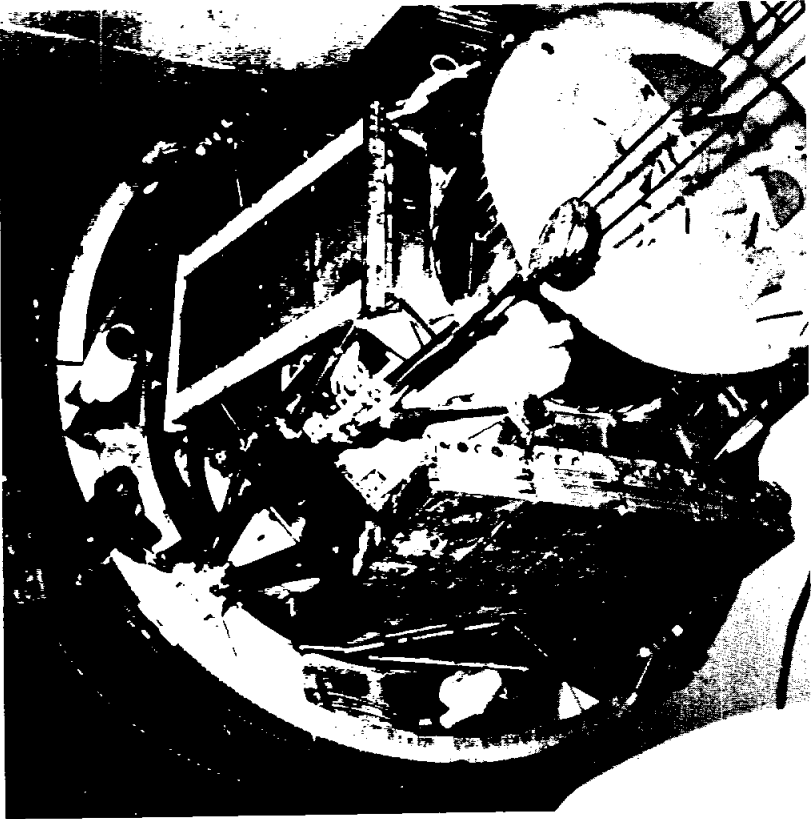


# Skylab Activity Gets Underway In Earnest



Ten days down, 46 to go. That's how the Skylab Medical Experiments Altitude Test in Crew Systems Division's 20-foot vacuum chamber is shaping up.

And, with the last Apollo less than six months away, events here and elsewhere are drawing more and more attention toward Skylab, the next operational manned space flight program.

The first Skylab command and service module, CSM 116, has been delivered to Kennedy Space Center and is due to undergo extensive pre-launch checkouts.

Here in Houston, while astro-

nauts Robert Crippen, Karol Bobko and Dr. William Thornton continue their endurance run in the Orbital Workshop mockup, Skylab test articles have been taken off the shaker and a flight item put into the baker.

Getting a good shaking were the components of the Skylab payload assembly—Saturn instrument unit, fixed airlock shroud and airlock module, multiple docking adapter, payload shroud, double-angle nose cone, Apollo telescope mount, and the ATM deployment assembly.

That test hardware underwent

computer-controlled resonance frequency survey and vibration testing in the Vibration and Acoustic Test Facility in Building 49.

The tests duplicated the sound and vibration that will buffet the assembly during liftoff and flight through the atmosphere.

A block away, in the Building 32 Space Environment Simulation Laboratory, an Apollo telescope mount flight article is completing the first of two ten-day thermal and vacuum tests.

The flight ATM came from Marshall Space Flight Center, (Continued on Page 2)

## ROUNDUP

NASA MANNED SPACECRAFT CENTER

HOUSTON, TEXAS



VOL. 11 NO. 19

August 4, 1972

## Blood Van Scheduled Aug. 10, 11

This year's bloodmobile visit to MSC is scheduled for next Thursday and Friday, August 10 and 11, at Building 8 from 8 to 3.

A donation of blood gives the donor and his family a participating membership in the Employees Activities Association blood bank.

A participant is eligible to receive two and a half credits, \$25, for each pint of blood used by him or his family.

A history of the MSC blood bank, and a discussion of requirements for blood donation, were carried in the July 7 issue of the Roundup. A few copies are available for personnel who missed distribution of that issue and who are interested in donating blood.

NASA and contractor employees who for medical reasons cannot donate blood may have a friend or relative do so in the employee's name, thus qualifying the employee for the benefit of the bank.

Donors will be taken by scheduled appointment only.

Contact: Helon Crawford at MSC extension 3908 or Lester Wynn at extension 6121.

## Orange Flight Cup Flew the Coop

In some dark corner or closet in Building 2 there's a coffee cup, off-white color, lettered in gold "Apollo 16" on one side, "Orange Flight" on the other.

Its owner, Pete Frank, flight director on the Orange Team for Apollo 16, isn't missing his coffee breaks but, for obvious personal reasons, does miss the cup.

Has anybody seen it?



## Care to Run for Office? Get Into Picnic Politics

By Pat Elliott

Want to run for office? How about "Administrative Office for the Permanent Committee for the Oliver Wendell Holmes Division"?

Yes, there really is such an office.

In looking for ways to plan a



SKYLAB ACTIVITY — Skylab seemed to show up almost everywhere you looked in the last few weeks. The payload assembly (top picture) was removed from the vibration lab to mark the end of tests that began in January 1971. About the same time, the Apollo telescope mount flight article (center picture) was going into thermal vacuum testing. And ten days ago the Crippen-Bobko-Thornton SMEAT crew (below) went down a reception line made up of Life Sciences deputy director Dr. W. R. Hawkins, Skylab Program Office manager Kenneth Kleinknecht, MSC deputy director S. A. Sjoberg, and Crew Systems assistant chief Jim Correale. The occasion was the crew's entry into the orbital workshop mockup to start a planned 56 days of life in space.

better MSC picnic, the Picnic Theme Committee members found the above-titled office—and many others—in an honest-to-goodness U. S. Government Organizational Manual.

Since the theme for this year's picnic is ELECTION '72, and we are going all out with the red-white-and-blue, flag-waving, vote, vote, vote... why not have our First Annual Interplanetary Election with candidates for every imaginable zany office.

For instance, because of Glynn Lunney's current tete-a-tete with the Russians, don't you think he would make a magnificent Inspector General for Foreign Assistance when we establish the first lunar colony?

Of course!

And don't you think Don Arabian would make a fine Assistant Administrator of the Office of the War on Hunger?

(Continued on Page 2)

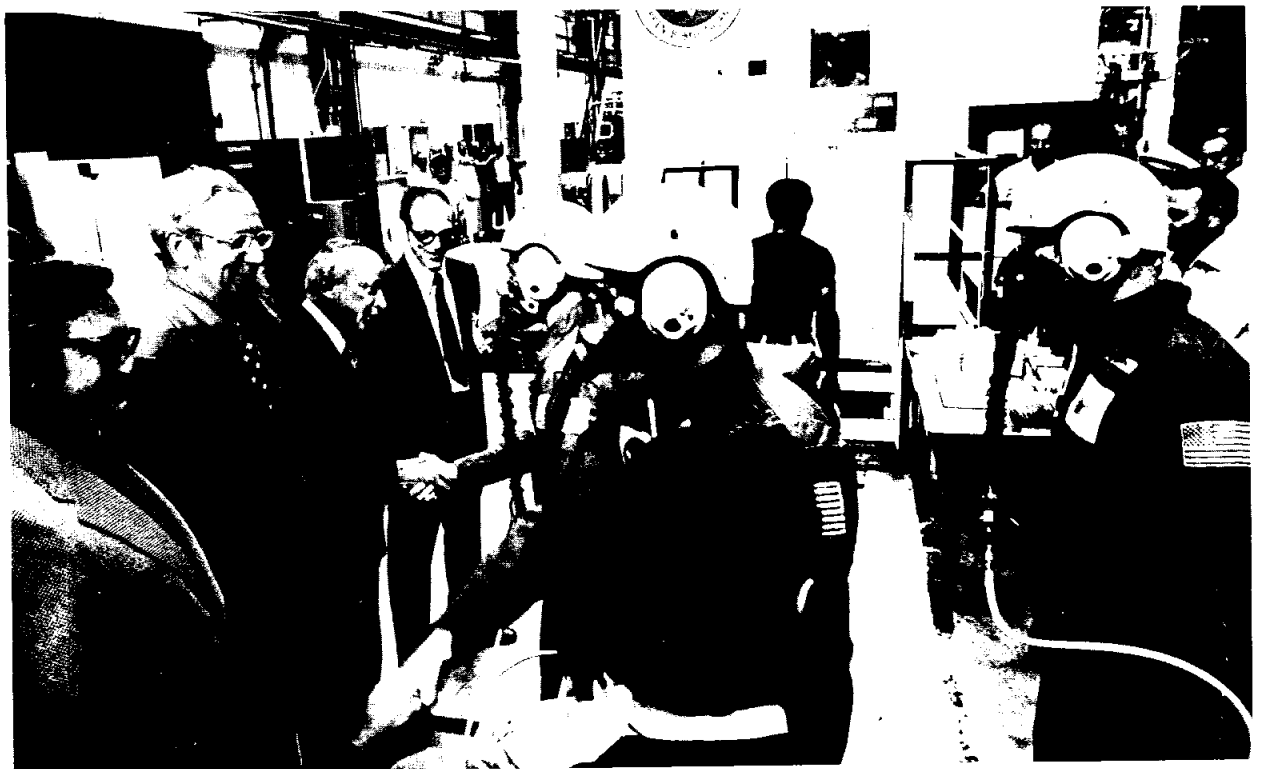
## U. S. and Russians Okay Joint Panel Medical Findings

NASA and the Soviet Academy of Sciences have approved recommendations developed at their second Joint Working Group of Space Biology and Medicine, held here in May.

The group continued its exchange of information on manned space flight experiences.

The U. S. report included pre- and post-flight aspects of the Apollo 16 flight, and the Russian report contained autopsy findings on the fatal Soyuz-Salyut mission.

The report confirmed that death of the three cosmonauts was caused by sudden decompression of the spacecraft.



## Aero Club Offers Repeat of Course For Non-Pilots

The Aero Club is repeating its introduction-to-flying course.

Designed to acquaint non-pilots with flying at a reasonable cost, the course includes ten hours of flying time, all flight instructor charges through solo, and ground school.

The cost is \$160. If time beyond the ten hours is required to solo, the only extra charge will be \$11 an hour for the plane. Ground school without flight instruction is \$20.

Students become associate members of the Aero Club and are covered by the club's insurance. After solo, the new pilot can apply for club membership without the usual \$50 initiation fee.

The offer is open to MSC and contractor personnel and their families.

Introduction and registration is August 21 at 5 p.m. in Room 720 of Building 2.

Contacts are Jim McCoy, extension 5171, or Bob Moncsko, 4667.

## Clear Lake Sailing Club Plans Races, Opens Five Dates to Novice Training

The Clear Lake Sailing Club, made up largely of MSC and contractor personnel, has announced a ten-date racing schedule for fall, five on Fridays and five the following day.

Friday night races, which will feature novice training and will team newcomers with an experienced sailor for the doubles events, will be August 11 and 26, September 8 and 22, and October

the 6th.

Skipper's meetings will be 6:15 at Canoe and Sail on Clear Lake.

Skipper's meetings for the next-day events start at 10:45 at the Harris County Park pier on the lake.

Contacts: Club Commodore Jay Legrende 333-2976, Secretary-Treasurer Pat Neale 488-1748, or Board Member Rita Sommer 643-7104.

## Scout Post Calls For Volunteers

A NASA-sponsored and aerospace-oriented Explorer Scout Post is in the works—if enough potential members and leader/committeemen come forth.

As planned, the post will have full use of MSC meeting rooms, ground facilities, and equipment.

For more information or to volunteer services, call Dawn Hoyle at MSC extension 2921.

## Chapman, England Leave Astronaut Ranks and NASA

Astronauts Philip K. Chapman and Anthony W. England have announced their resignations.

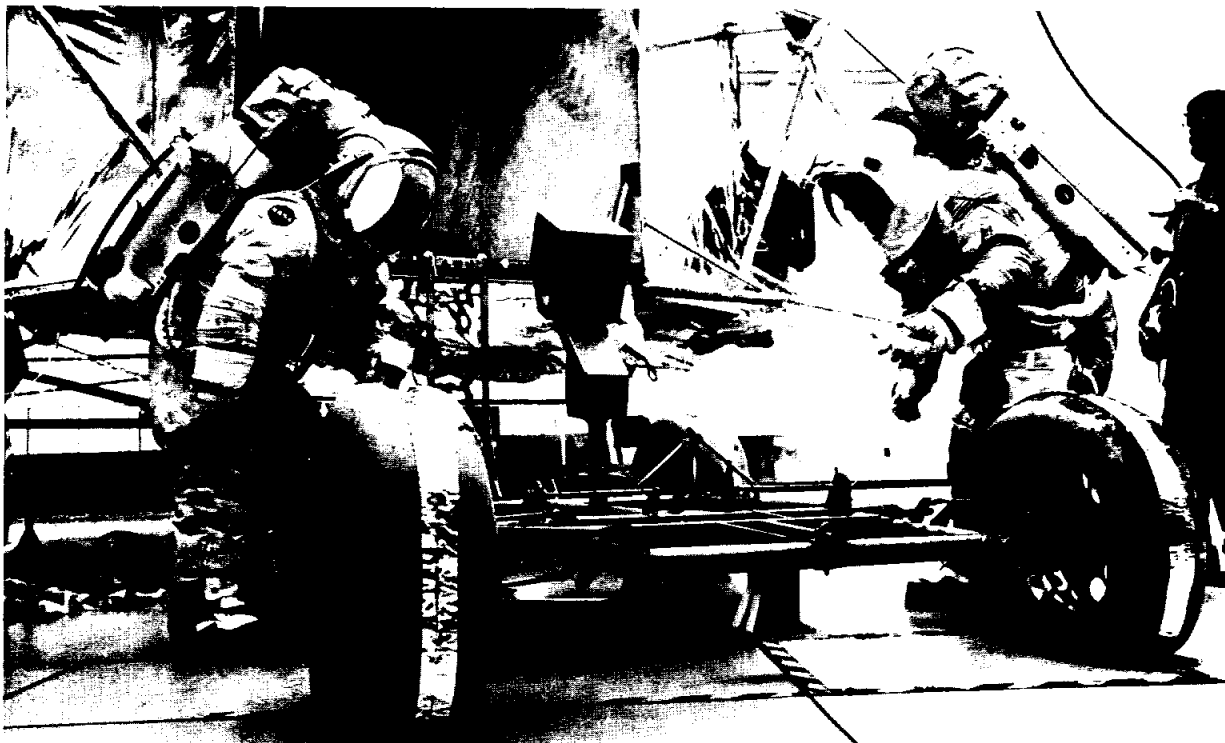
Dr. Chapman said he has accepted a job as principal research scientist with AVCO Everett Research Laboratories in Everett, Massachusetts.

He also will work as a senior research associate in the Measurement Systems Laboratory at the Massachusetts Institute of Technology.

Dr. England is accepting a position with the Regional Geophysics Group of the U. S. Geological Survey in Denver.

He will assist in developing techniques using radar from airplanes and spacecraft to learn about the surface and subsurface structure of the earth and other planets.

Dr. England also will continue as a co-investigator for the electrical surface properties experiment which will be conducted on the lunar surface during Apollo 17.



## Care—

(Continued From Page 1)

There are many more similar fun-sounding—but actual—government offices to fill.

So when you see the center adorned with "let's pretend" election posters, join the fun. Make plans to attend the big Election '72 MSC picnic September 23 at Camp Manison.

## Skylab—

(Continued From Page 1)

where it was built, and from Houston it will fly—in the "Pregnant Guppy" aircraft—to Kennedy Space Center.

The payload assembly—except for the ATM, which goes to Kennedy—is returning to Marshall at a more leisurely pace aboard the barge "Poseidon," that huge hangar-like affair docked at the foot of Avenue B until last Tuesday morning.

As far as Crippen, Bobko and Thornton are concerned, today's activity is sparse.

There are no major experiments, although Crippen, SMEAT crew commander, does have a habitability report to make. (See "Habitability Roundup" on page 4 for related information.)

The three test subjects also will bone up on TV electronics today and are conducting routine housekeeping functions.

Not quite one-fifth through the planned 56-day test, the crewmen are reported in good health and spirits.



**THE LAST APOLLO** — Undismayed by a "flat tire" on their lunar roving vehicle, Apollo 17 spacecraft commander Gene Cernan and lunar module pilot Jack Schmitt go through deployment and checkout training in preparation for their December journey to Taurus-Littrow. That's Cernan on the right. And the flat is just the sponginess in the training vehicle's tires — on the moon model the wheels are woven piano wire. The landing site of the last Apollo is just off the southeast shore of the Sea of Serenity. The touchdown area takes its name from the Taurus Mountains and the crater Littrow, both of which lie to the north of the site. The mountains are high and apparently steep-sided, and at least one massive rockslide into the valley from a 7,000-foot peak has been spotted on photographs from earlier missions. The site is considered a keystone in the Apollo program and was selected to help fill the gaps in what man has learned about the moon so far. Launch is scheduled no earlier than December 6. Ron Evans is command module pilot, the lunar "third man" who carries out orbital experiments while his mates search the surface.

## Fall Ball Meeting Called August 21

Fall softball is being programmed for the first time at MSC, with the organizational meeting scheduled for 5:30 Monday August 21 at the Ellington gym.

According to Employees Activities Association veep for athletics Jeri Brown, the fall slate is scheduled to open September 5.

Tentative plans call for a women's slow-pitch league, an over-35 men's slow-pitch league, and a regular men's slow-pitch league.

## Logistics Group Plans Schooling

"Introduction to Logistics" is in the works of the educational committee of the Houston Chapter, Society of Logistics Engineers.

Planning for the short course covering the elements of logistics of interest to chapter members follows election of 1972-73 officers.

Del Howard of Philco-Ford is chairman, Dan Herrers of Philco-Ford vice-chairman, Earl Regen of General Electric secretary-treasurer.

Membership chairman is Elias Huron, Service Technology Corporation, MSC extension 5881.

# ROUNDUP

NASA MANNED SPACECRAFT CENTER HOUSTON, TEXAS



The **Roundup** is an official publication of the National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for MSC employees.

Photographer: A. "Pat" Patnesky

## Monitoring Project Samples MSC Air; Analysis Shows Quality 'Acceptable'

In July 1971 a continuing ambient air monitoring program was initiated to determine the quality of the air at MSC.

Study plans call for air sampling for a wide variety of contaminants as soon as equipment and supplies are available.

During a recent meeting of the MSC Pollution Control Committee, a representative of the Life Sciences Directorate gave a status report of the air quality study.

Nine air samples for particulate matter and twelve samples for sulfur oxides were collected and analyzed during the first three months of 1972.

Average results showed 62  $\mu\text{g}/\text{m}^3$  (micrograms per cubic meter) for particulate matter and less than 25  $\mu\text{g}/\text{m}^3$  for sulfur oxides.

Comparison with the national primary standards for these materials (75  $\mu\text{g}/\text{m}^3$  for particulate and 80  $\mu\text{g}/\text{m}^3$  for sulfur oxides) shows ambient air quality in the MSC area to be acceptable.

Furthermore, the primary standard maximum 24-hour concentration limits for these parameters (360  $\mu\text{g}/\text{m}^3$  for particulates and 365  $\mu\text{g}/\text{m}^3$  for sulfur oxides) were never closely approached (96.0  $\mu\text{g}/\text{m}^3$  maximum for par-

ticulates and consistently less than 25  $\mu\text{g}/\text{m}^3$  for sulfur oxides).

In the near future, sampling and analysis will begin for nitrogen dioxide and eventually, sampling and analysis for carbon monoxide and photochemical oxidants may be included in the study.

## Last Call Today For Hawaii Trip At Bargain Rate

That trip to Hawaii being promoted by the Aerospace Employees Travel Club—the "Travelers"—faces a big milestone today.

A go/no-go decision will be made August 10, so reservations for the \$260 week at Waikiki must be in by tonight.

The package includes rooms-with-a-view at the Reef Hotel, greatly reduced admission to the Don Ho show, optional tours of the islands, and, of course, air fare both ways.

For details and reservations contact Ron Rafuse, 332-1356 Gerry Swanick at 481-2396 or MSC extension 2091.

## Roundup Swap-Shop

Swap Shop advertising is available to MSC and on-site contractor personnel. Articles or services must be offered as advertised, without regard to race, religion, sex or national origin. Ads should be 20 words or less, including home telephone number. Name and office code must accompany, but need not be included in, ad copy. Typed or printed copy must be received (AP3 Attn: Roundup) by Thursday of the week before publication.

### VEHICLES

- 71 Mustang 3-spd six, xlnr cndn, tape deck, body stripes, honeycomb grill. \$1995. Hammack 334-2986.
- 70 Ford XL convrt. air, pwr brakes & steer. AM/FM stereo. Legendre 333-2976.
- 68 Holiday Rambler trailer 27'. Becker 643-4151.
- 71 CL 350 Honda Scrambler, approx 2100 actual mi. lk new \$675. 333-4798 9-11 p.m.
- 71 Fiat 124 Spider 7500 mi xlnr cndn \$2895. Alexander 333-3395.
- 57 International Travelall 3-seater, radio, air, new tires, brakes, battery, floorboards, needs paint. Gutschewski 554-7263.
- Motorcycle trailer, 3-rail Big Wheel \$160. 333-4738.
- 62 Ford Galaxie Tudor hdtpr, air, pwr brakes & steer, pft cndn \$395. 488-0672.
- 70 Chevy pickup V8 4-bbl 350 cu. long wheelbase, pwr. air. 23K mi \$2700. Bucky 453-0149.
- 67 Dart, air, heat, radio, auto, pwr brakes, new shocks, muffler, brakes, battery, tires, water pump, xlnr cndn \$900. 488-3683.
- 72 Honda 450 CL xlnr cndn, 3900 mi. Glover 334-2317.
- 64 Corvair Monza convrt. vry gd cndn \$395. Pittman 488-1243.
- 65 Dodge Dart sdn, slant-6, std. 1-owner. 47,000 mi. xlnr mech, gd tires, reliable transp \$450. Boynton 667-4533.
- 61 VW gd cndn reasonable price. 474-4294.
- 71 Penton 125cc motorcycle gd cndn. Bean 333-3814.

### HOUSEHOLD ATRICLES

- Aquarius waterbed, 20-ga vinyl, dbl seal valve, 50-yr warranty wi custom walnut-finish frame \$60. 474-3945.
- Oak coffee table 35" sq and bookcase 36x 57x12. Danish imports Early Amer look. Finch 944-6133.
- Early Amer 7-piece bedrm furniture xlnr cndn \$300. 333-4798 9-11 pm.
- Leaving Country, Spanish bedrm set, bunk beds, dinette table wi 4 chairs Smith-Corona typewriter, camping equip, lamps, toys and misc. 488-1921.
- Large oak desk wi Formica top, matching hutch, like new. \$95. Pace 337-1436.
- Dbl bed wi steel frame, yellow sheets, \$30-value dark red spread, head bd not so good, \$60 or offer. Kiehn 483-5121.
- 2 sets bunk beds \$80 ea, both \$150, firm. Eaton 482-3161.

### BOATS

- 10' aluminum boat wi 3hp engine \$75. Stonesifer 482-7643.
- Luxurious 15' speedboat 120hp ob, trailer & equip incl pro ski-tow bar, 71 model in mint cndn, reduced to \$2995. Bland 333-4580.
- 12' Ouachita flat-bottom boat model 12S, 96 lbs. \$60. Harris 941-2495.
- 14' boat, wooden, 35hp manual start motor, trailer \$475. Brahm 946-4210.
- 19' O'Day Mariner, keel, working sails, 5hp oo many accessories \$1800. 534-5245.

### PETS

- Champ sired AKC reg collies 3 mo old males & females, sables & tri's, xlnr wi children, wormed & shots. Vaughan 332-1909.
- Dachshund male black & tan 6 mo old purebred miniature, AKC, all shots \$60. Blevins 481-3404.
- Just plain puppies desire good home, small, shorthair, include nominal fee for handling charges. Finch 944-6133.
- Unusual pet, 10' showcase, small retaining cage for boa constrictor. Rubenstein 334-2354.
- Dachshund 5 mo old, all shots \$35. Siegfried 334-2848.
- Free male spaniel 6 mo old, all shots, xlnr for children. Weber 941-2896.

### PROPERTY & RENTALS

- Townhouse, large 2 bdrm 2 1/2 bath 2-car garage on golf course, equity & assume 6% FHA, new air & newly decorated, 1419 Ramada 339-1004 after 5.
- Beautiful wooded lot in Dayton Lake Estate \$750. Chymlak 479-1885.
- Wildwood Resort City (N of Beaumont) 108 x 150 heavily wooded lot on 300 acre lake in Big Thicket, deed restric, priv incl golf, stables, beach, marina, picnic area. \$9950. 481-1847.
- 4-2-2 brick, fenced yd, fireplace, cent air, carpet, assume 6% loan \$150/mo plus equity. 10911 Green Arbor (by Alameda Mall). 946-0204.
- CLC 3-2-2 screen patio, fenced, Oakbrook. Smith 488-3238.

### WANTED

- Practice piano, will buy, rent, borrow or store for you. Legendre 333-2976.
  - 58 Ford wi std trans & big engine for parts. McCoy 944-5574.
  - Used lightweight tennis racket, pref aluminum 481-1847.
  - 10' table saw wi motor, also 6" joiner-planer. 488-4086 after 5:30.
- MISCELLANEOUS
- Group Insurance: Group life & travel accident life, call NEBA, ext 5410.
  - Surfboard car racks \$7.50. 946-2390.
  - 2 1/2 ton central air conditioning. Ruth Berry 1971, \$500. Pierce 554-2329.

- 9'x9' umbrella tent xlnr cndn, used twice \$25. Casserly 479-6433.
- Western saddle gd cndn \$50, 2-tone brown leather. 337-1839.
- Bilt-Rite baby carriage like new \$25. Strollee stroller vry gd cndn \$15. Bartosh 488-6052.
- Tenor sax by De Villier \$120, trumpet Severinsen by Getzen \$235. Reese 941-0102.
- Epiphone 5-string banjo wi hard shell case. 946-7004.
- Ambassador cornet wi case. Eaton 482-3151.
- Sony TC-155 Copycat open reel tape player, vry gd cndn \$50. Musgrove 488-3966.
- NASA Medals ltd edition proof set in presentation case, solid bronze, all manded fits thru Apollo 15 wi 16 & 17 avail later \$110. Handley 482-7041.
- Three 30" x 72" rubberized fabric air mattresses, rubber valve for inflating & deflating. Chalfont 482-7992.

Nikkor wide-angle lens 35mm f2.8, vry gd cndn. Pearce 747-3646.

### LATE ENTRIES

- Refrigerator-freezer, Wards large 2-door, white, xlnr cndn \$65. Washing machine, Seras, good mech cndn \$25. Tom 471-0928 or 483-4017.
- Frost-free Frigidaire 2-door refrig for sale, 1966 or 67, best offer. Lai 483-6461.
- Washer & dryer xlnr cndn \$150, copper-tone refrig gd cndn \$100. Mediterranean coffee & end tables xlnr cndn \$75, Med couch & chair needs recover \$35. 481-4224.
- Typewriter upright Underwood xlnr cndn \$38. 649-2569.
- Lawnmower runs good \$10, lawnmower wi extra engine, doesn't run \$5. 3-spd girls 26" bike made West Germany, accessories, works great \$30. Wilson 334-1895.
- Honda 160cc motorcycle \$190, 9mm Luger \$66, 12 ga shotgun \$27. Hanby 483-4166.
- Want ride to and from MSC, work 8:30-5, live nr Telephone & Wayside. Richardson 921-7565 or 483-5589.
- Want tricycles 12" or larger donated or loaned for MSC picnic. Jowid 488-6009.
- Want bottle capper, Everedy or equiv, for home brewing. Thomson 483-5171.
- 12 cu ft GE dbl-dr refrig, great for cabin or cottage. McCreary 946-5285.
- Criterion telescope wi 4 1/2" mount & 3 eyepieces, 16' Lone Star sailboat wi trailer & xtras, sheared raccoon fur coat. 488-4043.
- Honda 50 minitrail & helmet xlnr cndn \$200, heavy duty galv swing set xlnr cndn \$65. McCown 488-1559.
- Irish setter at stud, AKC reg. 334-3303.
- 50' x 100' waterfront bulkheaded Tiki Island, Galveston, lot. McBarron 474-4663.
- 4-2-2 Sagemont, corner, fenced, landscaped, oversize patio, 1 yr old, equity \$3500, payments \$269. 481-0286 after 5:30.
- 62 VW 90,000 mi on car 40,000 on engine, reasonably gd cndn, needs exhaust \$225. 554-4206.
- Want ride to and from 2 blk off Gulf Fwy Broadway xit 8:30-5, will pay. Pope 643-6018.
- 42" maple table & 3 capt 1 mate chairs \$50, dk green tweed colonial sofa & matching chair \$150. Hiemer 482-1630.
- 71 Gremlin cheap. Carlin 667-3000.

## Parade of Rodeos Discount Tickets Available at MSC

Discount-priced tickets to the 4th Annual Parada del Rodeos in League City August 17-19 are available to MSC and contractor personnel through EAA representatives.

Sponsored by the League City Jaycees and Southwest Rodeo Association, the performances will start at 8 p.m. each evening at the Galveston County Park.

Contact: EAA representative or John Hollan, extension 2961.

## Apollo 16 Moon Rocks Low in Density, May Have Come from Original Crust

Many of the Apollo 16 rocks are a low-density material which might have been part of the original lunar crust.

So says Dr. Paul Gast, chief of the Planetary and Earth Sciences Division.

Dr. Gast says that as much as 90 percent of the material collected in the Descartes highlands where Apollo 16 landed contains large amounts of aluminum and calcium.

He notes that instruments flown in lunar orbit showed large areas of the lunar highlands also to be rich in aluminum, leading scientists to believe they are dealing with typical highland rocks in the Apollo 16 samples.

Dr. Gast says the Apollo 16 sample contains four major rock types.

The most interesting and perhaps the most important of these, he said, is a very white rock never before seen in lunar samples.

Scientists call this rock a cataclastic anorthosite.

It appears to be formed by shearing and crushing of older, more primitive crustal rocks.

Geologists believe the lunar highlands are remnants of the moon's crust which formed more than four billion years ago.

The crust has since been battered by meteoroids—some as large as the state of Rhode Island—

leaving its surface heavily cratered and creating large basins which were later flooded with molten rock to form the dark colored mare or seas that are visible from earth.

A network of seismic stations set up on the moon by Apollo astronauts has confirmed the existence of a lunar crust and has shown the crust to be about 60 kilometers (38 miles) thick, or about twice as thick as earth's crust beneath the continents.

Dr. Gast noted that the lunar crust is strikingly different from earth's crust.

The crust on the moon, he said, comprises nearly ten percent of the moon's total mass while only half of one percent of earth's mass is in its crust. The moon's crust also appears much more uniform in its chemical composition than the earth's crust.

Also, anorthosite, which is an important component in the lunar crust and which is abundant in the lunar highlands, is found in relatively few areas on earth.

Dr. Gast said the moon must at one time have been melted to a great depth, allowing the low-density aluminum and calcium-rich mineral plagioclase to float to the surface like slag in a blast furnace before it cools to form the anorthosite-rich crust.



LET'S TAKE A TOUR—Many MSC personnel may be aware of the bus tours conducted around the center each day, but they may not know that those tours, an activity of the Public Affairs Office, are open to relatives and friends of the center personnel. The tours, conducted four times each working day, include visits to interesting facilities like Lunar Receiving Lab, Mission Control and the Space Environment Simulation Lab and others, all on a non-interference basis. Visitors are briefed by escorts, such as Carolyn Miller (standing) of Service Technology Corporation, trained in the historical and current workings of the center. Advance reservations are required for the bus tours and can be made by calling MSC extension 4321.

# 1 Skylab Wardroom From Concept to Flight Hardware

The Habitability Technology Section was established in October of 1969 to assure adequate attention would be directed to providing an acceptable standard of life in all planned manned spacecraft.

It was recognized that as mission durations increased and crew size and composition varied, planning would be required to minimize the necessity of the crew to devote undue effort to the normal activities of living.

To demonstrate how we as a section work let's look at the crew accommodations on Skylab. Initially, when the vehicle was planned as a wet workshop, accommodations were understandably sparse. When the program shifted to a dry workshop, many of the stringent design restraints were lifted and concern could be directed at assuring a more amenable and efficient environment.

The cramped austere condition of the original galley was enlarged to provide a wardroom where the crew could not only dine in comfort but also enjoy leisure activities (Figure 1).

Studies of equipment configuration and placement were made to determine the most efficient layout for the area. Many schemes were considered in sketch format (Figure 2), others were taken to models and full scale soft mock-up stages (Figure 3) for more detailed evaluation. The end product (Figure 4) represents the combined thinking of engineering and crew input.

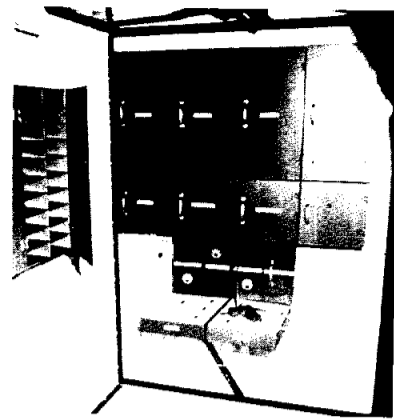


Fig. 1—Original Concept



Fig. 2—Preliminary Wardroom Studies

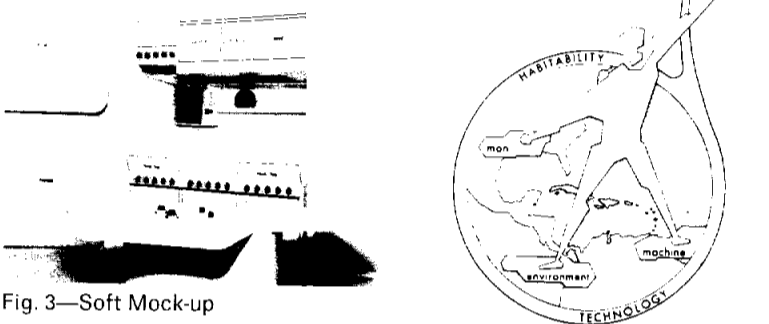


Fig. 3—Soft Mock-up

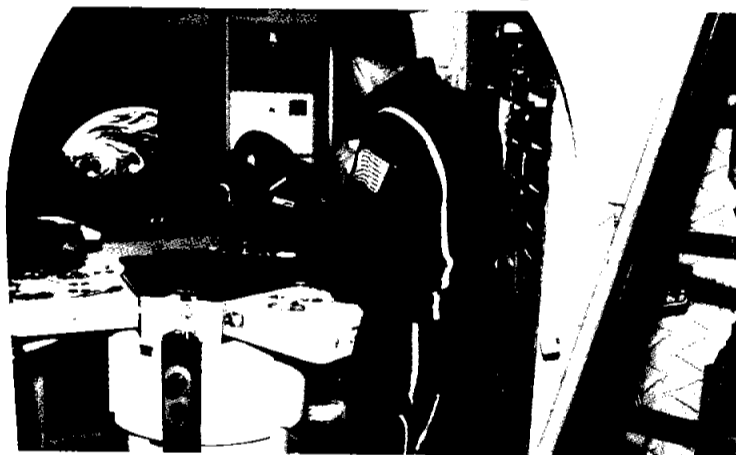


Fig. 4—Final Hard Mock-up

# 2 Appetite Appeal and Efficiency

A new form of food was developed to support the longer missions planned for Skylab. Our section was concerned with devising means of storage, preparation, and dispensation for the food that would eliminate the points of frustration reported by the Apollo crews.

Numerous approaches to preparation and dispensing were considered. Zero gravity tests were flown in the KC-135 leading to the final food format.

One of the concepts developed envisioned a dining tray incorporating variable heating provisions for the contained food portions. Figure 5 is of an early model of this tray used for testing and engineering evaluation. The concept was proven viable and developed into the flight article shown in Figure 6.

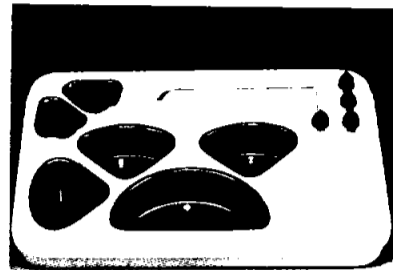


Fig. 5—Early Dining Tray Model

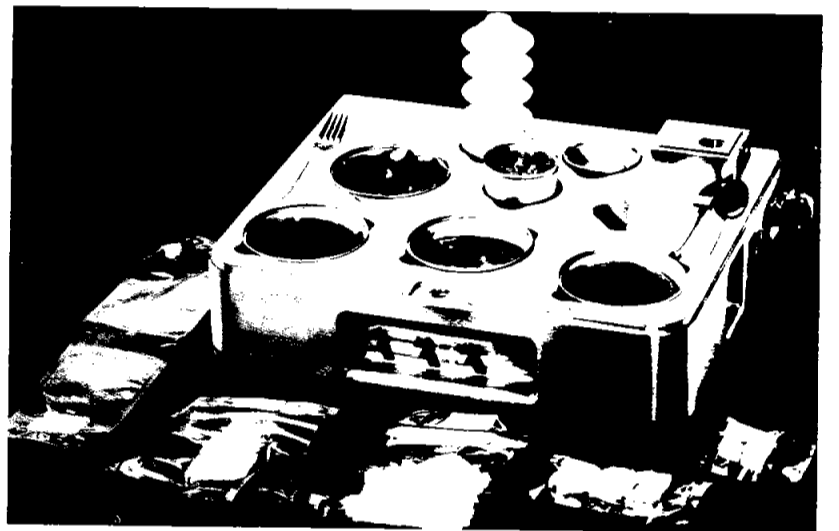


Fig. 6—Final Flight Article

These studies and analyses were conducted by the Habitability Section of the Spacecraft Design Division in conjunction with other technical groups throughout NASA.

# HABITABILITY ROUNDUP

# 3 Habitability for Orbiter

Currently the majority of our attention has been directed at the planning and design of habitability provisions for the shuttle orbiter.

We are looking at both flight deck arrangements and passenger accommodations. As configuration studies have evolved we have attempted to concurrently plan arrangements for the passenger accommodations. Sketches and layouts are used for initial selection. Scale models of candidate configurations are constructed to aid in evaluation and as focal

points for conversations with other technical groups (Figure 7).

Working closely with flight operations we are studying arrangements for the shuttle flight deck that will answer the unique requirements arising from the mission and flight envelope of the vehicle. Since human factor considerations play such a predominant role in the design of crew stations we have constructed and used full scale skeletal mock-ups to solve clearance, viewing angle and control placement problems (Figure 8).

An interesting concept growing from the orbiter passenger accommodation studies is the passenger couch restraint (Figure 9).

The intent here was twofold:

1. To adequately restrain a non-astronaut-trained passenger through the range of maneuvers and G loads dictated by the orbiter's flight envelope.
2. To minimize necessary interfaces between the passenger and the orbiter.

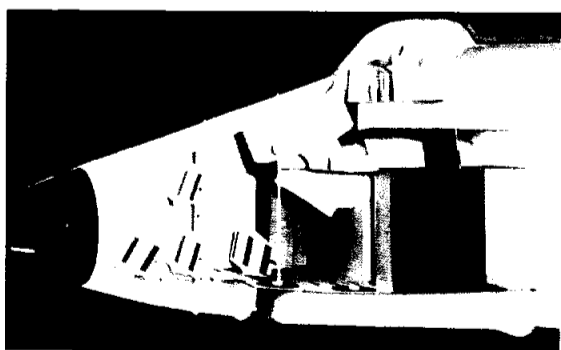


Fig. 7—Scale Model-Shuttle Orbiter

This parameter accomplishes a dual purpose in that it allows greater flexibility in planning payload on a specific mission basis; and by providing the majority of convenience services to the passenger at his point of restraint, movement through the orbiter is not required. With non-flight rated personnel in a regime of varying G, such movement could prove unsafe.

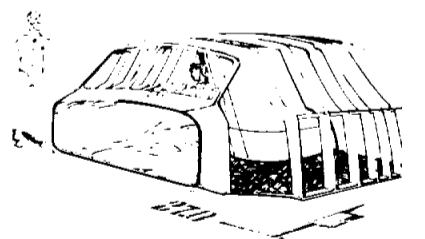


Fig. 8—Full Scale Skeletal Mock-up

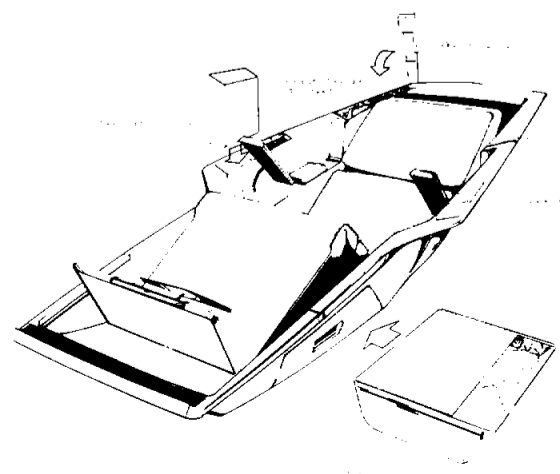


Fig. 9—Passenger Couch Restraint