

Weightless training facility opens at JSC

John Young suits up and is lowered into the water. JSC divers apply weights to his suit to create neutral buoyancy, and Young begins the exercise. This morning the first task is to disconnect the radiator, then the major problem is to close the payload bay doors, cranking a winch by hand as would be done during a Shuttle flight if the automatic closing mechanism did not function.

Since the 21st of November, the Weightless Environment Test Facility (WET-F) in Building 29, has been up and operating for crew training. The usual schedule is four crew training and one engineering run a week.

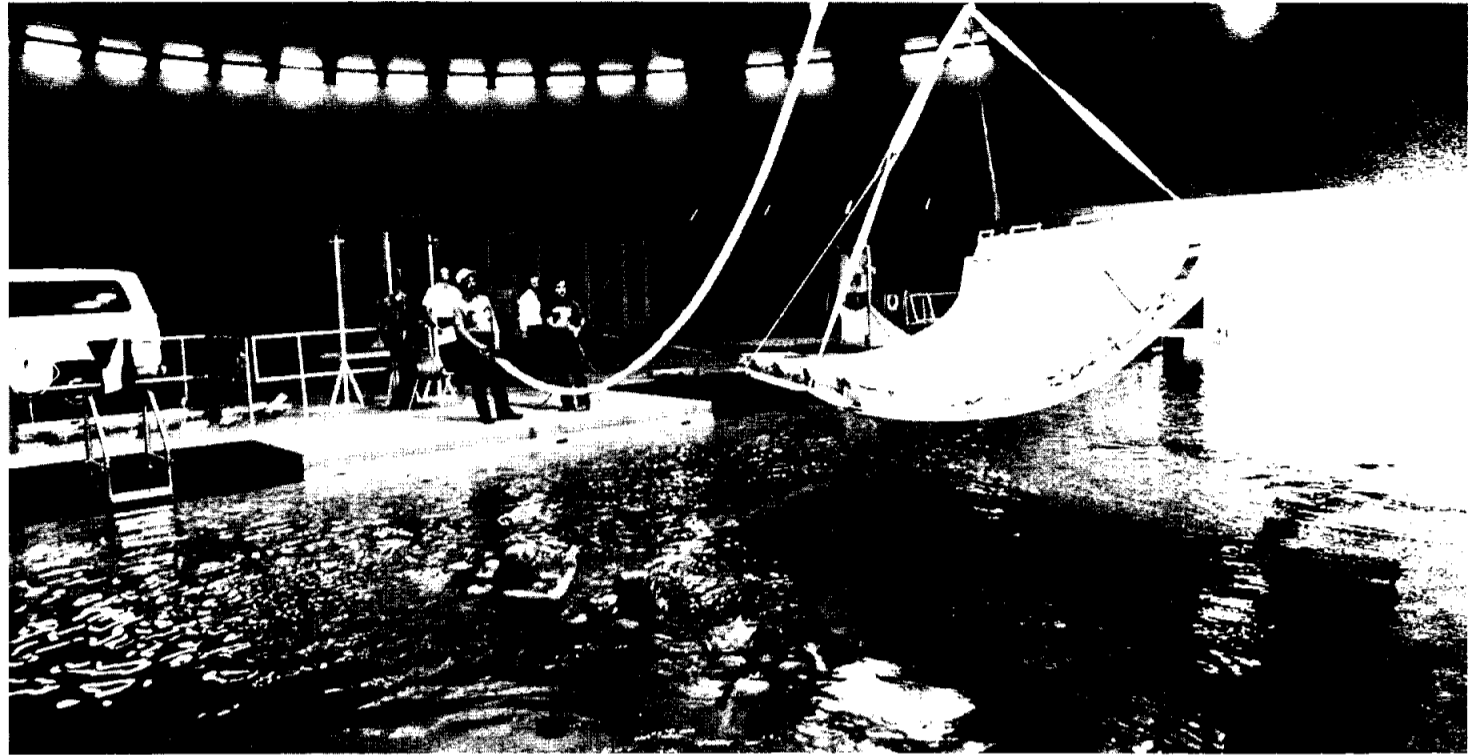
Suit technicians, medical doctors, and safety engineers are on hand for each test, along with video technicians. In a viewing room, test conductors communicate with divers throughout the exercises.

Neutral buoyancy simulations of weightlessness date back to the mid-60s, when one of the Gemini astronauts had problems conducting a procedure outside the spacecraft even though he had run through the procedure flying parabolas in the KC-135 aircraft.

Crew trainers realized that astronauts needed longer periods than the average 20-second parabola to test procedures, so they looked into underwater neutral buoyancy experiments then taking place in Pennsylvania.

In 1966, JSC built a temporary Water Immersion Facility and housed it in Building Five, then out at Ellington, and finally in Building 260. But the small size of the tank—25 feet in diameter and 16 feet deep—limited the training possible.

The new WET-F measures 33 feet wide, 78 feet long, and 25 feet deep,



Lowering the payload bay mockup into the WET-F

large enough to hold a full-size mockup of the Shuttle orbiter payload bay.

Six submersible video cameras follow training operations, two operated by divers and four mounted underwater with pan, tilt, and zoom manipulated from a console at the pool's edge. Filtering and chemical systems reduce bacteria and provide gin-clear water for the underwater photography.

In its first weeks of operation, the new facility has already proved to be invaluable for astronauts in training at JSC, say facility engineers.

STS Update

Weather affects 5th sim

The fifth in a series of long-duration simulations of the first flight of the Space Shuttle orbiter Columbia was conducted at Johnson Space Center December 2-4.

For the first time, real launch and landing-site weather conditions were used during the 56-hour exercise. A forecast of deteriorating weather conditions at the

prime landing site, Edwards Air Force Base, California, caused the flight team to attempt an early reentry on the second day of the simulation, during orbit 19. However, a simulated failure in Columbia's Inertial Measurement Unit forced the aircrew to abort the reentry burn. Subsequent plans were made to recover at the secondary site, White Sands Northrop Strip in New Mexico, but Edwards became the later choice as weather conditions there improved.

Two more long-duration simulations are planned after the first of the year and prior to the flight of Columbia in March 1981.

Test article fired

The Space Shuttle main propulsion system was successfully static fired for nine minutes, 51 seconds December 4, moving NASA a step closer to the first launch of the Space Transportation System in March. The test exceeded the firing time required to place a Shuttle in orbit.

This firing was the 11th test of the system and it brings the total test time on the main Shuttle propulsion system to 53 minutes, 17 seconds. This is in addition to the more than 24 hours of single engine tests that have been conducted in a separate program.

The main propulsion system consists of three liquid fueled engines, an external propellant tank, and associated systems. The test article also includes a simulated orbiter aft section.

Tiles flight tested

Actual flight tests of the Space Shuttle thermal protection tiles on an F-15 and F104 aircraft have been completed by NASA's Dryden Flight research Center. Approximately 60 flights were flown in the 12-month flight test program.

Six different tile sections representing six different locations on the orbiter have been flown at 1.4 times the aerodynamic conditions that the Shuttle will encounter during launch. Maximum speeds of 1.4

Shuttle suit reflects new era in space

Mobility, dexterity, interchangeability built into design

Space suits for astronaut use during the Space Shuttle era will be different from those used in previous manned space flight programs.

The Extravehicular Mobility Unit (EMU), as the suit and its life support system are more formally known, is currently under development and testing at JSC.

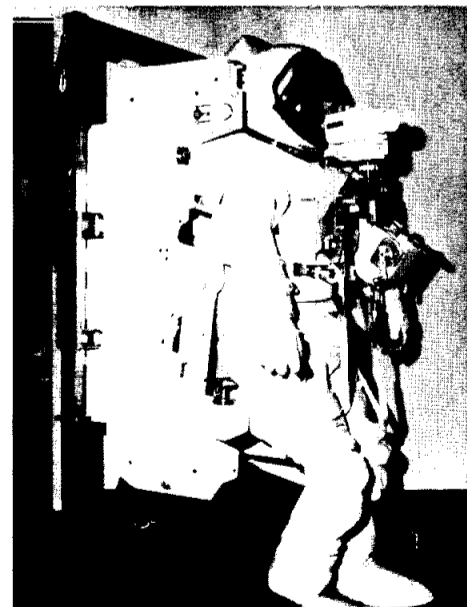
A principal objective is to make it easier to operate in the zero gravity environment and to provide greater upper body mobility for Shuttle astronauts.

Astronaut George Nelson, who is part of the research team, said recently that the more critical areas of EMU development have been the shoulder configuration and the gloves.

"The shoulder arrangement has been crucial because of the complete range of gimbaling action required," Nelson said. "And of course the necessity for suit integrity."

The solution was found in the design of a "rolling convolute" — an S-shaped fold of fabric where the sleeve is coupled to the hard upper torso of the suit. The arrangement permits complete freedom of motion for shoulder rotation.

Working with tools and other hand movements during extravehicular activities (EVAs) created the need for comfortable and pliable gloves. Resistance of the gloves produces hand fatigue, and suits are pressurized to four pounds per square inch. Nelson likens the effect to "squeezing a balloon," and because of the effort required, glove comfort is critical.



Space Shuttle EVA suit

"Any flawed seam, irritation, or pressure point can quickly cause soreness," Nelson said. Consequently, sizing, seam location, and the configuration and placement of wrist and digit flex points has been a critical feature of designing the gloves.

Fifteen glove sizes are available to Shuttle astronauts. They permit enough dexterity, Nelson says, to pick up a dime — "given enough time." Nelson characterized working in the gloves to be about as difficult as trying to work without using your thumbs.

Another unique feature of the suit is its "adjustable fit" concept. Suits used in previous NASA programs were custom-made for each astronaut — a long and

costly process. The Shuttle EMU is composed of sections which are pieced together in various combinations to accommodate different astronaut body sizes.

In addition to the range of glove sizes, there are five upper body sizes, three lower torsos, and a selection of upper arm, lower arm, and waist section sizes.

Rather than having a custom suit for each of the more than 80 astronauts and astronaut candidates currently assigned to NASA, they will share suit pieces. Astronauts are measured for fit and when a suit is required it is built from off-the-shelf pieces. It is subsequently disassembled and the pieces returned to storage for re-issue to others.

The EMU weighs slightly less than 300 pounds, which is comparable to the Apollo-era suits. However, it takes just 15 minutes to put on the EMU, compared to over an hour for earlier suits.

A portable life support system is incorporated into the suit and can sustain an astronaut for up to six hours. Following that, replenishment of consumables and batteries can be quickly accomplished back on board the orbiter.

As an undergarment, astronauts will wear a liquid-cooled, vented garment. This mesh, one-piece unit serves to remove metabolic heat produced by the astronaut. It also ventilates the limbs with air which travels through a harness to the inside front of the hard upper torso of the EMU, where it connects to the life support subsystem.

See SPACE SUIT Page 4

See UPDATE Page 4

Drive smarter with aids

Fifth in a series on smart driving courtesy of the U.S. Department of Energy.

There's never been a shortage of devices to add onto your car, or to put into your gas tank or crankcase, that claim to give you better gas mileage. Some of them actually work.

Among the most worthwhile "additives" are the new improved-friction motor oils. On the average, they improve gas

mileage about 5%.

There are two types of improved-friction oils now available at most service stations: regular motor oils with special additives, and synthetic oils. They test about the same for increased miles-per-gallon.

Synthetics, however, are advertised for less-frequent oil changes (as much as 25,000 miles between changes).

You're not likely to save enough gas to pay for a full tune-up; but you need occasional tune-ups to keep your car running well, and increased gas mileage is an added benefit.

In many cases, a less-expensive "minor" tune-up will yield significant gas savings. This means cleaning and regapping plugs and points and adjusting timing.

An evaluation for the Department of Transportation concluded

that it is reasonable to expect a 3% average improvement right after a tune-up.

A manifold vacuum gauge with a dial face, which can be mounted on or below the dash, measures the pressure in the engine intake manifold. It is a good indicator of the amount of fuel being consumed. Maintaining a high and steady vacuum pressure, as indicated on the gauge, can help you keep a light, steady foot on the accelerator when cruising. The gauge also indicates the benefits of decelerating versus braking.

Another more-expensive gauge that's fun to use is the miles-per-gallon meter. It gives you continuous reading of the miles-per-gallon being obtained by your car.

However, there are some limitations on many current models. There's usually a short delay in the meter's calculations. You see what you were doing a



few seconds ago rather than right now. In rapidly changing traffic conditions, the meter won't remind you not to zip in and out of traffic.

A good way to avoid wasteful, uneven speeds when on the highway is to use cruise control. This

device holds your car to any speed you select when on the highway. It is deactivated at a touch of the brake. You can override it with the accelerator to drive faster.

The gas-saving advantage of cruise control is that it prevents unintentional speeding and variations in speed.

One disadvantage is that cruise control will maintain constant speed even up hills. For the greatest gas economy, you should strive for a constant accelerator pressure — rather than constant speed — when climbing. It is very simple to disengage cruise control when you start to climb and to reactivate it at the top of the hill.

(This is the final article in the series. Many of the techniques discussed here are included in a free pamphlet, "How to Save Gasoline and Money," available from Energy, P.O. Box 62, Oak Ridge, TN 37830.)

Bulletin Board

Missed Physicals Can Be Made Up

Did you miss your annual physical examination? Each year a number of JSC employees miss their physicals for various reasons. If you missed yours, the JSC Clinic is scheduling makeups for between December 22 and January 2. Call x-4111 to make your appointment.

Big Band Gala For a Worthy Cause

The La Porte Bay Area Heritage Society is presenting a Holiday Gala Big Band Sound Dance, featuring Manny Green and his 12-piece orchestra, Saturday December 27 at the Sylvan Beach Pavilion on Galveston Bay in La Porte. The event is semi-formal and tickets are \$20 per couple. Tickets can be purchased at the La Porte Chamber of Commerce, 471-1123. Proceeds will be used

to rejuvenate the old Railroad Depot which was recently moved to Sylvan Beach Park as a historical monument.

JSC Employee Wins Combined Federal Campaign Drawing

The Hyatt Regency Hotel recently donated an award—a deluxe guest room for two for Friday and Saturday night at a special rate—to the United Way. In a drawing held November 20, the winner of the "Memory Maker" weekend was selected from all JSC employees. The winner is A. A. (Tony) Verrengia of the Space Shuttle Program Office. Congratulations

Schmitt to Speak On Site December 17

Senator Harrison "Jack" Schmitt will speak on "Today's Outlook for Space" Wednesday

December 17 at noon in the Building Two Auditorium. All employees are invited to this AIAA sponsored event.

On Sale at the JSC Exchange Store

(Store hours 10 a.m. to 2 p.m.)
Plitt Theatre tickets: \$2
General Cinema tickets: \$2.40
Postage Stamps (20/15 cents): \$3
Entertainment '81 Coupon Book: \$16

Gold C Value Book 80-81: \$5
The JSC Exchange Store can special order for you any book in print and save you up to 15%. (Discounts depend on the publisher's policy.)

Business cards with the NASA logo on them can also be ordered through the JSC Exchange Store: the price is \$10 for 250 cards.

Orders for the above services can be placed at the counter at

Continued on Page 3

Nominations being taken for 5 credit union slots

Election of three members of the credit union Board of Directors and two members of the Credit Committee will take place on Friday, March 6, 1981.

Nominations for these positions will be accepted until 5 pm, January 23, 1981. Resumes should be sent to the nominating committee chairman, Roy C. Stokes, c/o JSC-

FCU, P. O. Box 58346, Houston, Texas, 77058, or left at the information desk of the credit union.

No nominations will be accepted from the floor during the annual meeting.

The Annual Meeting will be held at 7:30 pm on March 6, 1981, at the Gilruth Recreation Center.

Learn energy solutions at display in Building 2

You can take a fusion quiz, or learn how much energy is saved by "closing your home's openings" with two exhibits on display in the JSC Visitor Center through January 4.

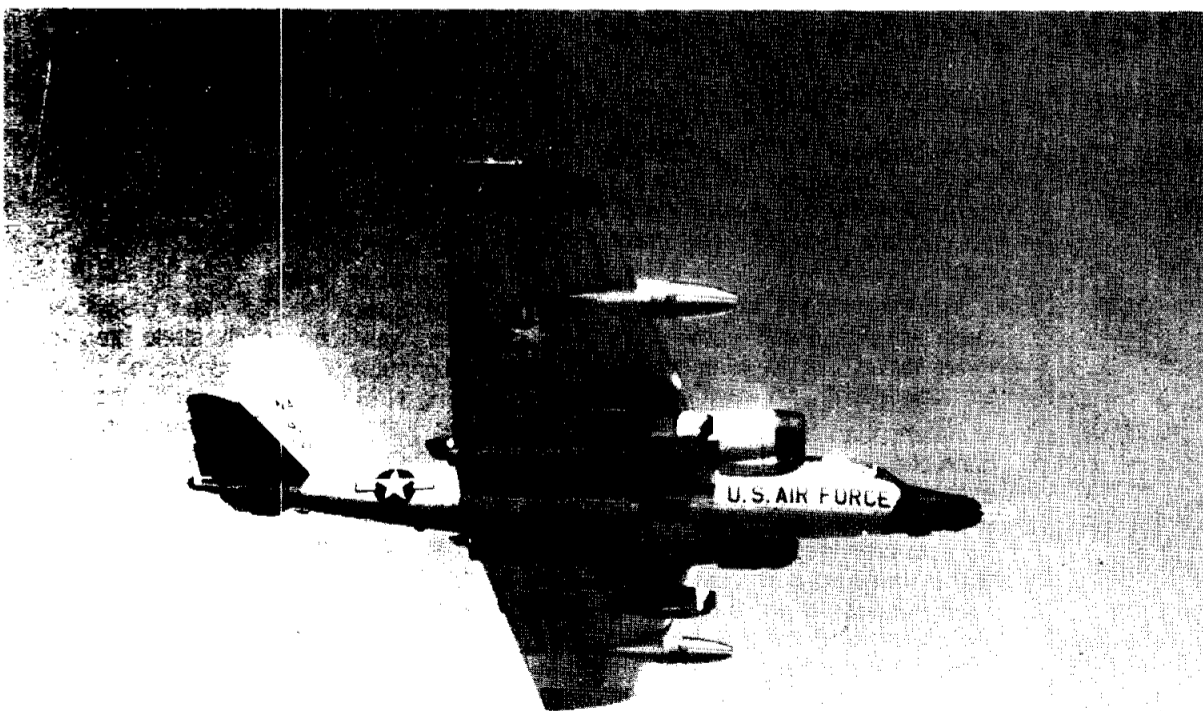
The exhibits use question-and-answer panels, true-or-false quizzes, and graphic information to illustrate some of the Department of Energy's programs to solve the nation's energy problems.

"Magnetic Fusion Energy" gives a simple demonstration of fusion — how it occurs naturally in the sun and how we may be able to produce and use it. In one section you can try to use your arm-

strength to force "positive charged particles" together, and the exhibit even tells how much energy the exhibit uses.

At the "Saving Energy in Your Home" display, you can calculate the percentage of savings expected after making different home energy improvements. Other charts compare energy savings by different methods in different regions or cities around the country.

The two exhibits are located in the south end of the Visitor Center. They are part of the DOE's national exhibits program operated by the American Museum of Science & Energy in Oak Ridge, Tennessee.



Aircraft Ops samples southern air

JSC's Aircraft Operations Division recently completed its 20th mission in support of the Department of Energy's Project Airstream, conducting high altitude sampling flights from Ellington to Howard AFB, Panama; Lima, Peru; and Montevideo, Uruguay, and obtaining samples at altitudes between 30,000 and 63,000 feet.

Aircraft Ops has flown airstream missions three times a

year since JSC acquired the WB-57F aircraft, NASA 928 pictured above, in 1974.

On board the WB-57F are more high altitude air sampling instruments than any other aircraft, including a U-1 foil which collects particles on paper filters; a system which compresses ambient air to 300 psi in basketball size spheres; a sampler which measures the concentration of tritium, a radioactive isotope of hydrogen; charcoal

traps; a quartz crystal microbalance which measures particle mass and size; and a Coordinated High Altitude Measurements Program (CHAMP) which measures different elements including water, vapor, and ozone.

On this mission the first southern hemisphere air samples were collected since JSC acquired the project.

See SAMPLING Page 4

Cookin' in the cafeteria

Week of December 15 - 19

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; 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 December 22 - 26

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 and Pies.

Tuesday: CHRISTMAS SPECIAL - Roast Turkey with Cornbread Dressing, Giblet Gravy, Cranberry Sauce, Baked Yams, Green Beans Almondine, Waldorf Salad, Roll, Butter, Beverage, Apple & Mince Cobbler (\$0.50 extra).

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

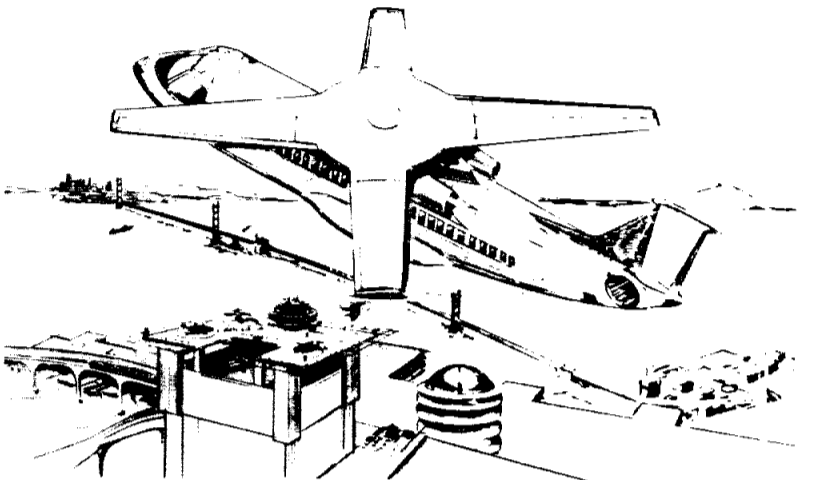
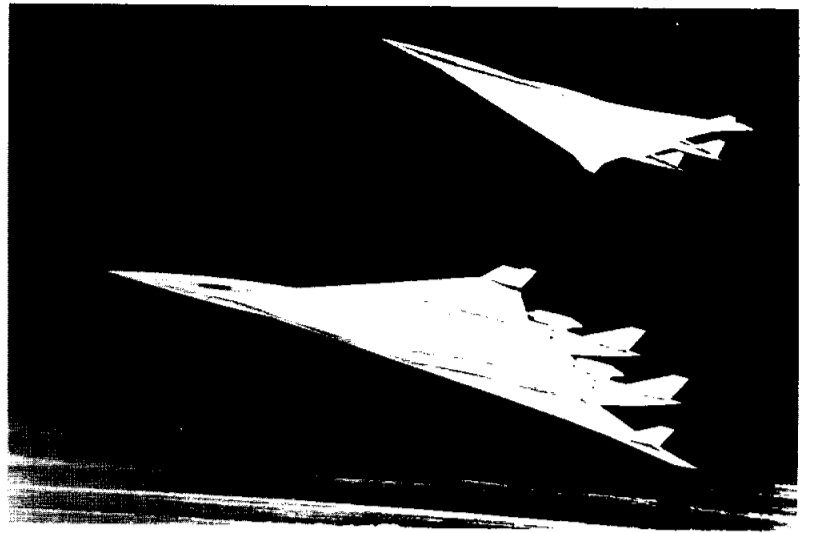
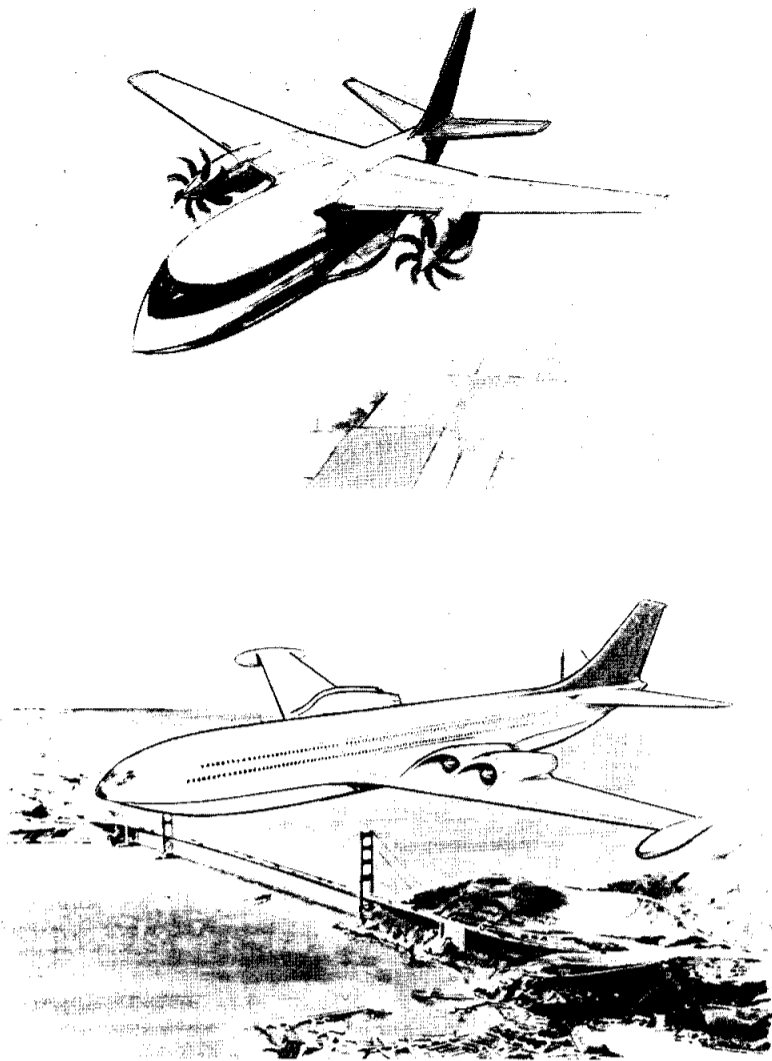
Thursday: HOLIDAY

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

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

AIRPLANES OF THE FUTURE are shown in these four sketches from Lockheed-California. At top left is the "propfan" concept, a partial solution to energy shortages. It uses an eight- to ten-bladed swept propeller and can carry 120 passengers at speeds near Mach 0.75. Below left is the Large Seaplane, which carries 800 to 1500 passengers. It avoids the landing gear size and runway load problem for large capacity jets by landing on bodies of water. An aircraft this size would have a double deck arrangement. At top right is a Supersonic Transport concept—a large model that is economically successful. It would carry 300 to 400 passengers a range of 4000 miles at speeds over Mach 2.0. It could burn liquid hydrogen, and employ high temperature composites and aluminum alloys. Bottom left is a Vertical Takeoff and Landing craft which could ease congested ground access to airports. The VTOL could operate from heliports and inner city rooftops carrying 50 passengers on short routes at speeds near Mach 0.6. All four are among numerous concepts being studied by Lockheed.



Bulletin Board

From Page 2

either exchange store or through the mail (code: AW).

Lunarfins Is Active All Year

Now is the time to start thinking about scuba diving. The Lunarfins are active all year, sponsoring basic certified scuba instruction and refresher courses. Members are supplied free breathing air for personal tanks and have available to them rental scuba gear. Programs at the regular meetings are

an informative treat. Regular meetings are every third Wednesday of the month at 7:30 p.m. at the Clear Lake Park Building, NASA Road One. There will be no meeting in December (Christmas party). For more information call 480-1340 evenings.

Bike Club Going For Another Ride

Sunday December 21 the JSC Bike Club will make a trip all the way around Clear Lake. It makes a nice ride for Sunday when the traffic is low. Meet at 10 a.m. at Bay Area and Space Center Blvds. Ride leader is Brian Morris, x-5293 or 481-3900.

Dear Mom, here we are on Mars

(Recently NASA cooperated with the Cub Scouts in its "World of Tomorrow" program. The following is a letter that was written as a composition as part of the project.)

Dear Mom & Dad,
Remember the rocket Mike, Kelly, and I were building for the Cub Scout project? Well, Kelly pushed the blast-off button before we were ready and here we are on Mars. I'm sorry we didn't get a chance to say good-bye, and I hope you didn't worry about us.

We really enjoyed the trip but we did get a little hungry. Mike left his peanut butter and jelly sandwiches on the launch pad so Kelly and I had to share our bologna sandwiches and cookies with him. These little green men are real nice to us. They even let us sleep in their bed which is really just a hole in the ground. Their only food is something that looks like a huge grasshopper and tastes like green leaves. I guess that's why the people are green.
There are little green girls here, too. Mike wants to bring one home

with him but he's not sure his Mama would like her.
We'll be coming home before long. Keep the C.B. radio tuned to Channel One and we'll call you when we get close enough. Meet us at Smith Mt. Lake with plenty of hot dogs and hamburgers. That's where we'll splash down.
Tell all the Cub Scouts hello for us.

Love,
Jeffrey
Somewhere, Mars

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.

CARS & TRUCKS

- '76 VW Dasher, 65,000 miles, AM/FM, AC, yellow 2 door, manual, \$2,500. 333-2911
- '73 Chevy Window Van, Dual Air, P/S, P/B, good condition. \$1,800. 473-7745.
- '73 Pontiac Ventura, 2 dr. 350, good condition, \$1,000. 482-8759.
- '71 Pinto, 28 miles per gal. Standard 4-speed, \$300, x3921 or 482-0777.
- '74 VW Thing, \$1900. 483-5270 or 471-3735.
- '72 Pinto, good condition, 46,948 mil. Call 946-5849 after 5 p.m.
- '78 Camaro, P/B, P/S, Automatic, Air, FM Radio, both engine & body excellent, 24,000 miles. Best offer over \$4500. Peacock x2208.
- '77 Oldsmobile (Toronado) excellent condition. Loaded with extras. Call L. D. Gillum after 6 p.m. 442-6847.
- Deer Lease Vehicle. 1966 Datsun Patrol 4x4. Removable Steel cap. Needs reverse gear. \$500. Jim x7242.
- '73 Olds Cutlass Supreme, runs good, ac/am-fm, 61,000 miles, \$500 or best offer. Call Wayne x3085 or 482-0358 after 5 p.m.
- '73 Vega Hatchback. A/C, 4-spd. Rebuilt engine, cast iron steeves. Good condition. \$650. Ray X3071 or 332-5892.

BOATS & PLANES

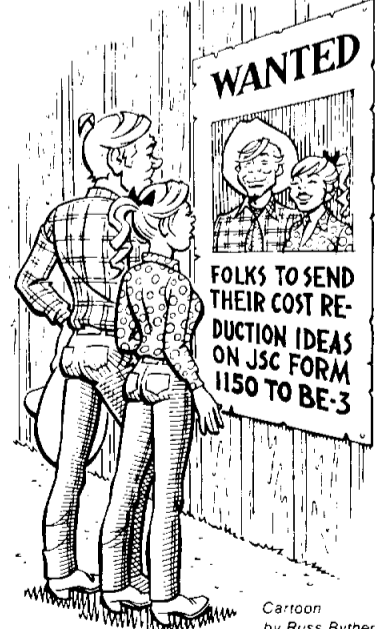
- FOR SALE: '76 Regatta w/115 Johnson including trailer, \$3400. Good condition. Call 534-2890, Jackie or Anna.
- LIDO-14 Sailboats: New/Used—Family sailing/racing. Popular boat/big fleet. Excellent investment. 334-2392 or 482-7305.

CARPOOLS

Need additional member, Braeswood Square in SW Houston to JSC, 7:30 to 4:00. 774-4321.

PROPERTY & RENTALS

LEASE: 1-1 & Den condo at The Landing. Lake view. Newly redecorated. Boat slip available. Yacht Club membership, utilities, \$450. x2958 or 334-5696.



Cartoon by Russ Byther

- SALE: El Lago, newly redecorated throughout 3-2, large recreation room, separate den and living room. \$80K. 334-2354.
- RENT: Lake Livingston Retreat. 3 B/R water front under the trees. All amenities. By week or weekend. Jerry x4207 or 554-6093.
- RENT: Beautiful 3-2-2 new house, fireplace, wood fence, microwave oven, large kitchen, \$495 plus deposit. 482-6609 after 4:30.
- SALE: League City/Pecan Forest, 4-2-2A. Immediate occupancy, com-

bine non-escalating 8 1/4% loan with 2nd mortgage for great affordability. Low 60's. 554-2934.

MISCELLANEOUS

- 5 bicycles and spare parts. 333-3941.
- Membership in NASA Aero Club for Sale. Call x5049 or 480-4952 after 6 p.m.
- 2 girls 24" bicycles, good condition, \$25 ea. Sanders 481-6928 or x3458.
- FOR SALE: Weight Bench, all aluminum, has for press, rack, etc. \$35. Good Christmas Gift. x4176 or 644-0315.
- Men's 14 ct yellow gold ring with five 1/4 ct diamonds. \$200. Cindy x7236.
- FOR SALE: Roller skates, in-door/outdoor, Women's size 5 1/2. Used twice. \$20 or best offer. 480-3921 after 6 p.m.
- 2 Dish Mags for Ford (15x8.5), both for \$60. Shirley x4258 or 473-5004 after 5:30.
- FOR SALE: Right hand seat for 1969 VW bug - black. Call 485-7436 evening and weekends.
- PASSENGER MANUALS. '70, '75 & '76 Ford-Mercury, \$9 ea. '72 Olds and Body by Fisher, \$7 ea. 1966 Chevrolet, \$5. WIRING DIAGRAMS. '75 Maverick, \$3. '70 Ford, \$2. Paul Marchal 534-3021 after 5.
- FOR SALE: Digital group small computer system: Z-80 CPU, 18K RAM, Keyboard, CRT, Basic W/W. Mike Mullane x3856/486-8862
- Boys 20" bicycle, new tires, tubes and chain. \$25. 488-2652 after 5.
- Set of used golf clubs. 4 woods, 10 irons & bag. 482-4600.
- Like new Schwinn exercycle, less than one year old, \$100. Jack x6434.
- Boys 20" monoshock bicycle \$35. Girls 13" bicycle \$15. Diane x4549.

Assorted printing computer terminals. Sell or trade for almost anything. Call Jim at 486-8564 after 6 p.m. or weekends.

GE frost-free freezer, needs freon job, \$30. Garage door opener, \$30. G-78-15 radial tire with ring, \$30. Call 482-6609 after 4:30.

The ideal Christmas present—back issues of Roundup dating to 1962—is available to space center employees free in the Building Two annex (Newsroom) reception area.

The Roundup office is cleaning out the file cabinets, and we don't want to throw away these historical documents which tell the story of man in space since the days Johnson Space Center opened. So we've piled them in the Newsroom for you.

The back issues are available first come first served.

Men's three piece suit like new. Worn once. Red, size 38. \$200. 339-1793 after 4:30.

Bamboo plants, big 5-gal bunches, separate or plant as is. Makes good privacy hedge. \$5 per bunch. Steve x3212.

Solid Wood Dining Room set (Spanish Style) \$800 (firm), Jack Baston 333-3645.

STEREOS & CAMERAS

FOR SALE: Small b&w TV (w/radio & cassette tape player/recorder) \$100; small b&w TV (10 years old) \$50; SONY Beta 8400 Video recorder \$550 (with timer); Jack Baston 333-3645

Quasar VR 1000 video recorder w/cassette. Brand new in box. \$675. Call Pam Pate x4512 or 941-5204 after 7 p.m.

135mm, f2.8 and 200mm, f3.5 telephoto lenses. Both lenses have filter adapters, haze filters & cases. Universal screw mount. \$45 ea or \$75 both. 946-4013 after 6:00 p.m.

FOR SALE: Sony 5400 VTR, w/beta scan, \$900. Magnavox color camera, used twice. \$725 RCA 23" TV, excellent condition, beautiful cabinet, \$100. 333-2974, Ed Campagna.

AMATEUR RADIO: Collins KWM-2, Speaker, 312B-4 Phone Patch, SM-2 Mike, Siltronics FS-600A Wattmeter. \$700 Wayne Boncyk x2938 or 486-9692.

LOST & FOUND

LOST: Fat Black Cat, 9 yrs old. Nov 15, Pipers Meadow, near Metro. John x4231.

MUSICAL INSTRUMENTS

TAPCO 6 ch stereo mixing board. Hi/Lo imp., inputs, dual meters. \$325 firm. Gabe x4103, or 333-5329.

Wurlitzer Electronic Church Organ. Call after 5 p.m. 944-5965.

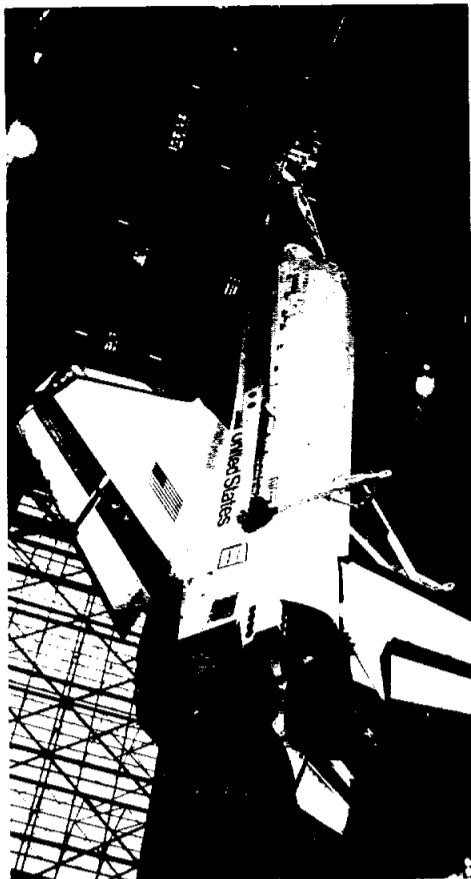
FOR SALE: Gibson "Grabber" Base guitar, custom hard case, amplifier w/brain. complete rig only \$650 or best offer. 488-0658 after 5

PETS

Pick of the litter. AKC Siberian Husky, 1 yr old, male, blk and white with blue eyes. \$150. Morton 946-4752.

Just in time for Christmas. 2 Welsh Pony mares \$150 ea., 1 Appaloosa/Welsh Stud \$200. All kid broke. Whitmore 483-7241.

Chocolate Brown, male AKC, Toy Poodle pup, 6 wks. 482-4600.



Orbiter hoisted into place and mated with ET and SRBs at Cape

"The exploration of space appeals to the human drive for adventure and the human thirst for knowledge. It provides the spark for optimism about the future."

—George M. Low
(former NASA Administrator)

Update . . .

From Page 1

times the speed of sound and dynamic pressures of 1140 pounds per square foot were achieved during the program.

Following each flight each test section was inspected and precisely measured to identify any deformation or structural changes that may have occurred as a result of the flight loads.

Design changes of various degrees have been made to the TPS system along the underneath side of the orbiter wing leading edge, along the underneath side of the orbiter wing leading edge, along the wing glove area, around the window posts, and along the vertical tail leading edge, as a result of the flight test program.

Among the changes were a redesigning of attachment techniques, modification of gap filler assemblies, and improvement of installation and testing techniques. All design changes were retested after modification to assure satisfactory performance.

The six different tile locations on the orbiter that were tested are the close out tile aft of the wing leading edge area, forward wing glove area, vertical tail leading edge, window post area, elevon trailing edge, and elevon hinge area.

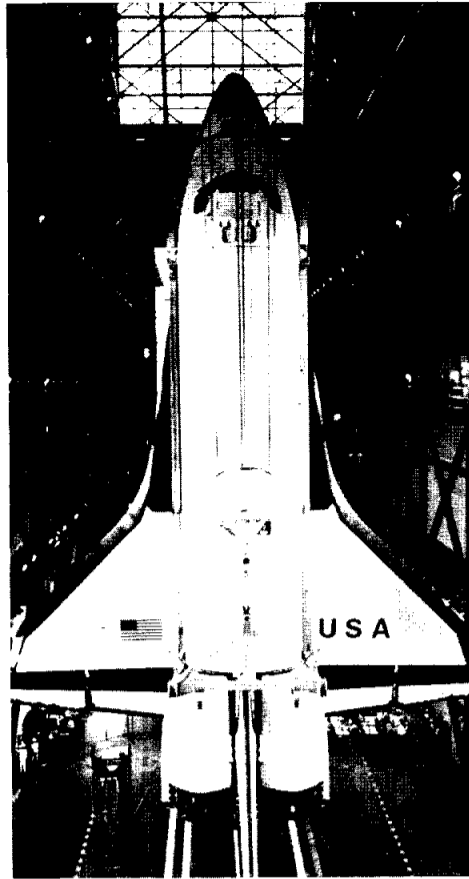
Space Suit . . .

From Page 1

Development of the life support system to accommodate the astronaut in a zero gravity environment has also been a challenging aspect of EMU research. In addition to suit pressurization and ventilation, the system provides a constantly refreshed atmosphere for crewmember breathing. The system has light-emitting diode displays and a caution-and-warning system for alerting the crewmember to any system failure or abnormal condition with the life support or communications equipment.

This portable life support system is attached to the back of the hard upper torso of the EMU. Displays and controls are attached directly to the front of the EMU, and allow the crewmember to control and monitor the system.

EMU development dates back to 1976 and involves NASA engineers working with the contractor, Hamilton Standard, Inc., and its major subcontractor International Latex Corp. The research team also includes Astronauts Story Musgrave, Anna Fisher, and Nelson.



Frosch says NASA's best

The following are excerpts from NASA Administrator Robert A. Frosch's farewell message to employees December 8.

"I believe that NASA is the best technical agency in the world, an agency which does its job as well as it can possibly be done, better than most people believe it could be done.

"NASA has a number of priceless assets, the most important of which are people in the agency and their attitude towards their work and towards each other. This is an agency which is marked by professional thoroughness, not only in its engineering and scientific work, but in its managerial and administrative work.

"We are continually the lead agency for administrative and managerial techniques. Our people from all over the agency are in demand not only as technical consultants, but as managerial and administrative consultants.

"We have one particular asset, a most important asset: we are critical and problem-solving in the best meaning of those words. This is an agency in which everyone feels free to point out problems, an agency in which people criticize themselves out loud in appropriate times and places so that problems can be fixed.

"This is an asset that I hope the agency will retain.

"As you know I am leaving January 20, but I will not vanish from the technical scene. Not only will I be watching what the agency does, but I will be supporting the agency.

"There may be a shift in the mood and interest of the country—not just because of the somewhat startling election results, but because of the effect on the nation publicly that the Voyagers have had, and that I am sure the first flight of the Shuttle will have.

"The signals are returning to a great interest in technological and scientific things, so the time may be right for large scale goals to be enunciated."

Sampling . . .

From Page 2

The WB-57 crew—a pilot and scientific equipment operator—wear pressure suits similar to those worn by Gemini astronauts, because of extreme altitudes.

Mission Manager for the South American deployment was Thomas L. Barrow. Pilots were Charles Hayes and Dick Gray, and scientific equipment operators were George Nelson, Kathy Sullivan, and Harley Weyer.

NASA 928 is the only four engine jet operated by one pilot.

The aircraft carries 4000 pounds of payload at altitudes over 60,000 feet.

Orbiter now to undergo many tests

The orbiter Columbia is currently in the Vehicle Assembly Building at the Cape undergoing preparations for rollout to the launch pad, now scheduled for December 26. At a recent press briefing, Robert Gray, Manager of the Shuttle Project Office, described the series of tests still required on the orbiter before its launch in March 1981.

Of major importance is the Shuttle Interface Test, now taking place. The SIT tests the entire Shuttle configuration as it is assembled for flight—it followed the mating with the mobile launcher and the mating of the External Tank with the Solid Rocket Boosters. "In this test, we make sure that when we tell the SRBs to gimbal at the nozzles, they do gimbal at the nozzles and so on," Gray said.

Once all subsystem tests are completed, the orbiter will be run through seven simulated flights with a crew on board. Then final preparations for rollout to the pad begin and "connections are very critical," Gray said, referring to the electrical, liquid, fuel, gas, and purge lines.

It takes seven hours to roll the vehicle from the assembly building to the pad, then there are numerous connections to make followed by validations of the connections.

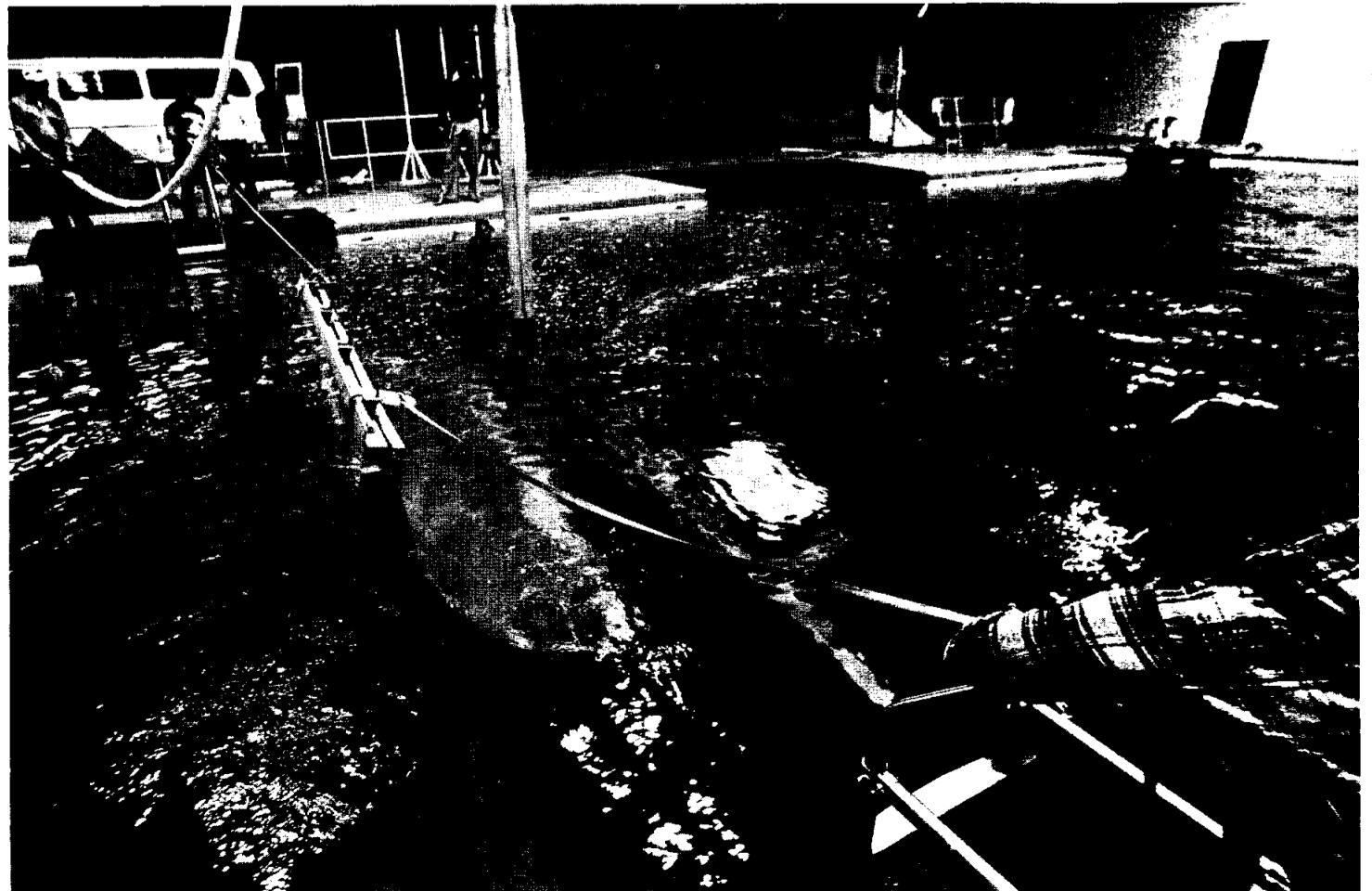
The prime crew and backup crew will run through emergency egress training with the orbiter on the pad, then there will be an interface test—end to end—with the Mission Control Center in Houston.

Other tests include a "plugs out" test, where the orbiter will go through a simulated countdown, starting at T-60 seconds, and disconnecting procedures will be tested. Back-up systems will be tested, there will be a hot-firing of the orbiter Auxiliary Power Units, and an External Tank Cryo Load test, "where we actually load the cryogenics one at a time just as for launch," Gray said.

"A major test left to do is the Flight Readiness Firing, a full firing of the Space Shuttle Main Engines," Gray said. "We will be in flight configuration to the extent that we can be, and go through a full launch countdown to zero, then ignition of the three main engines.

"We will fire those engines at full throttle for about 20 seconds."

The Flight Readiness Firing is scheduled for February 7.



Getting the WTF ready for crew training (Story on Page 1)