise Class, and the Aero Club Ground School.