

# Gemini Maneuver Unit Tested In High Vacuum

The "world's smallest manned spacecraft," the Air Force-developed astronaut maneuvering unit (AMU) last week underwent extensive testing in Chamber B of the Space Environment Simulation Laboratory in Building 32. Gemini IX pilot Charles A. Bassett will use the AMU for extensive extra-vehicular maneuvering during the mission.

## Center Accepts Space Chamber For Apollo Tests

Formal acceptance of the 65 ft. diameter vacuum chamber by MSC took place recently after the completion of acceptance tests by Industrial-Fisher-Diversified, prime contractors for the facility in Building 32.

The transfer of the facility to MSC was accomplished by the U.S. Army Corps of Engineers, technical monitor for MSC facility construction. The 120 ft. high chamber will be used to conduct thermal tests of Apollo spacecraft under vacuum conditions.

The chamber systems which have been checked out and accepted by MSC include the vacuum pumping equipment, the cryogenics for the cold walls, and the repressurization system.

Solar lamps for the facility are in the process of installation by the Radio Corporation of America; and North American Aviation Co., Downey, California, is installing its support equipment for spacecraft tests.

During the next two months, MSC's Space Environment Simulation Laboratory will be performing the preliminary portions of the chamber shakedown tests.

In the chamber tests, Maj. Edward Givens, USAF AMU project officer, was taken to a simulated altitude of more than 200,000 feet above sea level. The AMU performed successfully under high-vacuum conditions while integrated with the chest pack life support system, the tether line and the Gemini pressure suit.

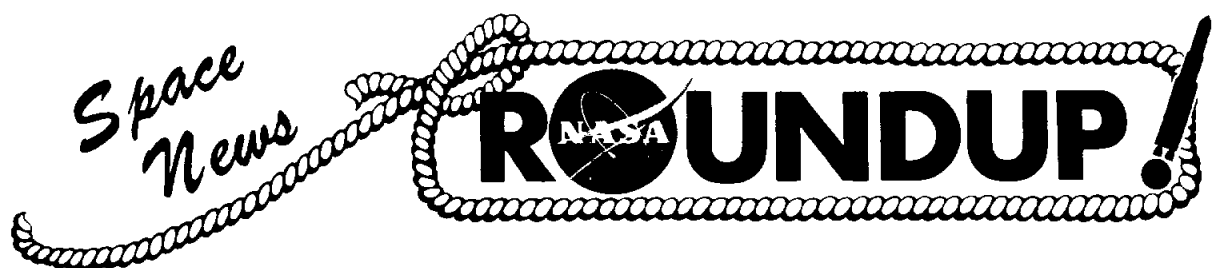
Toward the end of the test, four technicians were injured when an oxygen bottle valve failed outside the chamber. The failure had no effect on the test's successful completion. Some minor problems also occurred with suit connections. The problems will be studied further before the next test in the series.

For the environment tests, the AMU was mounted on a special stand in the vacuum chamber. The test subject first entered the air lock and the chest pack was checked out as it will be in the Gemini spacecraft.

Major Givens then opened the inter-connecting main door to the chamber, thereby simulating opening the spacecraft hatch and moving back to the spacecraft adapter where the AMU would be stowed. He then performed a complete checkout and firing of the AMU's hydrogen peroxide jets upon instructions from the test director who acted as command pilot.

The AMU-propelled extra vehicular activities in Gemini IX and XII are part of a series of DOD experiments being conducted during the Gemini program.

LTV Aerospace Corporation, a subsidiary of Ling-Temco-Vought, Dallas, developed the AMU for the Air Force Space Systems Division.



VOL. 5, NO. 7 MANNED SPACECRAFT CENTER, HOUSTON, TEXAS JANUARY 21, 1966

## Another Step Toward Lunar Landing



SIM FLIGHT FOR FIRST APOLLO—Apollo flight controllers simulate the Saturn/Apollo 201 mission in the second-floor Mission Operations Control Room in Mission Control Center-Houston. Glynn Lunney (inset) is flight director for the mission, a suborbital downrange flight of the first production Apollo spacecraft and the first Saturn IB.

## Agena Engine Tests Continue As Spacecraft VIII Gets Pyrotechnics

Gemini VIII spacecraft, launch vehicle and rendezvous

target preparations proceeded this week in various parts of the country toward launch of the two-day rendezvous and EVA mission early in the second quarter of 1966.

At McDonnell Aircraft Corporation, St. Louis, manufacture of the Agena substitute Augmented Target Docking Adapter (ADTA) was complete and a series of tests of the ATDA was scheduled at MAC prior to early February shipment to Kennedy Space Center.

Agena 5003 was to have been shipped Tuesday from Lockheed-Sunnyvale to KSC. Primary propulsion system modifications have been made on Agena 5003 as a result of the findings of the review board which investigated the October 25 failure to orbit of Gemini VI's Agena rendezvous vehicle. The final decision whether to employ Agena 5003 or the ATDA in the Gemini VIII mission will hinge upon a series of tests now underway on the Agena primary propulsion system modifications at the USAF Arnold Air Engineering Center, Tullahoma, Tenn.

At Launch Complex 19 umbilical connections to Gemini Launch Vehicle VIII were completed Monday, and the GLV was powered up the following day.

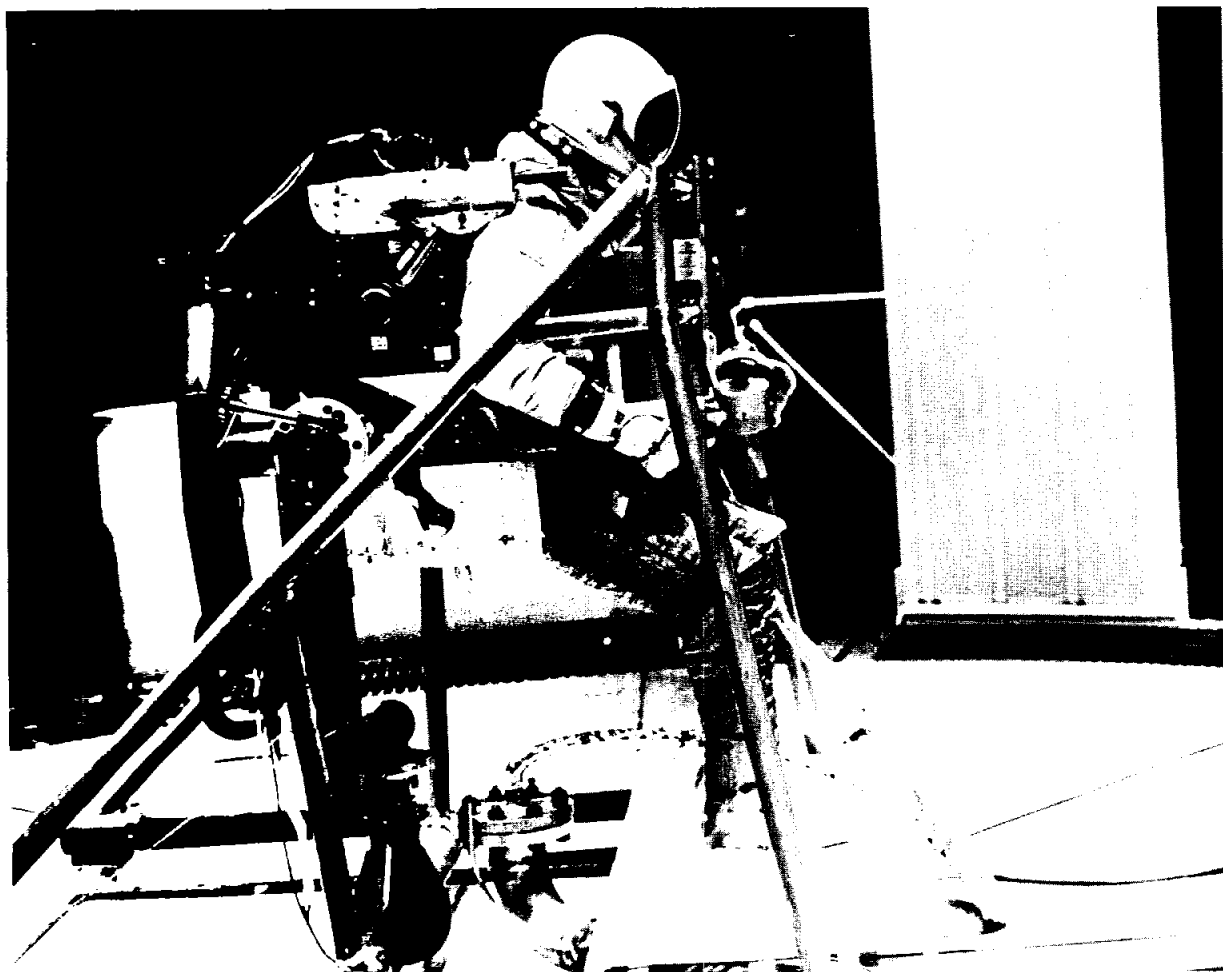
Gemini Spacecraft VIII is presently in the KSC Pyrotechnic Building for installation of pyrotechnic cable and tubing cutters, separation shaped charges and other explosive devices. The spacecraft fuel cells have also been installed.

### Mrs. Dryden Thanks MSC Employees For Memorial Contribution

Mrs. Hugh L. Dryden, widow of the late NASA Deputy Administrator and space pioneer, has conveyed her appreciation to employees of MSC for their contributions to the American Cancer Society in memory of Dr. Dryden.

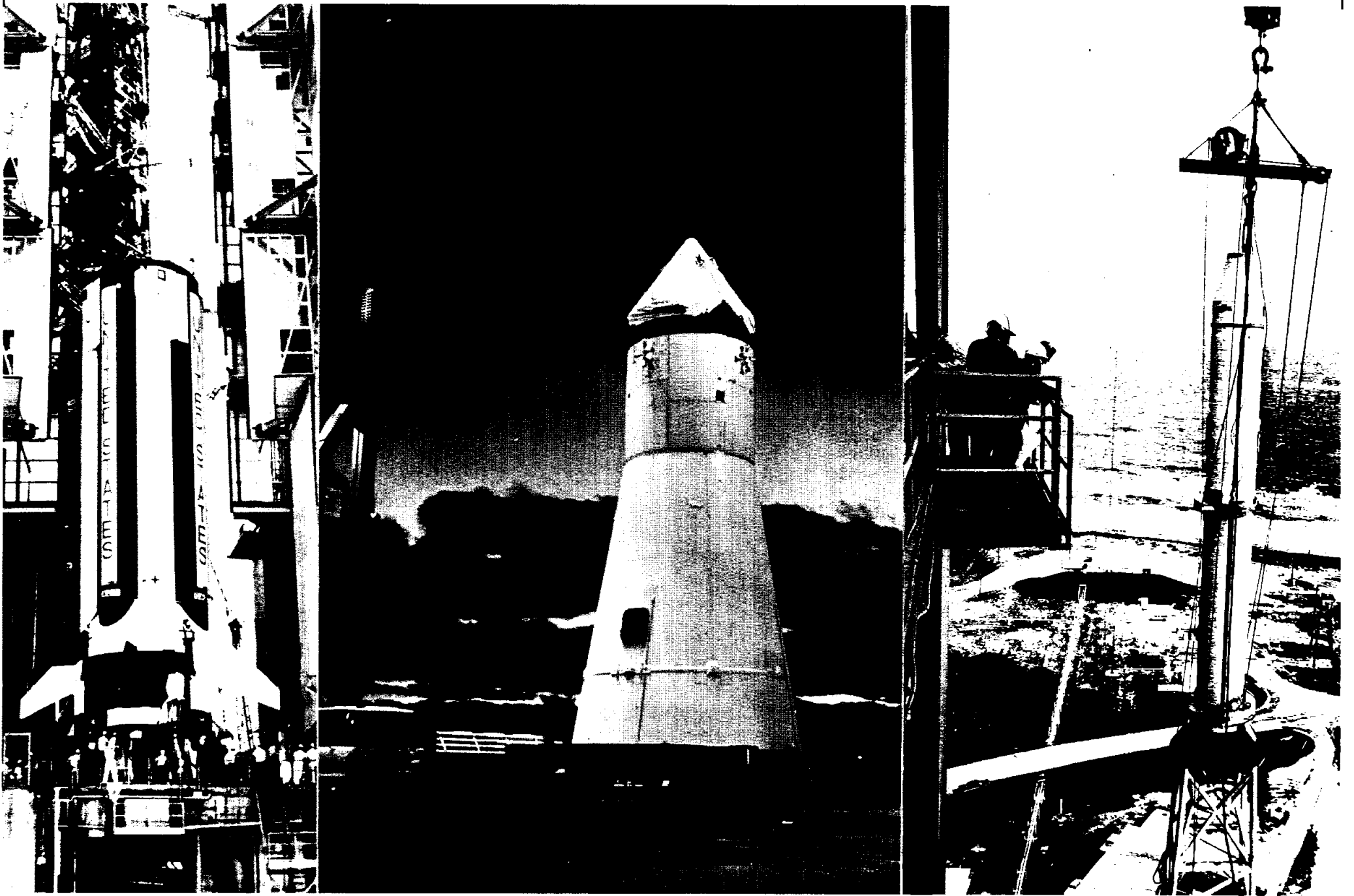
Mrs. Dryden's letter said in part, "Since so many people shared in this memorial gift it is not possible for me to thank each one individually . . . Your letter and your thoughts have been a source of great strength and comfort to all of us. Thank you for your kindness during this difficult time."

Dr. Dryden, Deputy Administrator of NASA since its creation in 1958, and director of the parent agency NACA, died in Washington on December 2. (See December 10 Roundup)



PERSONAL SPACECRAFT—Air Force Maj. Edward Givens wrings out the Gemini IX Astronaut Maneuvering Unit during a high-vacuum test of the system in the Space Environment Simulation Laboratory. The chest pack life support system, tether line and Gemini pressure suit were included in the test.

## Saturn/Apollo 201 Begins to Take Form at Launch Complex 34



**LAUNCH PREPARATIONS**—Actions around Launch Complex 34 at Kennedy Space Center during the past few weeks have seen the erection of both stages of the first Saturn IB launch vehicle, left, mating of Apollo Spacecraft 009 command and service modules and LEM cannister to

the launch vehicle, center, and hoisting to the top of the service tower of the solid-propellant Launch Escape System. The unmanned suborbital flight downrange to impact near Ascension Island in the South Atlantic is aimed toward

checking the launch vehicle/spacecraft compatibility and to qualify the spacecraft headshielding in high-heat re-entry. The Saturn IB first stage develops a total of 1.5-million pounds with its eight H-1 engines.

### Like A Tree He'll Grow . . .



**THREE ELECTRICIANS**—Astronaut Edward White, assisted by George Gonzales of the Harris County Boys Home, left, and Buddy Williams of Boys Harbor in LaPorte, in a pre-Christmas ceremony in the MSC Auditorium turned on the lights of the Community Christmas Tree planted by Clear Lake Jaycees at the Third Street entrance.

### Experimenters List Gemini V Results

The National Aeronautics and Space Administration presented an interim report on 13 scientific and technological experiments carried aboard the Gemini V flight in Washington earlier this month.

Gemini V was an eight-day manned space flight launched Aug. 21. Astronauts L. Gordon Cooper and Charles Conrad comprised the crew for the mission.

Results of the experiments were presented by the principal investigators during the one-day session. Robert O. Piland, MSC experiments manager, was chairman.

Experiments and their investigators were: Zodiacal Light Photography, Dr. E. P. Ney; Synoptic Terrain Photography, Dr. P. Lowman; Synoptic Weather Photography, K. M. Nagler; Cloud Top Spectrometer, Dr. F. Saiedy; Visual Acuity, Astronaut Visibility, Dr. S. Duntley; Cardiovascular Conditioning, In-Flight Exerciser, In-Flight Phonocardiogram, Dr. L. Dietlein; Bone Demineralization, Dr. P. Mack; Human Otolith Function, Capt. A. Graybiel; Celestial Radiometry, Space Object Radiometry, Capt. B. Brentnall.

## Michigan Tech Confers Doctorate On Slayton

Donald K. Slayton, Assistant Director for Flight Crew Operations, received an honorary Doctor of Engineering degree from Michigan Technological University in a ceremony today at MSC.

The honorary degree hood, citation, and diploma was presented by the university's president, Dr. Raymond L. Smith. The degree was conferred upon Slayton by the university's Board of Control "in recognition

of high attainments in engineering."

Dr. Robert Gilruth, Director of MSC, assisted, in the ceremony. He received the Doctor of Engineering degree from MTU several years ago. It is the highest recognition the university can award to an engineer.

Slayton delivered the MTU commencement address in absentia last August. William A. Fowler, the university's Director of Development, who delivered the address for Slayton, will accompany Dr. Smith to MSC.

One of the seven original Mercury astronauts, Slayton received a Bachelor of Science degree in aeronautical engineering from the University of Minnesota. As Assistant Director for Flight Crew Operations, he is responsible for directing the Astronaut Office, Aircraft Operations Office, and the Flight Crew Support Division. He holds the NASA Distinguished Service Medal for his leadership in astronaut training.

The main campus of Michigan Technological University is at Houghton. There are branches at Sault Ste. Marie and Alberta.

### NFFE Local Schedules Information Sessions

Representatives of the National Federation of Federal Employees, MSC Local 1413, will meet with interested employees all next week at three locations: Building 2, Room 316 East, 8 to 8:30 am and 5 to 5:30 pm; Cafeteria 11 am to 1 pm; and Ellington AFB Cafeteria, 11 am to 1 pm.

Agency policy states that employees have the right to participate or not to participate in NFFE activities without fear of penalty or reprisal.

# Apollo Recovery Beacon Gets Gulf Shakedown

In preparation for the return of the first Apollo spacecraft from the moon in the latter part of this decade, a series of tests was conducted recently by MSC's Landing and Recovery Division to checkout direction finding equipment for homing an Apollo spacecraft for post-landing location and recovery.

The homing equipment, and AN/ARD 17 VHF/S-Band direction finding receiver, was designed and built for the Apollo missions and for installation on

## Evaluation Begun Of Would-Be Astronauts

Detailed evaluation of applicants for NASA's astronaut selection program is now underway.

A total of 351 persons applied for the program prior to the Dec. 1, 1965, deadline. Of these, 159 met basic minimum qualifications.

Up to 15 of the qualified applicants will be selected for astronaut training scheduled to start next summer. Names of successful applicants will be announced in the spring, probably in May.

Fifty-nine of the qualified applicants are civilians. The 100 others are members of the military services.

Six women expressed interest in the program, but none of them met the minimum qualification requirements.

To qualify, applicants must: (1) be a United States citizen born on or after Dec. 1, 1929; (2) have a bachelor degree in engineering, physical or biological sciences; (3) have 1,000 hours jet pilot time or have graduated from a military test pilot school. In addition, they must be able to pass a Class-I flight physical examination.

## 'Freeloaders' Using Officers' Club Downgrade Value of Membership

Shortly after MSC began relocating to Houston, the Ellington AFB Officers' Club revised its constitution to permit membership in the Club by NASA employees of Grade GS-9 and above, and who pay their dues.

Club management has recently noticed an upswing in abuses of the privilege of being Club members by MSC employees. The main abuse has been that some members invite guests to Club functions who are eligible for membership, but who do not choose to join. Such practice obviously deprives other conscientious dues-paying Club members from some degree of Club usage.

Moreover, the knowledge that "freeloaders" can enjoy Club privileges without the responsibilities of membership can evoke among members who do keep their dues and bills paid, an attitude of "why should I pay dues for other people to benefit from?"

Air Force HC-130H Air Rescue Aircraft.

Tests were performed off Galveston Island in the Gulf of Mexico using an Apollo boilerplate spacecraft with the Apollo Recovery Beacon and Apollo Survival Radio transmitting signals.

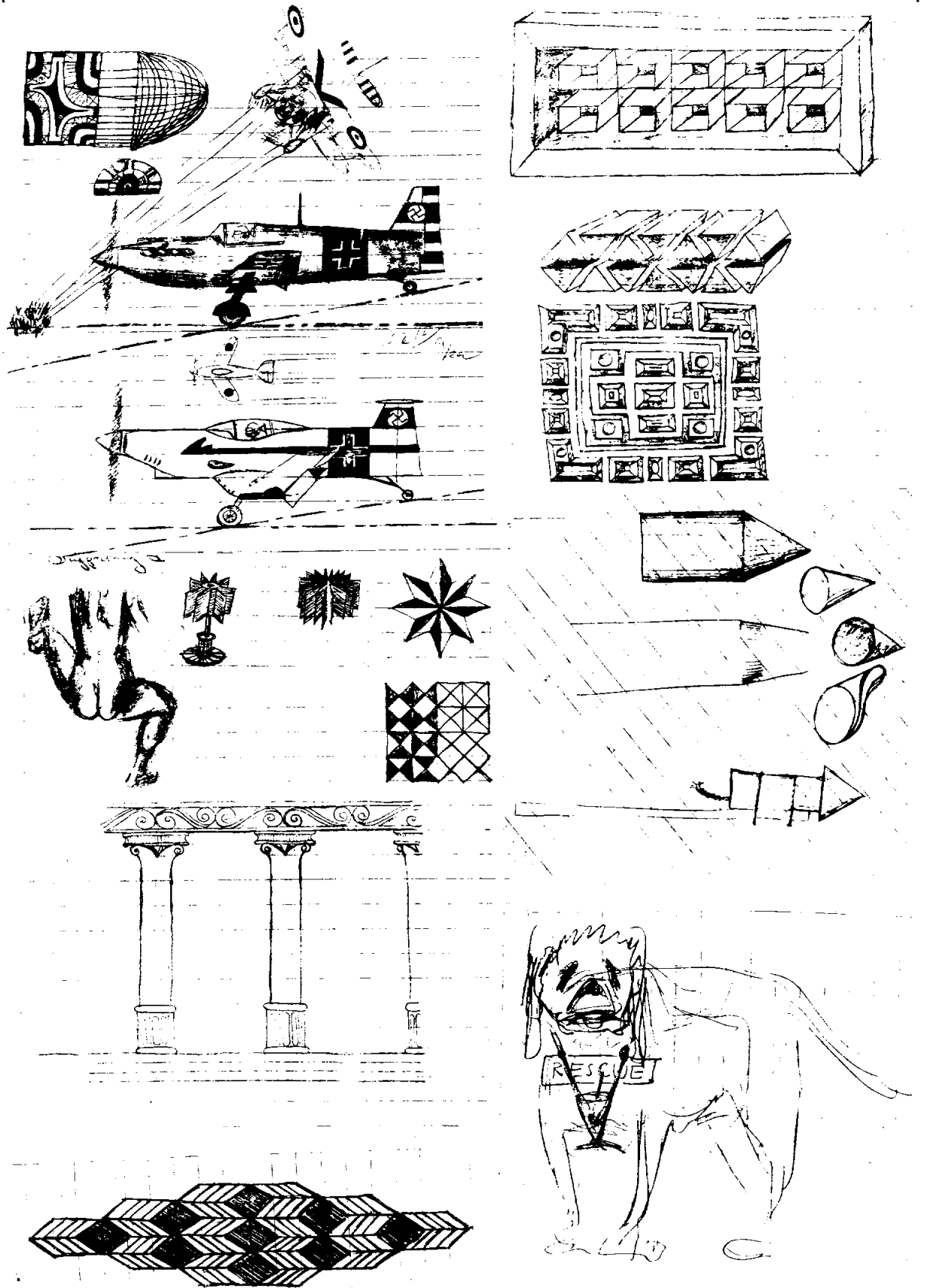
Homing runs were made from varying altitudes of 28,000 feet down to 500 feet to determine the range of the direction finding receiver onboard the aircraft with the Apollo Recovery Beacon and Survival Radio on the spacecraft in the Gulf. The equipment performed exactly as expected with line-of-sight acquisition of the floating Apollo boilerplate spacecraft on all homing runs by the aircraft, including 21 nautical miles out when the aircraft was at 28,000 feet.

Several of these air rescue aircraft equipped with the homing equipment will be used to cover the landing footprint of Apollo spacecraft returning from the lunar flights.

The homing device, being installed on all Air Force HC-130H Air Rescue Service aircraft, will have the capability of tracking the spacecraft in earth orbit on earlier Apollo flights, as well as during the reentry phase. The installation is expected to be completed on all the aircraft in about one year.

The Apollo direction finding homing equipment is manufactured by the Cook Electric Company, Morton Grove, Ill. MSC funded the Air Force Systems Command at Wright-Patterson AFB and they handled the negotiations for the \$6,232,000 contract. The contract includes development and fabrication of the original unit, spare parts, training aids, manuals and bench mockups, until all the units are installed on the aircraft.

## What Really Goes on in Conference Rooms



CREATIVE DOODLING—Doodles abandoned in MSC conference rooms run the gamut from anatomy to architecture to geometric patterns. Shown here is a montage of representative doodles which includes a pair of inboard profiles of stylized Luftwaffe fighters, three Greek columns with Ionic capitals, rear view of a nude runner, a St. Bernard with a martini hung on its neck, a series of spacecraft configurations leading to the ultimate Fourth-of-July final design, and various idle geometric patterns, but no partridge in a pear tree. One doodle included the comment, "Talk, talk, talk—must not have any freedom at home!" It could be that doodles may be the original form of pop-art.

## Technical Symposium Scheduled January 25

The January MSC Technical Symposium will be held Tuesday, January 25, in the MSC Auditorium from 4 to 6 p.m. MSC contractors with permanent badges are invited to attend.

The Propulsion and Power Division will provide the Symposium program. Papers to be read and their authors are as follows:

"Radioisotope Power Systems Study for AES," James L. Cioni; "Liquid Propellant Behavior in Zero Gravity Environment," Jerry C. Smithson; "Electrostatic and RF Effects on Spacecraft Electro-explosive Devices," Donald J. Lewis and/or Robert L. Robinson; and "Solid Booster Program," Joseph G. Thibodaux.

## Apollo Systems Briefings Offered

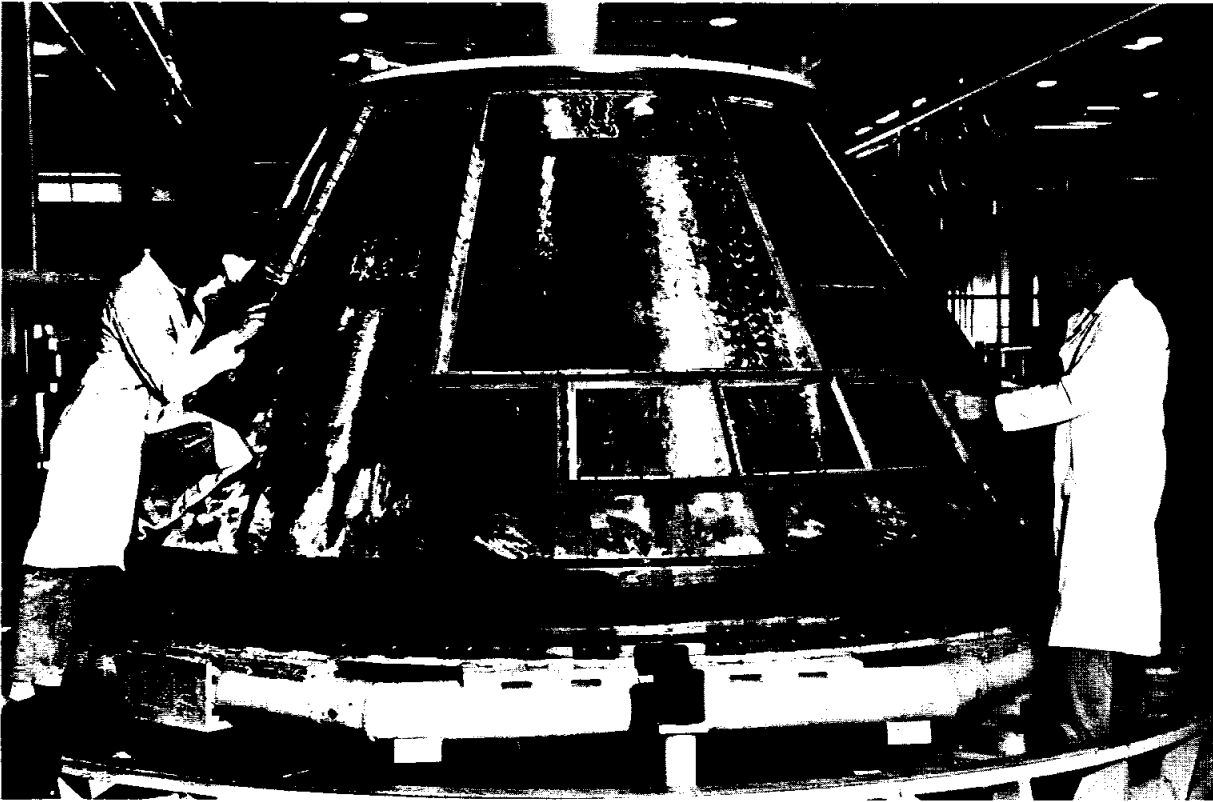
A series of systems briefings for the Apollo 012 CSM will be presented at MSC from mid-January through early March. These briefings, conducted by instructors from the North American Aviation Training Logistics Department, will be held in the Systems Trainer Area, second floor, Building 4. Presentations will range in length from 6 to 24 hours with shorter briefings conducted in 3 hour per day sessions and longer briefings requiring 6 hours per day. The following subjects will be covered in this series:

- Apollo Familiarization—24 hours
- Electrical Power System—12 hours
- Structures and Mechanical Systems—12 hours
- Telecommunications Familiarization—6 hours (1 day)
- Communications—12 hours
- Data Acquisition—12 hours

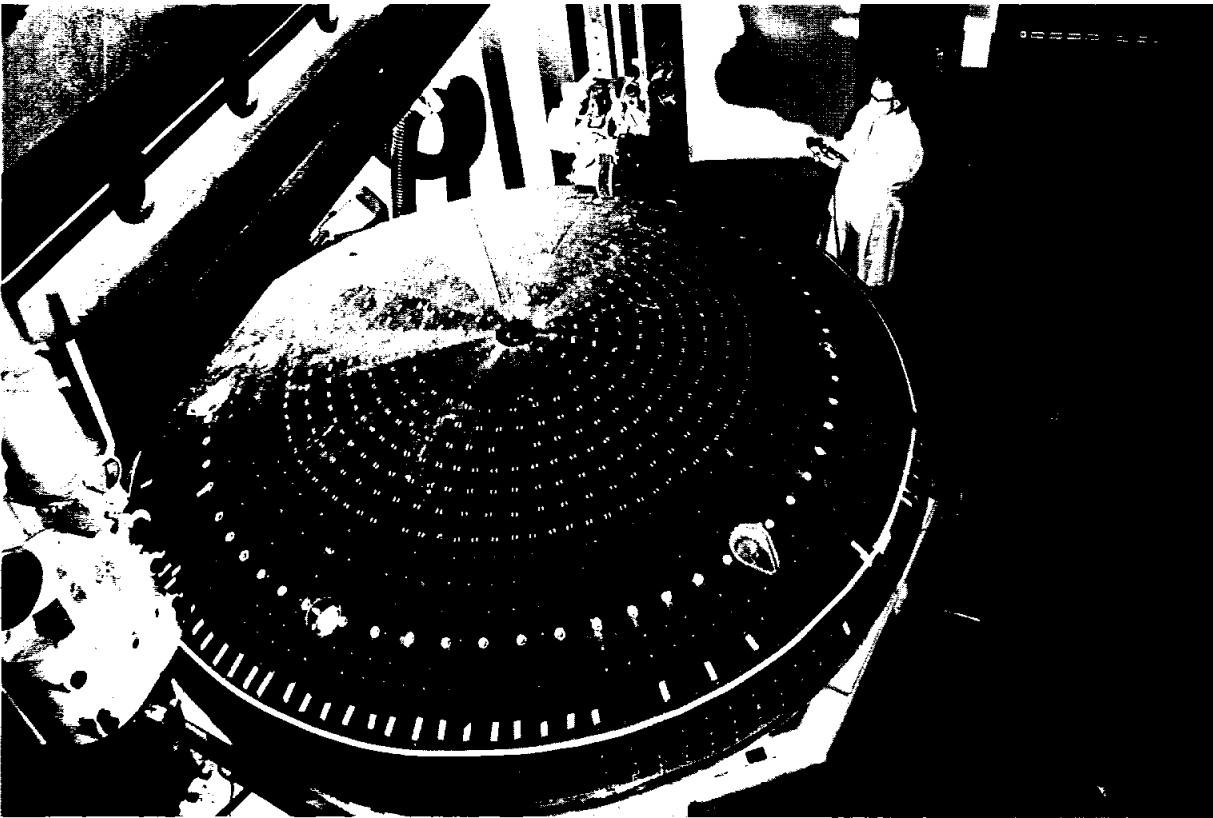
- Sequential Events Control System—15 hours
- Crew Systems—16 hours
- Environmental and Control—12 hours
- Stabilization and Control—24 hours
- Propulsion Systems—12 hours

A memorandum with schedule and enrollment procedures has been distributed at Branch level throughout the Center. Personnel interested in attending one or more of these briefings should contact their offices for this memo.

Since the enrollment must be limited, rosters will be prepared on a first-come basis; however, there will be future opportunities to attend similar briefings. Present schedules indicate that the entire series will be repeated at approximately 3 month intervals. These briefings are coordinated through the Subsystem Manager for System Training, CF-22, Extension 4374.



FIRST OF MANY STEPS—Apollo Command Module crew compartment is fitted with fiberglass edge members to which honeycomb will be bonded. Each honeycomb cell will be filled with ablative material.



CLOSE-TOLERANCE CONTOURING—The honeycomb matrix for the Command Module aft section is contoured on a computer-controlled lathe to assure proper thickness of the ablative material.

## FOUR INCHES FROM 5500° INFERNO—

# Apollo Reentry Fire Depends Upon Av

**T**HE ABLATIVE HEAT-SHIELD forming the outside surface of the Apollo Command spacecraft, which will protect the crew during the re-entry phase of manned flights, was developed and built by Avco Corporation's Research and Development Division, of Wilmington, Massachusetts.

The thickness of the Apollo heat-shield averages four inches around the Command Module. The success of the last half-hour of the voyage before the parachutes deploy will depend upon the ability of this thin layer of material to absorb the punishment of re-entry, and keep the crew in 75° Fahrenheit shirt-sleeve temperatures, as the spacecraft comes back into our atmosphere at 25,000 MPH speeds, generating upwards of 5,500 degrees of heat in the process.

### Materials Chosen

The ablative Apollo heat shield was the result of three years work by Avco/RAD. Groups of materials were first identified which would satisfy basic aero-thermodynamic performance; these materials screened and tested to pin-point those which best met all Apollo mission criteria; and new manufacturing techniques developed to make the transition from laboratory to full-scale fabrication. Behind all this is a decade of work and experience by the Division developing ICBM re-entry vehicles capable of carrying payloads from space flight back into the earth's atmosphere.

The ablative material which resulted is a low-density, fiber reinforced, phenolic epoxy resin, about one-quarter the weight per pound of comparable missile nose cone material. The material is called an "ablator" because during re-entry the bulk of heating is contained or ablated by a charring process which rapidly absorbs the heat, completing the normal burning cycle before its effect reaches the spacecraft's metal surface.

### Subcontract to NAA

Avco received its initial heat shield contract from the Space and Information Systems Division of North American Aviation in March, 1962, for an estimated \$25,000,000, covering

vehicles scheduled for last November was a follow-on contract for Command Modules design. All work under these by the Corporation's Research and Development Division, E. D. and General Manager. Program is under the Dodge.

North American flew—the only part of the earth—from its Space Downey, California, Bedford, Massachusetts, Guppy," especially for cruiser, makes the crates which hold the sections—nose cap, compartment and aft sections. The crates are trucked (MPH) to Lowell where they are centered.

Before production the stainless steel substructure is inspected, weighed and all openings and hat gravity determination.

Fiberglass honeycomb is fitted over the Module Honeycomb and edge with a primer and a bonding agent. The honeycomb matrix is bonded secured by over the bonding is inspected visually.

Bonded sections are computer controlled gear across the entire cone exact to thousandths of an inch. Heats vary across the surface also must vary.

During these initial stages have been taking place materials. Pre-mixed a

**MECHANICAL BEE**—Special guns inject dielectrically heated phenolic epoxy resin into the more than 370,000 honeycomb cells on the Command Module. Each cell is separately filled with the ablative material by white-gloved Avco workers, like so many bees packing honey into hive honeycombs.





# From Lunar Missions Avco Heat Shielding

earth orbit testing; and awarded a \$22,000,000 thirteen Apollo Command Module contracts for lunar missions. Research and Development, Kenna, Vice President of The Division's Apollo program, under the direction of John A.

the Command Module spacecraft returned to the Division's plant in Northampton, Mass. The "Pregnant" Boeing Stratoliner, carrying the three Apollo Command Ship's four forward section, crew compartment, and service section. From Hanscom, the heat shield is moved in slow motion (20 inches per second) to Avco's Apollo opera-

tion. Each section begins, each section of the heat shield structure is first visually inspected and measured—including thickness, weight, and center of gravity.

Heat shield panels are next pre-machined on the lathe's outside surface. The heat shield members are sprayed with a bonding adhesive applied. The heat shield is set in place and the heat shield is cured. After curing, the heat shield is cured ultrasonically, then

is machined on a computer lathe. Thicknesses of the Command spacecraft are of an inch. As re-entry spacecraft, thicknesses

of the heat shield stages, parallel activities: preparing the ablative material and stored in a freezer,

each cartridge of ablator is heated dielectrically just before use. Trained operators fill each of the 370,000 honeycomb cells covering the entire Module. Since conventional equipment could not handle the fibrous material, special guns are used for this key operation.

Covered with heat shield material, each section is then wrapped in a rubber vacuum bag and rolled into the oven again for curing, or hardening. Curing takes from several hours up to four days, depending on the section.

## X-Rayed for Defects

The hardened heat shield is X-rayed for voids, incompletely filled cells, high density inclusions and broken or crushed honeycomb cells. The spacecraft is returned to the clean room where the defective cells are repaired.

All voided cells regunned, sections go back on the numerically controlled vertical turret lathe, where excess ablator is removed, and the heat shield countoured to a smooth surface. To catch even the smallest rough spots, each section receives a final sandpapering by hand.

The heat shield's thickness across the spacecraft undergoes a final check at this point. All told, this crucial factor of thickness is monitored during production by some 20,000 measurements.

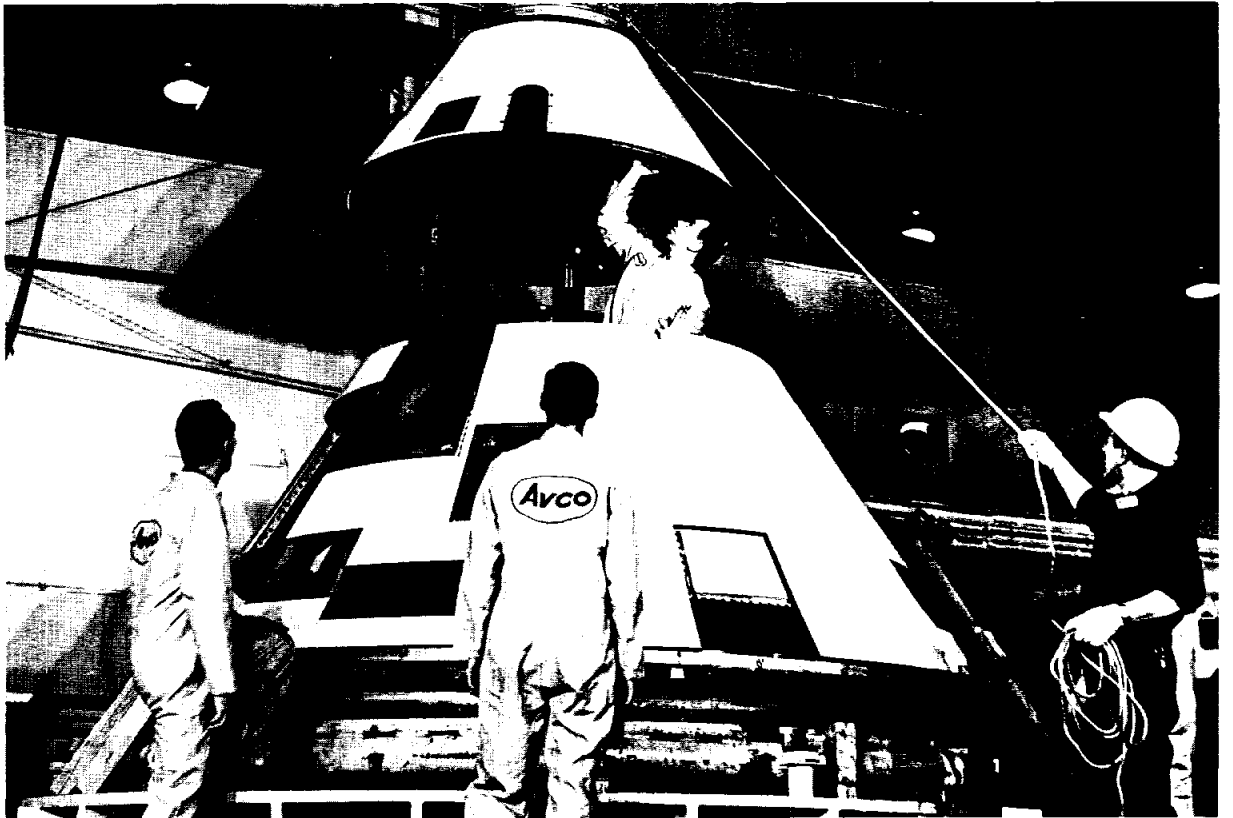
A final baking in the oven assures correct moisture content.

Rendezvous windows are installed, and joints around crew access hatches, windows and maintenance panels sealed with a silicone rubber gasket material that cures at room temperature.

Lastly, a pore sealer and a white moisture barrier finishing coat is applied and each section testfitted for correct joining and to check weight and center of gravity.

After final checkout, the Command Module is re-crated, and returned to North American Aviation's Space Division in Downey, California, where the outer heat shield is fitted over the inner crew compartment, and mated with the rest of the spacecraft—the heat shield ready to do its job of helping bring the Apollo crew safely back to earth.

**DEFECT HUNT**—Apollo heat shield sections are X-rayed for locating voids, broken or crushed honeycomb cells, high-density inclusions and other defects. Areas not passing the inspection are drilled out and refilled with ablative material—then X-rayed again.

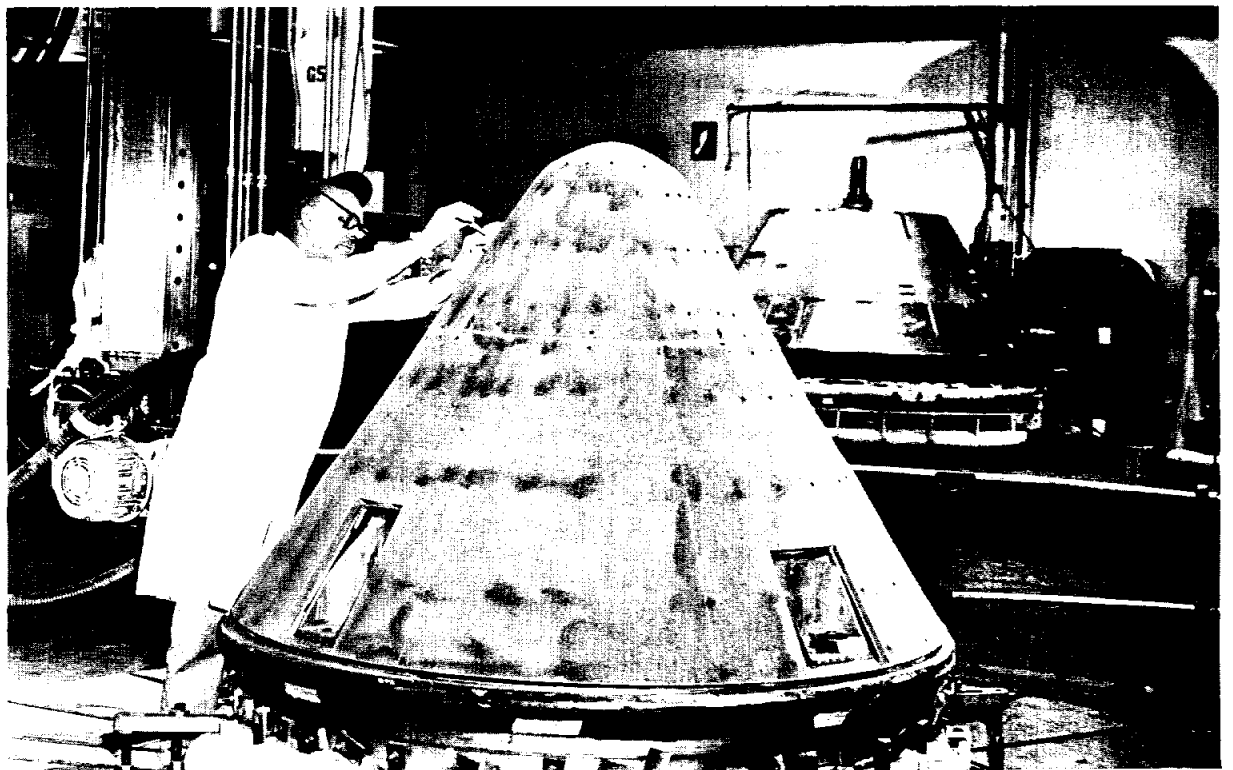


**PRE-DELIVERY CHECK**—An Apollo crew compartment receives a final check before leaving Avco's production line and being airlifted to North American in Downey. A white coat of sealer protects the spacecraft during its return trip to the West Coast.



**THE FINISHING TOUCH**—This crew compartment ablative heat shield receives finishing touches after oven curing at 250°F and being machined to proper thicknesses. Each of the more than 1000 hatch and access panel bolt holes will later be filled with plugs of the ablative material.

**TRIMMING WEIGHT**—An Avco technician, below, checks an Apollo nose cap and forward section for thickness of ablative material. Areas of the spacecraft receiving less severe heating during reentry are machined down to reduce weight.



The SPACE NEWS ROUNDUP, an official publication of the Manned Spacecraft Center, National Aeronautics and Space Administration, Houston, Texas, is published for MSC personnel by the Public Affairs Office.

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## Might As Well Face It: Seat Belts Save Lives

(Part of a continuing series on driving, home and job safety by the MSC Safety Office.)

Fasten your seat belts!!!

Most of us ignore this life-saving plea to the point of not even installing seat belts in our vehicles. The chances are better than even that you don't buckle up every time before starting your engine. It's so easy to say—"But I'm only going to the corner store, I don't need my belt." The said statistics are that 47% of all deaths occur at less than 40 miles per hour and that 70% of the fatalities happen within 25 miles of the victim's home.

Another thought in most people's minds is that "I'm the best driver ever—I've never had an accident." Again statistics indicate that over 80% of the people involved in accidents have never before been involved in an automobile collision.

Some people say that all the statistics are fine, but how can this assist in selecting a good seat belt for my vehicle? Each manufacturer claims to have the best system of seat belts. However, just because the box says that it meets or exceeds the Society of Automobile Engineers Standards, don't bet on their being of good quality.

Some belting systems are superior to others. Here are some suggestions on how to select a safe, long-lasting set of seat belts.

First—the method of passenger bucklings. The steel metal-to-metal buckle has been shown superior to the slip-through variety and is more apt to be used by the vehicle passengers.

The American Sportscar Association has outlawed the slip-through type of seat belt because experience has indicated that in roll-over type accidents, the constant releasing and tightening on the slip-through belt will loosen it and eventually it comes unfastened. The constant fastening of the slip through type of belt at one point wears the belt and will in time degrade the strength of the belt. Another

reason is that it requires more time to unfasten the pull-through type belt in case of extreme emergency and many people refuse to wear belts because of this time element.

Statistics show that in less than one per cent of all automobile accidents a seat belt would have been detrimental. Other hard facts are that 15,000 lives each year can be saved each year by the use of seat belts.

The buckle is only one link in the belt system. The method of fastening the buckle and the inserts to the straps is an area of potential failure. Belts have been marketed with only one single row of stitches to hold the metal tab or buckle on the strap. This meets the federal specifications which require that no stitches cross one another but it is doubtful that it would offer much restraint under accident conditions.

Tests indicate that if the stitches cross one another, there is potential failure from the cutting of the stitched thread. Federal specifications state specifically that cross-stitching will not be done and recommends a method of stitching that appears as a double "W" in which the stitches come close but never cross one another.

The straps should be of the flat herringbone weave material and are a very important part of the system. This weave is superior to the pebbled grain. Under test the pebbled weave will stretch and tends to cut itself in two. The herringbone weave, although it does not feel and look as strong, when tested has proven itself to be superior.

The last part and perhaps the most important part of seat belts is the method of attaching the belt ends to the car body.

Again using federal specifications as a guide, the only approved method is the angle clip bolted directly to the floor of the vehicle with the belt threaded at least three times back and forth through the clip and the slide piece. This does not mean that belts which use the eye-bolt as a fastener are not approved; it means that the method described in the federal specifications is best. Tests again have proven that it is possible to disconnect the hook from the eye-bolts under accident conditions.

Briefly then, good seat belts should have metal-to-metal buckles, herringbone weave straps and be bolted to the floor retainer without hooks.

*Don't get caught dead sitting on your seat belts!!!*

## SPACE QUOTES

ADDRESS TO NATIONAL SPACE CLUB, Washington, D.C., Nov. 17, 1965 by NASA Deputy Administrator Robert C. Seamans, Jr.

... "We are beginning to feel our way toward the future. Project Voyager, a system for unmanned planetary exploration and life detection, is under design. An advanced solar observatory is being developed. We are examining the many ways we can capitalize upon the Saturn/Apollo system, looking to its use for long-term scientific and technological applications, including meeting some of the needs of not only the Department of Defense, but also the Departments of Commerce, Interior, and Agriculture, and other potential users of space technology . . .

... "The challenge of the frontier of space has generated the historic human response: competence, courage, curiosity, and enthusiasm. It has led to the creation of a new capability for the nation—and with that capability a new family of questions concerning how best to employ it.

"Any exercise of this capability will require continuing support from the major segments of our society. The level of such support must be weighed against all other requirements for other areas of science and technology; and, as a whole, science and technology must be weighed against the needs of new programs for human welfare, for defense, and for the society in which we live."

## Space News Of Five Years Ago

Jan. 24, 1961 — NASA outlined specifications for a low-altitude active communications satellite Project Relay at Goddard Space Flight Center.

Jan. 25, 1961 — Assembly of Ranger I was completed at Jet Propulsion Laboratory.

Jan. 29, 1961 — NASA announced establishment of Goddard Institute for Space Studies (GISS) in New York City, which would be an extension of the Theoretical Division of Goddard Space Flight Center, Greenbelt, Md. It will be headed by Dr. Robert Jastrow.

Jan. 30, 1961 — James E. Webb nominated as Administrator of NASA by President Kennedy.

Jan. 31, 1961 — Mercury-Redstone 2 (MR-2) was launched from Cape Canaveral, with Ham, a 37-pound chimpanzee aboard the spacecraft. During the powered phase of the flight, the thrust of the propulsion system was higher than planned. In addition, the early depletion of the liquid oxygen caused a signal that separated the spacecraft from the launch vehicle a few seconds before planned. The over-acceleration of the launch vehicle coupled with the velocity of the escape

OUT OF TEXAS' PAST—

## Early Bay-Area Settlers Not Too Keen On Zoning

Some newcomers to these bay-shores may have been shocked to hear the mayor of Houston declare recently that it is too late to zone the nation's biggest unzoned city. But it is not only too late; it is too early.

From the time of John Harris, founder of Harrisburg, the suburb that launched a city, to the present, Houstonians have never taken kindly to the idea of letting somebody else tell them what they can do with their real estate.

John, as reported in this feature previously, settled on Buffalo Bayou at the mouth of Bray's in 1823 and set up a trading post. The following year Steve Austin the colonizer and Baron de Bastrop, the Mexican land commissioner, assembled the settlers at Bill Scott's place, which was on Buffalo Bayou just below Nate Lynch's place (Lynchburg).

Here Austin made a speech explaining the colonization laws, which were astonishingly liberal (land costs and taxes were nominal). Then the baron issued landgrants, and John got a clear title to the street sentimentally called Broadway, in memory of Little Old New York.

John's title explicitly stated that he could pull grass, throw rocks or do anything else he might feel an impulse to do on his property. There was no zoning commission to tell him (or his heirs) that it was illegal to erect a sawmill, an abattoir or a mansion on Bray's bonny banks—just as there is no such agency today.

At that same meeting another Austin, John, received a title to "two leagues of land in the form of a square on the Buffalo Bayou at the place where the two main branches of said bayou come together." The lesser branch we now call White Oak Bayou. The confluence is at the foot of Main Street.

Some say John was a distant relative of Steve's; others say he was no relation to the Father of Texas. We know that John Austin was a comrade-at-arms of James Long, first leader to "liberate" Texas and husband of Jane Long, heroine of Bolivar Point, whom we call Mother of Texas.

Anyway, John's two leagues of land later became the city of Houston.

Those pioneers felt strongly about the merest suggestion of any interference with their property rights. At the meeting at Bill Scott's place in 1824, a man named Thomas tried to tell a man named Vince what use he ought to make of the Vince pastures. And, according to *Burke's Almanac*, "William Vince, becoming enraged at Ezekiel Thomas, knocked him in the head with a blacksmith's hammer and laid him out senseless for about an hour, much to the disgust of the Mexican commissioner, but under treatment of Dr. Knuckles he was restored."

Joe Clopper and his three sons arrived on these prairies in 1828 and attempted to establish a high-class and strictly residential subdivision. They passed up the site of Houston because it was too lonely and isolated.

John Harris' Burg was jumping, but it had no property restrictions. So Joe and his boys settled on land across Bray's Bayou from the Harris establishment. They built a house, bought two others and felled timber for a fourth.

Then the sons started looking around in unzoned Harrisburg for wives to share their cozy suburbia.

They had to give up before finishing the third son's house. In his journal, Joe complained that Harrisburg was too hot in the summer and that all the women there were already married.

"And they," he added, "are as of rough a mold as their uncultivated and rustic partners."

So the Cloppers tore down all their houses, made a great raft of logs and floated down to Hunter's Point, which they renamed Clopper's Point. There were no women there at all, married or single, rough or smooth. But there was a breeze off the bay, which was better than zoning.

(EDITOR'S NOTE: To acquaint MSC employees with the rich historical background of the Galveston Bay area, and of Texas in general, a series of historical articles prepared by the Historical and Library Services Branch will appear in the Roundup.)

## Don't Pick That Lock; You Can Borrow Key

MSC employees who find themselves keyless at Ellington during normal working hours may fetch a key to locked buildings at Building 345. All borrowed keys must be returned the same day.

During non-working hours, call the Security dispatcher at Ext. 2691 to arrange access.

**White Sands 20-Year Men**



**SERVICE AWARDS**—Six employees at White Sands Test Facility, N.M. recently received their 20-year Service Awards from WSTF Manager Martin Raines. Left to right, top row: John Day and Charles Kelch; second row: Winford Oliver and John Opre; bottom row: Gene Sayler and Jim Sturtz.

**Lunarfins Train For Underwater Hockey**

MSC's skin and Scuba-diving club, The Lunarfins, began practice

January 10 for underwater hockey competition with other diving clubs in the Gulf Coast area. The club trains in the Tropicana Swimming Pool on Telephone Road in Houston.

Sponsors this past December of a Red Cross-certified course in life saving and water safety, the Lunarfins this spring will sponsor a certified course in the use of self-contained underwater breathing apparatus. The course will offer technical diving information as well as supervised practical experience in the use of Scuba gear.

Persons having a suppressed desire to explore the depths of lower space are invited to attend Lunarfins monthly meetings. Jim Peacock and Hugh Scott at Ext. 2557 have additional information about Lunarfins activities and courses offered.

**Visitor, 'Idiot' Badges Issued At Six Places**

"Idiot badges" for the MSC employee who leaves his photo badge on his other jacket or otherwise shows up for work unbadged, can be obtained at receptionist desks in Buildings 2, 4, 16, 30 and 32. Visitors to the Center who are not badged at the Second Street entrance Visitor Control Center may also be badged at these reception desks.

Permanently badged MSC employees who bring official visitors onto the Center should take the visitors to the nearest receptionist for badging.

**Lanzkron to Address Electronic Convention**

Dr. Rolf W. Lanzkron, chief Flight Projects Division ASPO, will present a paper at the 1966 Winter Convention on Aerospace and Electronic Systems in Los Angeles February 2-4.

Lanzkron's paper will be presented during a third-day session, "Apollo/Saturn Support Equipment," which will be chaired by NASA Associate Administrator for Manned Space Flight, Dr. George E. Mueller.

Titled "Apollo Spacecraft Ground Support Equipment," Lanzkron's paper will cover the development of a universal computer-controlled piece of digital spacecraft checkout equipment that can be used by all Apollo contractors at all sites.

**Omit Zip, and Zap—Mail Bidges Not**

Effective as of January 1, official franked agency mail will not be accepted in postal channels unless proper Zip code numbers appear as part of the address on each piece of mail.

Someone at Ext. 2811 can assist in tracking down proper Zip code numbers, if incoming correspondence or available directories do not list the addressee's number.

**Singleton Club Meets**

The MSC Singleton Club will meet Tuesday, February 1 in Building 336, Ellington AFB, at 5:30 pm to discuss Club organization and activities. Single NASA and contractor employees are invited. For details call Arminta Yanez, Ext. 7771.



MANNED SPACECRAFT CENTER, HOUSTON, TEXAS

**EMPLOYEE NEWS**

**MSC BOWLING ROUNDUP**

**MIMOSA MEN'S LEAGUE**

Standings as of January 13

TEAM	WON	LOST
Chizzlers	14	6
Agitators	12	8
Whirlwinds	12	8
Foul Five	11	9
Green Giants	11½	9½
Alley Oops	10	10
Road Runners	10	10
Fabricators	7	13
Technics	6½	13½
Goobers	6	14

High Game: B. Graham 273, G. Amason 266.

High Series: G. Amason 701, B. Harris 701.

High Team Game: Whirlwinds 1108, Alley Oops 1105.

High Team Series: Chizzlers 3138, Alley Oops 3085.

**MSC COUPLES LEAGUE**

Final standings, first half

TEAM	WON	LOST
Bowlernauts	44	24
Idgits	41	27
Four Friends	40½	27½
Spastics	38½	29½
Sociables	37	31
Almosts	36	32
Intimidators	33	35
LBD	31	37
Eight Balls	30	38
Aces	29	39
Fireballs	28	40
Fabulous Four	20	48

High Game Women: Gladys Jones 231, Betty Durkee 222.

High Game Men: Ron Durkee 245, Joe Garino and Jean Petersen 237.

High Series Women: Gladys Jones 582, Shirley Yeater 571.

High Series Men: Joe Garino 629, Dan Kennedy 626.

**MSC 5 O'CLOCK MONDAY MIXED LEAGUE**

Standings as of January 3

TEAM	WON	LOST
Pacesetters	29	23
Bombers	28	24
McH's	28	24
Pot Shots	27	25
Hi Hopes	24	28
Thirds	20	32

High Game Women: T. Bordeaux 193, Blanche Henderson 192.

High Game Men: E. Ray Walker 246, Harley Erickson 223.

High Series Women: Doris Ridenour 506, Gale Mauney 483.

High Series Men: Harley Erickson 604, E. Ray Walker 585.

(League bowls at 5 pm each Monday at the Ellington AFB Alleys. Visitors invited.)

**1965-66 MSC/Ellington AFB Basketball League**

All games played at the Ellington AFB Gymnasium

American Division		National Division	
Team No.	Name	Team No.	Name
1.	747th Rams	10.	Air Nat'l Guard
2.	Guidance and Control	11.	Tech Svcs Div
3.	Coast Guard	12.	AV Corp
4.	MPAD-Gunners	13.	G.E.
5.	Grasshoppers	14.	FCD
6.	FSD	15.	Philco
7.	ASPO	16.	Univac
8.	2103rd Comm Sqdn	17.	Prop & Power Div
9.	ASTD-Lone Stars	18.	IBM

Schedule for January 24 to February 3

	Jan. 24	Jan. 25	Jan. 26	Jan. 27
6:30 pm	11-17	12-18	13-16	15-14
8:00 pm	2- 6	3- 5	1- 7	8- 9
	Jan. 31	Feb. 1	Feb. 2	Feb. 3
6:30 pm	3- 6	2- 7	1- 8	4- 5
8:00 pm	12-17	11-16	13-15	10-18

Standings As of January 14, 1966

American Division			National Division		
TEAM	WON	LOST	TEAM	WON	LOST
MPAD-Gunners	5	0	IBM	5	0
Grasshoppers	5	0	AV Corp.	2	0
Coast Guard	5	0	G.E.	2	1
ASTD-Lonestars	2	3	FCD	3	2
IESD	1	2	Philco	3	2
747th. Rams	1	3	UNIVAC	2	2
2103rd. Squadron	1	4	Air National Guard	1	4
ASPO	0	3	Tech. Serv. Div.	0	3
Guidance & Control	0	4	Prop. & Power Div.	0	4

**First 1966 Bridge Winners Announced**

Winners of the first 1966 Duplicate Bridge Club game on January 4 were Sue Shrader and Leona Kempainen, first, and Alice Gowdey and Esther Wake second; North-South; Max Cone and F. Simon, first, and Bob and Terry Hodgson, second, East-West.

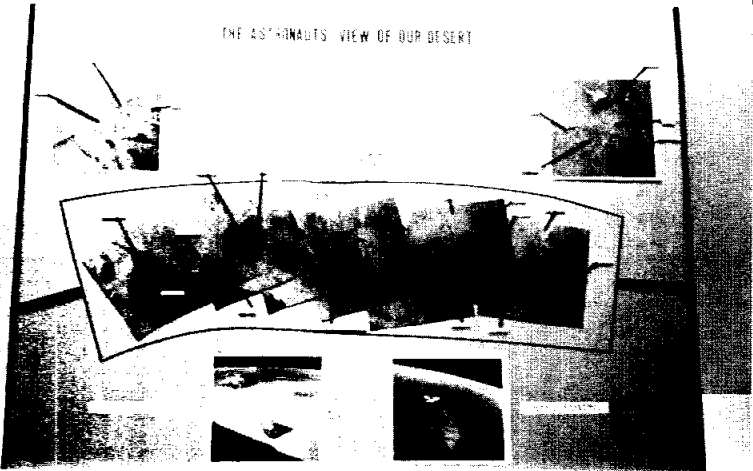
On January 11, the first game of the Series Awards, North-South winners were: Esther Wake and Alice Gowdey, first, Larry and Marilyn Gallagher, second; Bob Hodgson and Leona Kempainen, first; Bill Hamby and R. Wake, second, East-West.

The games are now being directed by Max Cone under an arrangement which provides that he will be available to play should anyone need a partner.

The first special event this year will be the Mixed Pairs Championship on Tuesday, February 8. Winners of this event will be awarded a handsome trophy.

## Desert Panorama From Space

THE ASTHONAUTS' VIEW OF OUR DESERT



**SYNOPTIC DESERT**—Photos from Gemini IV and V missions have been prepared in a photo mosaic to show the southern Arizona desert from the Gulf of California to the Chiricahua Mountains. The exhibit is in the Arizona-Sonora Desert Museum west of Tucson, where Richard F. Sowers, brother of George Sowers of MSC's Resources Management Division, is Museum business manager.

## Apollo Power System In White Sands Tests

The fuel cell system providing electrical power to the Apollo spacecraft began performance verification tests last week at MSC's White Sands Test Facility.

The three-month test series will include the first firing of the Apollo service module propulsion system integrated with fuel cells and on-board cryogenics—the super-cold liquified gases from which the cells generate electricity.

The tests also will mark the first use of the Apollo-configuration ground support equipment that initiates production of electricity within the cells.

Objective of the test series is to verify performance of the fuel cell system to be flight tested in Apollo Spacecraft 011 at Cape Kennedy this year. Spacecraft 011—mission AS-202—is the second Apollo/Saturn IB mission, the first to carry fuel cells.

The tests will be conducted for NASA by North American Aviation, Inc., prime contractor on the Apollo spacecraft. United Aircraft Corporation's Pratt and Whitney Division of East Hartford, Connecticut, is sub-contractor to North American for the fuel cell.

The three fuel cells in the electrical power system (EPS) will power the Apollo spacecraft electrically from launch to re-entry. During brief peak power periods, such as course correction maneuvers, batteries will supplement the fuel cell output.

In operation, the cells will produce electrical power—as do those used in the Gemini Program—through conversion of energy created by the chemical reaction of oxygen and hydrogen.

Rated power output for each of the three cells is 1.42 kilowatts at 29 volts DC. Power required to operate all spacecraft systems can be obtained from two cells if necessary. A single cell will supply up to two kilowatts for short periods and, under reduced load, will create enough electricity to permit safe termination at any point in the mission.

The final test in the programmed White Sands series will include close simulation of

emergency conditions using two cells, then just one cell under conditions of maximum load.

This test phase plus simulation of the Spacecraft 011 unmanned flight will put the cells through 40 hours of continuous operation.

Initial tests will involve no on-board cryogenics. Ground support equipment will start and sustain cell operation to verify ground support equipment and EPS performance.

Further steps will test unloaded cryogenic storage tanks against vibration and shock of the service propulsion system firing. Programmed tests also call for engine firing with the fuel cell under full load using on-board cryogenics.

## Weather Scrubs Little Joe II Test

Unfavorable weather conditions, including a snowfall the night before, caused a scrub of the planned Tuesday launch of the Little Joe II Apollo launch escape system test at White Sands Test Facility, N.M. The launch was rescheduled to be made no earlier than yesterday.

Airframe 002, a production Apollo command module, was mated to the Little Joe II instead of a ballasted boilerplate spacecraft as in earlier WSTF tests. The primary objective of the tests is to fully qualify the Apollo launch escape system for manned missions by demonstrating the escape system and the spacecraft in a tumbling mode, verifying airframe integrity under extreme conditions, demonstrating canard damping of tumbling rates, and qualifying the boost protective cover structure.

Following launch northward from WSTF Launch Complex 36, the Little Joe II/Apollo flight profile calls for a pitch-up maneuver three seconds prior to ignition of the launch escape system which will induce dynamic conditions to cause the command module to tumble after separation.

Canards deploying from the upper end of the launch escape system motor will stabilize the module into a blunt-end-forward attitude prior to jettison of the escape system and subsequent deployment of the main recovery parachutes.

Landing will be 22 miles down-range after 440 seconds of flight. (See Nov. 26, 1965 *Roundup*)



## SECOND FRONT PAGE

### Stylized Space Walk



**SCHOOL SCULPTURE**—"Walking in Space," a wire sculpture by Omaha sixth-graders Ronnie Wheeler and Brent Birchler is presented to Gemini IV "space Walker" Ed White by Colin Kennedy, MSC Exhibits Coordinator with Atkins & Merrill, Inc. The sculpture began life as a table centerpiece at a space program luncheon in Omaha, and Kennedy brought it to MSC for presentation to White.

## Apollo Application Experiment Integration Proposals Sought

The National Aeronautics and Space Administration has invited aerospace industries to submit proposals for definition studies of integrating experiment equipment in space vehicles which could be utilized for manned Apollo Applications missions.

The requests for proposals were issued by the Marshall Space Flight Center, Huntsville, Ala.

After evaluation of the proposals, two or more firms will be selected for negotiations of parallel nine-month study contracts.

The studies are to define experiments integration work (payload integration) in the Apollo lunar excursion module, Saturn launch vehicle instrument unit and top (S-IVB) stages of Saturn IB and V vehicles. The contracts will be managed by the Marshall Center, which has been assigned responsibility of this stage of the Apollo Applications effort. MSC is responsible for payload integration in the command and service modules of the Apollo spacecraft. (See *Roundup*, December 23, 1965).

Apollo Application proposes to utilize the technology and space vehicles developed for the Apollo manned lunar landing program to extend the capabilities of man to explore space. Type of missions proposed are earth orbital for biomedical, scientific, operational and technological experiments: lunar orbital missions using special scientific equipment such as cameras, sensors and probes to collect scientific data; and extended exploration of the moon's surface.

The studies will include consideration of mission analysis, experiment equipment, installation and integration of equipment, specialized crew requirements, launch facility requirements, tracking, and other support requirements.

## It's a better spacecraft than boat . . .



**SPLASHDOWN REHEARSAL**—Gemini VIII crewmen Neil Armstrong, right, and David Scott, receive a briefing on water egress procedures from Jim Shannon, Landing and Recovery Division, center, and from Gordon Harvey, Flight Crew Support Division, left, during last Saturday's session in the Gulf of Mexico. The training was conducted from the NASA Motor Vessel Retriever and included use of survival gear and helicopter pick-up of crewmen from Gemini life rafts.