

A WELL-LIGHTED PLACE—Gemini Launch Vehicle X stands floodlit in the Launch Complex 19 erector prior to mating of the second stage to the first stage and prior to hoisting of spacecraft Gemini X to the White Room. Gemini X is scheduled for launch no earlier than July 18 with crewmen John Young and Michael Collins aboard.

A WEEKEND TRIP—

Stafford, Cernan Tell Mission Experiences

The crew of Gemini IX last Friday faced what is often the most strenuous event of any manned space flight mission—the post-flight press conference. In a ceremony before the press conference, Gemini IX crewmen Tom Stafford and Eugene Cernan each received from NASA Deputy Administrator Dr. Robert C. Seamans the NASA Exceptional Service Medal. Stafford last December received the same medal for his part in the Gemini VI mission.

Dr. Seamans, in commenting upon the results of the Gemini IX mission, said, "Gemini IX

Gemini X Work Keeps Schedule

Pre-launch checkout of the various elements of the Gemini X mission were on schedule as of *Roundup* press time.

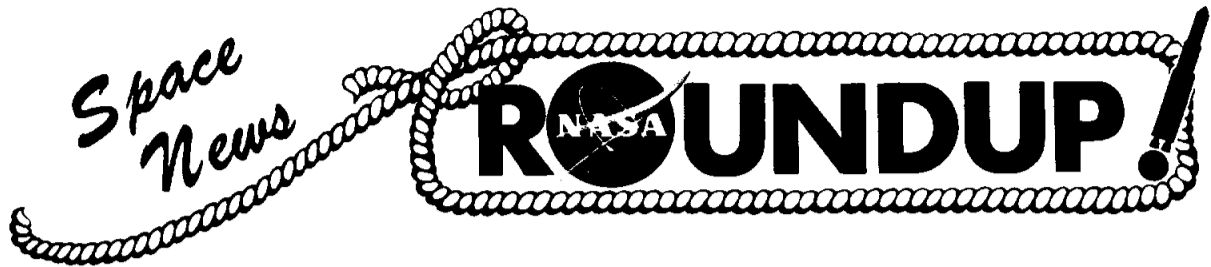
The Gemini X spacecraft and launch vehicle Monday was in electrical interface verification testing at Launch Complex 19 prior to mechanical mating. At Launch Complex 14, the Atlas Standard Launch Vehicle was in subsystems tests after being into the gantry, and the Gemini X Agena Rendezvous Vehicle was in combined interface tests in Hangar E.

was an extremely interesting mission. It began after several delays with a virtually flawless launch and ended with a pinpoint landing. On the other hand, we found that there are still unforeseen difficulties to be overcome before we can operate at a 100 percent efficiency in the space environment... This experience points up something that we tend to forget; the Gemini program is experimental. We try on each flight to advance to a maximum extent our understanding of space and how to operate in it. Quite often we learn things we had not expected... We try to learn those lessons that can only be learned in space and are still dissatisfied with ourselves when technical and procedural failures keep us from our goals."

Each Flight Different

MSC Director Dr. Robert R. Gilruth amplified Dr. Seamans' comments by saying, "Each of these flights has been different from the last or from earlier flights, and in each flight the crews have had their own individuality. But the flights have all had one thing in common; they have each advanced the knowledge of space and how to fly in space. The tasks have been increasingly difficult and each time the way has been paved a

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TWO EVAs PLANNED

Rendezvous-EVA Gemini X Set For July 18 Launch

The launch of the Gemini X mission has been scheduled for no earlier than July 18 at Cape Kennedy, Fla.

The three-day mission will begin with the launch of the Agena Target vehicle by an Atlas booster about 2:40 pm CST. The Gemini X spacecraft will be launched about 4:30 pm CST. The Agena will be inserted into a 185-mile circular orbit and the Gemini into a 100 by 168-mile elliptical orbit.

Primary crew for the mission is John W. Young, command pilot, and Michael Collins, pilot.

A/S 203 Launch Reset to June 29

The Apollo/Saturn 203 launch, previously scheduled for June 30, has been rescheduled for June 29.

The date was changed because of a scheduled launch of the Lunar-Anchored Interplanetary Monitoring Explorer. The spacecraft is scheduled to be launched June 30 by a thrust-augmented improved Delta rocket on a mission that will place it in an orbit around the moon to study the environment in the vicinity of the moon.

The AS 203 launch will be the second mission for the uprated Saturn I, the Saturn 1B, to study the behaviour of liquid hydrogen fuel in the launch vehicle's second stage during three or four earth orbits. No Apollo spacecraft will be carried on the flight.

Backup crew is Alan L. Bean, command pilot, and Clifton C. Williams, pilot.

Young, a Navy Commander, was pilot on the first manned Gemini flight, Gemini III, March 23, 1965. Collins, an Air Force Major, Bean, a Navy Lieutenant Commander, and Williams, a Marine Corps Major, have not made space flights.

Plans for the Gemini X mission include rendezvous, docking and extravehicular activity. The Gemini X spacecraft is scheduled to rendezvous and dock with its target vehicle and if possible to achieve a dual rendezvous with the Agena launched in the Gemini VIII mission March 16.

The first rendezvous is scheduled in the fourth revolution over South Africa with docking following a period of station keeping.

The crew will maneuver the docked vehicles, using the Agena target vehicle propulsion system, into a position to accomplish a dual rendezvous with the Gemini VIII Agena at an altitude of approximately 247 miles. The crew will undock from the Gemini X Agena and use the spacecraft control and propulsion systems to initiate the final phase of the dual rendezvous with the Gemini VIII Agena.

Two spacecraft extravehicular activities are planned for Gemini X. The first is a stand-up EVA in which the pilot will be standing on his seat with his upper body extending through the

open hatch of the spacecraft. During the 55 minutes of this stand-up EVA the pilot will perform the ultra-violet astronomical experiment, color patch photography experiment, synoptic terrain and synoptic weather photography.

During the umbilical EVA the pilot will evaluate the operation of the Extravehicular Life Support System (ELSS, chestpack), the Hand-Held Maneuvering Unit (HHMU), evaluate maneuvering in space and perform two micrometeoroid collection of experiments. He will be using a 50-foot umbilical throughout this 55 minutes of EVA.

Sixteen experiments are to be performed during the Gemini X mission: Star Occultation Navigation (D-5), Ion Sensing Attitude Control (D-10), Tri-Axis Magnetometer (MSC-3), Lunar Ultraviolet Spectral Reflectance (MSC-5), Beta Spectrometer (MSC-6), Bremsstrahlung Spectrometer (MSC-7), Color Patch Photography (MSC-6), Landmark Contrast (MSC-12), Zodiocal Light Photography (S-1), Synoptic Terrain Photography (S-5), Synoptic Weather Photography (S-6), Micrometeorite Grater Collection (S-10), Micrometeorite Collection (S-12), Ultraviolet Astronomical Cam-

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PTL to Present Family Night Program June 27

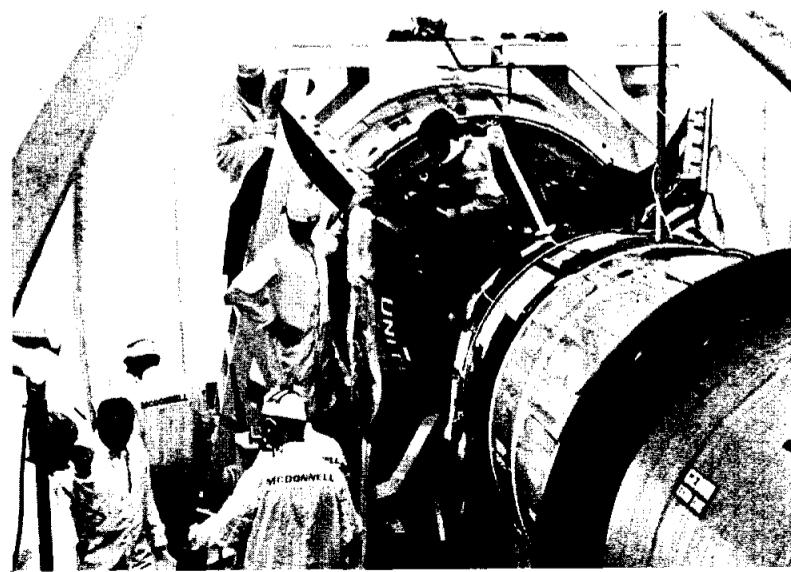
Photographic Technology Laboratory June 27 will present this month's MSC Family Night Symposium in the MSC Auditorium at 8 pm.

On the Symposium program are the following presentations: "A World Tour by Gemini Spacecraft," by Dick Underwood including terrain photos made during Gemini missions of various parts of the earth.

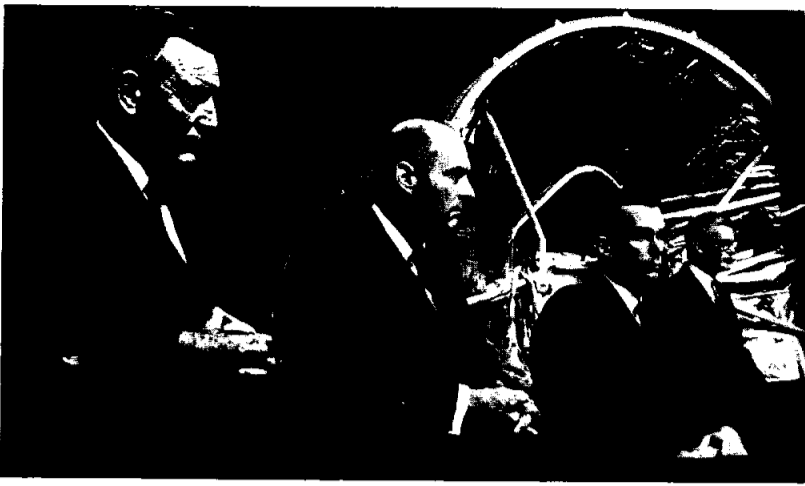
"Comparison of Mercury and Gemini Cameras," by Tom Brahm or Bobby Gray.

"Engineering Photography," by Eugene Edmonds, including zero-G, recovery and laboratory test photography and a demonstration of fiber-optics transmission of television images.

"Technical Laboratory Support," by John Holland — a description of the highly-specialized processing equipment required by the photo lab in supporting the manned space flight program.



FIRST RENDEZVOUS—Gemini X spacecraft and its Agena rendezvous vehicle meet atop the Kennedy Space Center's "timber tower" for electrical interference and interface tests. The next time the two meet they will be at a slightly higher altitude than the timber tower platform. Prime pilot Michael Collins stands in the spacecraft cockpit. The spacecraft has since been hoisted to the white room of Launch Complex 19 for mating operations.



MEDALS FOR GEMINI IX—NASA Deputy Administrator Dr. Robert C. Seamans, right, reads the citations for the NASA Exceptional Service Awards during the Gemini IX Awards Ceremony June 17. The Awards went to Col. Richard Dineen, USAF Ret., (left) for his effort as Director of Gemini Launch Vehicles of the Space Systems Division, Air Force Systems Command; to Gemini IX Command pilot Tom Stafford and to pilot Gene Cernan for their achievements in the Gemini IX mission.

Stafford-Cernan Weekend Trip

(Continued from page 1)

little bit more for the next flight . . . I feel that Tom Stafford and Gene Cernan have done a superb job in the Gemini IX flight."

Passing the narrative back and forth, Stafford and Cernan covered the mission from the frustrations of riding the Pad 19 elevator down after two scrubs, through the successful launch, three rendezvous maneuvers, finding the Augmented Target Docking Adapter (ATDA) unwilling to permit docking because of its clinging shroud, more than two hours of EVA by Cernan, and finally the reentry to the most perfect landing thus far in the Gemini program.

Got Out of Town

"And finally Friday morning," said Stafford, "we got up the elevator again; again we got no DCS update to update our computer for launch, but then we decided we might as well get out of town for the weekend and we left rather suddenly there on Friday morning. The Titan put us into an orbit below the docking adapter and about 650 miles behind it, and through a series of maneuvers that were calculated by Mission Control Center in Houston we completed the first rendezvous."

Information was given to us from Mission Control as to when to burn and when not to burn, very early," said Cernan. "These burns were very critical in terms of a mile per hour, for instance, on one side of the world can mean a miss distance of the target of several miles."

"In the transfer maneuver," continued Stafford, "we ended up 12 to 15 miles below the orbit of the target and approximately 25 miles slant range. We came up in a maneuver below the docking adapter; we could see it in reflected sunlight and we transferred in reflected sunlight. As soon as it went into darkness, Gene and I both could see a flashing blue light, and right there we knew we were home free, because we couldn't see a flashing blue if the shroud was on."

But as the crew of Gemini IX discovered as they got within 1000 feet of the ATDA, the shroud was still partially attached and docking was impossible.

Desert and the docking adapter looked to me just like a period on a piece of typing paper. Without radar we would have never found the docking adapter and completely missed the rendezvous."

Gemini IX rendezvoused with the ATDA just east of Australia and kept station within 20 to 30 feet until the next sunrise over Hawaii.

Fantastic Out There

Shifting to the extravehicular activity portion of the mission, Cernan described his sensations during two space-days and one space-night outside the spacecraft.

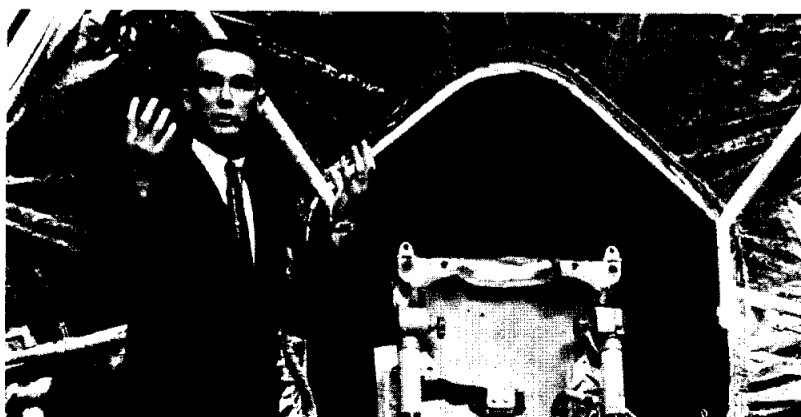
"I might emphasize that there is no doubt about the fact that it is pretty fantastic being out there —just the fact that you had left the bounds of the spacecraft and were at that time some 180 statute miles above the surface of the earth and it certainly was a beautiful sight and something I look forward very much toward doing again," said Cernan. "There was absolutely no disorientation; I never felt lost. I never felt that I lacked any capabilities to get back to the spacecraft at any time I so desired."

Planned evaluation of the Astronaut Maneuvering Unit (AMU) was cancelled when Cernan's faceplate fogged up from the high level of moisture in his extravehicular life support system. Checkout of the AMU had almost progressed to the deployment point, but the fogging problem showed no indication of abating."

No Voodoo

EVA was terminated after two hours and ten minutes. "There is no new voodoo out there in space as far as EVA is concerned," said Cernan. "You are at home out there and you feel as comfortable out there as you do right here and I think one of the reasons you do is because you think so much about it, you plan so much about it and you work for it for such a long time that it becomes very familiar and very comfortable. I'm convinced that we can do just about anything out there that we can do right here."

Using real-time out-the-window motion pictures to illustrate their narrative, Stafford and Cernan concluded the description of the mission by covering the sensations and sights of the reentry sequence and landing less than three miles uprange of the prime recovery vessel, USS *Wasp*.



EVA RECOUNT—Gemini IX pilot Eugene Cernan describes for newsmen his movements while outside the spacecraft, illustrating his discussion with Gemini equipment adapter and Astronaut Maneuvering Unit mockups.

Control Team Named For A/S 203 Mission

Flight controller assignments for Apollo/Saturn 203, now scheduled for no earlier than June 29, will be comprised of one shift in the Mission Control Center-Houston and in six ground stations of the Manned Space Flight Network.

John D. Hodge is A/S 203 flight director and Stuart M. Present is assistant flight director. Gordon Platt of Marshall Space Flight Center is the flight director's experiment representative responsible for monitoring A/S 203 experiments systems and for initiating any required real-time commands related to the liquid hydrogen orbital behavior experiment.

Consoles in the Mission Control Center which will not be manned during this mission will be the flight surgeon, spacecraft communicator, EECOM engineer, GNC engineer and retro-fire officer positions.

Other Mission Operations Control Room (MOCR) assignments are as follows: Merrill A. Lowe, Herman R. Goodwin and Louis E. Mercier, operations and procedures; Charles W. Casey, booster systems engineer No. 1; Dexter H. Burdeshaw and Robert K. Wolf, booster systems engineer No. 2; Carl D.

Arnett, MSFC, experiments systems engineer; Maurice G. Kennedy, flight dynamics officer; Granville E. Paules, guidance officer.

Ernest L. Randall and George T. Jenkins, network controller; John F. Childress, support control coordinator; Ronald B. Cagle, John W. Collins, Douglass R. Wilson and Clifton W. Phillips, M&O supervisor, and Paul Haney, public affairs officer.

Monitoring A/S 203 systems and experiments at remote sites will be the following people: Franklin L. Van Rensselaer, experiment systems engineer (ESE) at KSC Launch Control Center; Perry L. Ealick, CapCom, Frank E. Swalley, William F. Nelson and John D. Schweikle (Douglas Aircraft) ESE's at Bermuda; Jarold L. Vaniman and Russel T. Neher (Douglas Aircraft), ESE's at Corpus Christi, Tex.; Arda J. Roy, CapCom, Myron C. Hayes (IBM) S-IVB monitor, and Charles E. Mundie and Ronald A. Ammons (Douglas Aircraft) ESE at Carnarvon, Australia. Lawrence S. Canin, CapCom, Roy E. Day (IBM), S-IVB monitor, William M. McCumber (Douglas Aircraft) ESE at Guaymas, Mexico.

Apollo Chamber Tests To Start This Summer

One of the test facilities designed to groom Apollo spacecraft for flight beyond the atmosphere will begin operations this summer at MSC.

Chamber "A" in Building 32 is the largest known thermal vacuum chamber in the world. It rises seven stories high and is 65 feet in diameter. A set of vacuum pumps can suck almost all of the air molecules out of the chamber and maintain a vacuum environment which is normally found 87 miles above the earth.

It can also produce the thermal environment. The heat of the sun comes from banks of carbon arc lamps in the back and top of the chamber. Heat loss in space can be simulated by panels in the chamber walls which are supercooled by liquid nitrogen.

Construction of this realistic simulator was begun in April 1963. In May 1964, the structure was completed and a vacuum checkout test was run. The pressure of the outside air pushing inward against the chamber was greater than the engineers had calculated and the metal of the sill of the 40-foot diameter entrance door failed.

The engineers went back to work to beef up the structure of the chamber. In April 1965, a second vacuum test was run, and the chamber held a high vacuum satisfactorily.

The finishing touches and shakedown testing are being done on the chamber now in preparation for the first opera-

tional test of an Apollo spacecraft in mid-1966.

A ground test spacecraft will be used in the chamber. It will never fly into orbit, but it is an exact duplicate of the spacecraft which will be launched, and qualifies the flight spacecraft by similarity.

The first tests will involve only two parts of the spacecraft, the command module where the crew is stationed and the service module, which is a large propelling engine for the spacecraft.

The chamber's metal floor can also rotate. It may be necessary to turn the spacecraft during flight to prevent overheating or freezing of equipment onboard, and the floor rotation simulates the spacecraft propulsion.

The control room for this full scale simulator provides the capability to monitor closely by hardline and television everything that is happening inside the chamber. In case of an emergency, the chamber can be repressurized to 27,000 feet altitude in 30 seconds. A rescue crew is on station at all times in the manlock to provide assistance to test subjects after repressurization.

With its complex equipment for simulating space conditions, the big chamber will help NASA engineers to put the final stamp of approval on the spacecraft for the first lunar voyage.

Refreshed Aqua-astronaut



INSTRUMENT FLIGHT—M. Scott Carpenter prepares for takeoff on an instrument refresher flight at Kingsville Naval Auxiliary Air Station in a TF-9 Cougar aircraft. Handing Carpenter his helmet is Airman Apprentice Larry M. Lewis, Training Squadron 21 plane captain. Carpenter renewed his jet instrument pilot rating during the three-week course.

White Sands Flights Man-Rated Apollo LES

Twenty-five months of flight testing at White Sands, New Mexico, has flight qualified the first major system to be used by Apollo crews enroute to the moon.

The launch escape system, a 33-foot tower assembly attached to the top of the Apollo spacecraft, was "man-rated" after its sixth and final flight at White Sands January 20. It had performed perfectly during each progressively more difficult trial.

The launch escape system (LES) contains rocket motors to pull the Apollo command module and its three-man crew up and away in the event of trouble with the giant Saturn launch vehicle, either on the launch pad or during the first few minutes of flight.

After about three minutes from liftoff, the system is jettisoned, and the spacecraft's own propulsion system can be used for aborts.

The six LES flight tests all took place from Launch Complex 36 at White Sands, using "dummy" boilerplate Apollos until the final test when a production spacecraft structure was flown for the first time.

Here Are Leaders In Softball Play

Standings in the 1966 MSC/EAFB Fast- and Slow-Pitch Softball Leagues as of June 17 place the following teams in top positions:

Fast-Pitch, American Division: Philco/WDL, 4 wins, no losses; National Division: NAA, 4 wins, no losses.

Slow Pitch, American Division: Tech Services All Stars, and Security Mets both tied with 5 wins, no losses. National Division: five-way ties of 5 wins, no losses between Univac, P&PD Hustlers, Space Science Division, MPAD-RAB, Coast Guard/EAFB.

Four of these tests used the solid-propelled Little Joe II launch vehicle, with simulated emergencies programmed to take place at various altitudes. Two of the tests simulated off-the-pad aborts, using no launch vehicle at all, but pulling the spacecraft to altitude with only the LES motors, allowing it to drift safely back to earth beneath its three 83.4-foot parachutes.

One unexpected test of the LES came in May 1965, when the Little Joe II launch vehicle encountered structural failure during initial phases of flight. The launch escape system immediately pulled the Apollo spacecraft to safety, proving it could cope with real emergencies as well as those carefully planned.

The launch escape system is more than a tower-mounted rocket. It uses simple, solid propellants for its 155,000-pound thrust escape motor to initiate the escape maneuver either automatically or by command from the crew.

But it also has hydraulic-actuated "wings," called canards, to stabilize the spacecraft properly as it descends to lower altitudes where the parachutes are deployed.

It is taller than the combined Apollo command and service modules, weighs more than a two-man Gemini spacecraft, and packs as much thrust, for a few seconds, as both Redstones which propelled the first two Americans Alan B. Shepard and Virgil I. Grissom—into sub-orbital space flights.

And, though NASA has proved that the escape system is ready for use by its astronauts, NASA is working equally hard to perfect other Apollo Systems so that the LES will not be called upon at all.

Saturn V Access Arms Undergo Rigorous Shakedown At Marshall

Arms are "swinging" at the NASA-Marshall Space Flight Center. Giant mechanical arms which connect the Apollo/Saturn V space vehicle to the launch facilities are undergoing tortuous tests at MSFC.

Not all of the swinging arms are mechanical. Human arms—those of engineers and technicians hustling about getting the vital pieces of ground support equipment ready for installation

on mobile launchers at the NASA-Kennedy Space Center's Launch Complex 39—are keeping time with their metal counterparts.

A test of how well the Marshall Center does its job will occur when the first Saturn V launch vehicle leaves the launch pad next year. The three-stage rocket is being developed for Apollo lunar missions.

A bit of the "spaceport" has been created at the Marshall Center's Unique Ground Support Equipment Test Facility to check out the swing arms. Rockets swaying in the wind, freezing rains, and hurricane force winds are all created on cue here to test the arms.

MSC Negotiates Electronics Pact With Entronix

MSC has selected Entronix Corporation of Houston and Medley Electronic Corporation of Brownsville, Texas, for further negotiations of a contract to provide central electronic shop support services at the center.

An award fee type contract will be negotiated for a one-year period with renewal provisions for two additional years. Estimated costs for the first year of services are \$425,000. Services to be provided include overhaul, repair and fabrication of electronic aerospace components. It is anticipated that approximately 50 persons will be required to provide the services.

Under an award fee type agreement, the contractor can earn additional profit by improving performance and reducing costs. Entronix Corporation and Medley Electronic Corporation are two of five firms which responded to the request for proposals issued by the center.

Nine arms, built by Hayes International of Birmingham, Ala., will carry service lines to the 365 foot tall rocket/spacecraft combination as it stands erect on the mobile launcher. These lines are electrical, propellant, hydraulic and pneumatic. Weighing up to 52,000 pounds each, the arms are hinged to the launch umbilical tower. Longest of the devices is 85 feet.

Swing arms, so called because they retract as the launch vehicle leaves the ground, also serve as access routes and work platforms for technicians making last-minute changes and repairs to the launch vehicle.

Winds up to 75 miles an hour are whipped up to duplicate Florida storms. The high winds are created by four aircraft engines.

Guy Perry, chief of the test facility, said winds may cause

the Apollo/Saturn V rocket to oscillate as much as 40 inches. These motions, combined with rain frozen by super-cold propellants, are expected to cause equipment problems.

Every arm is put through a series of tests, Perry said, designed to duplicate conditions expected at the launch site.

Perry said the 18-acre facility has eight swing-arm test positions and one position for testing access arms to be used by Apollo crews. Also being tested here are launcher hold-down arms and tail service masts. All the tests may be controlled from a central blockhouse.

Each test position has two elements—a vehicle simulator for duplicating motions during countdown and launch, and a section duplicating the launch tower.

The vehicle simulator duplicates the portion of the launch vehicle skin containing the umbilical connections and personnel access hatches. Driven by a hydraulic servo system, the vehicle simulator produces relative motion between the vehicle and the tower. The simulator can duplicate the motion of any part of the vehicle.

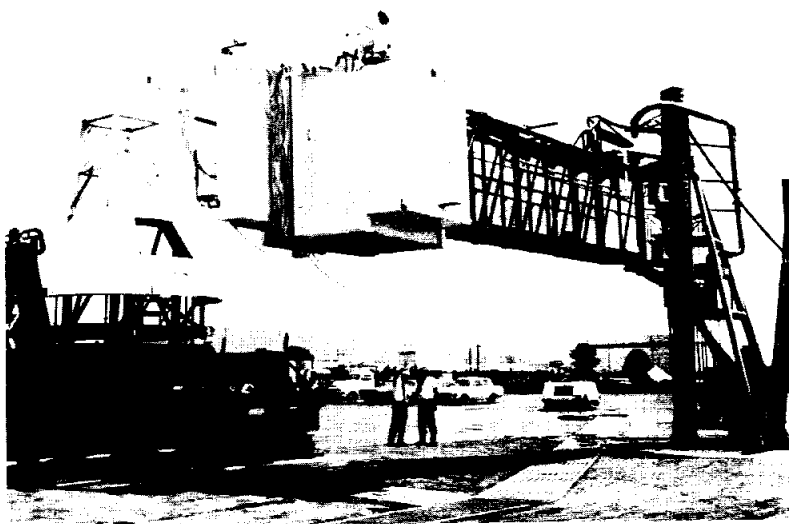
The top of the 36-story vehicle may oscillate up to plus or minus 20 inches at low frequencies—from .2 to 1 cycle per second.

Five of the simulators are equipped with elevators that duplicate the lift-off of the vehicle. The elevators move upward for about eight feet to simulate the "breaking" of the umbilical connections at lift-off.

Tower simulators duplicate that portion of the umbilical tower where the umbilical swing arm and the equipment required to retract the arms during launch are located. A remote control water spray system is mounted on top of each tower simulator to provide "rain" and for fire protection.

Cryogenic propellants are pumped through the lines at five positions to give technicians a realistic look at the equipment after it has been "chilled down."

The 29 service arms and associated equipment being fabricated by Hayes are trucked to the Marshall Center for testing.



WALKWAY TO THE MOON—Access arms or walkways for Saturn V mobile launchers are thoroughly wrung out in tests at the Marshall Space Flight Center prior to shipment to Kennedy Space Center. In the top photo, a command module mockup is mounted on a motion simulator which duplicates the swaying of a Saturn V in high winds. The lower photo shows the crewman's view as he leaves the elevator and hikes across the access arm.

PEANUTS Charles Schulz

I HEAR GOOD THINGS SAID ABOUT U. S. SAVINGS BONDS. THEY MUST BE VERY NICE.



Conference Cameos



QUESTION BARRAGE—Management and operations people of the Gemini IX mission stand by to field questions from newsmen during the Gemini IX post-recovery press conference June 6 in the MSC News Center. Left to right are Dr. Charles A. Berry, MSC Director of Medical Research and Operations and one of three mission flight surgeons; Donald K. Slayton, MSC Director of Flight Crew Operations; Eugene F. Kranz, Gemini IX White Team flight director; Charles Mathews, Gemini Program Office manager; William Schneider, Gemini IX mission director; Lieut. Gen. Leighton I. Davis, DOD manager for Manned Space Flight Support Operations; Dr. Robert R. Gilruth, MSC Director, and Dr. George E. Mueller, NASA Associate Administrator for Manned Space Flight.

Teacher Workshop Examines Space Impact on Education

An educational symposium and workshop aimed at determining the impact of space exploration on teacher education was held at MSC June 15-17.

Sponsored jointly by the University of Houston and the Manned Spacecraft Center, the conference was designed to acquaint attendees with NASA programs and to explore ways of developing an exchange of information between NASA and educators. Other objectives were to study ways of supplying professional advisors for materials selection and information organization and to develop a means of testing and evaluating the effectiveness of NASA educational programs and services.

Sponsors of the symposium hoped that by reaching the professors of teacher education, a more concrete understanding of the needs of the educational community could be obtained.

The symposium was the first such conference directed specifically to persons responsible for science education instruction at the university level. The

closing session of the conference was devoted to an evaluation of NASA's educational programs.

Pitch Servo Short Causes Atlas 'Hardover'

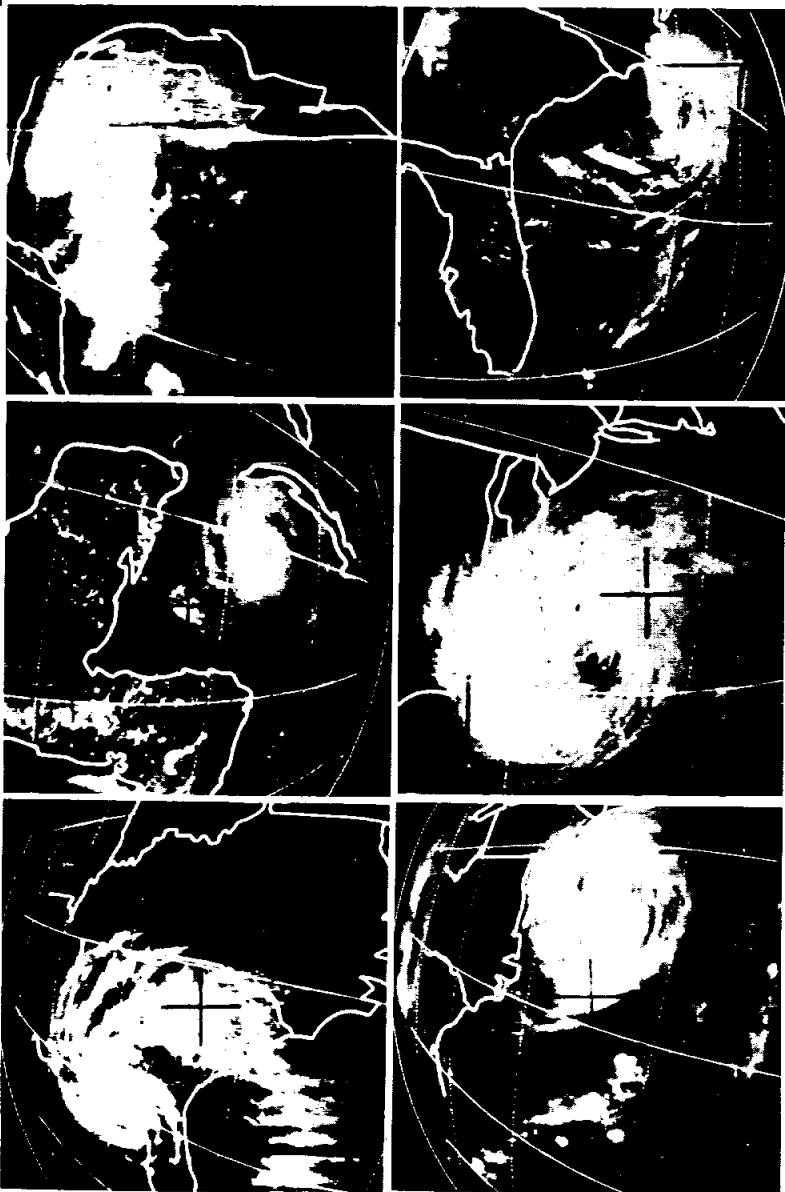
A failure analysis of the Atlas-Agena Launch vehicle malfunction which scrubbed the May 17 attempt to launch Gemini IX indicates that the Number 2 booster engine gimbaled to what is called a "hardover" position due to a short in the electrical command circuit to the engine pitch servo valve. (See May 27 Roundup).

Although several failure modes could have caused the engine to swivel to this extreme position, it was determined that only one—an electrical short in the servo valve circuit—could have produced the exact set of data which was received from telemetry of the space vehicle.

The failure was described by Maj. Gen. Ben I. Funk, Chairman of the Gemini Flight Safety Review Board, as the type which is called "random." A detailed technical review of the Atlas standard launch vehicle program demonstrated that it was not the result of any system deficiency or design weakness.

To eliminate the possibility of similar problems in future launches a number of additional tests will be conducted and additional inspection steps—including X-raying all electrical connectors—have been instituted. These steps will be performed on all Gemini Atlas Agena Target boosters scheduled for the remainder of the Gemini program, and were performed on the Gemini IXA Atlas launch vehicle which orbited the Augmented Target Docking Adapter.

Portrait of a Hurricane



STATESIDE PASS—ESSA 1, the US Department of Commerce Environmental Science Services Administration's weather satellite, photographed the life cycle of Hurricane Alma as it was born in the Western Caribbean south of Cuba (top left); grew into a tropical storm near the Yucatan Channel and matured into a full-fledged hurricane as it neared Cuba (middle left); swept into the Florida panhandle with winds up to 100 mph (lower left); lost energy and again became only a tropical storm as it passed over the southeastern US into the Atlantic (upper right); turned north and moved up the Atlantic coastline (middle right); and finally turned northeast and died out after brushing the Atlantic seaboard (lower right).

Texas A&M's Connally Institute Offers Instrumentation Courses

The James Connally Technical Institute of the Texas A&M University system will offer a two-year training program in instrumentation technology starting September 6.

Using the James Connally AFB facilities in Waco, Texas, the institute offers a curriculum aimed at preparing high schools graduates, who have a good background in physics and math, for employment as engineering aids, lab or research technicians, electromechanical technicians or instrument installation supervisors.

MSC employees whose offspring are interested in following such a course of training may write the Director of Admissions, James Connally Technical Institute, Waco, Texas, 76703.



Joint Effort to Meet Growing Need



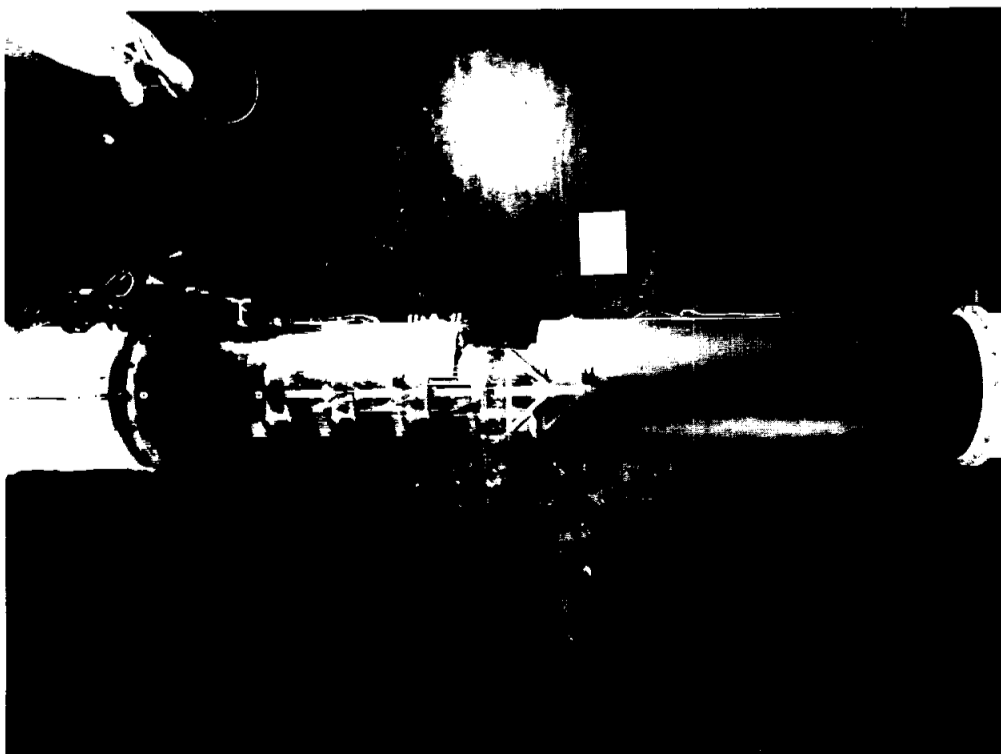
SEARCH FOR SMALL BUSINESSES—MSC's Industry Assistance Office and the Houston Regional Office of the Small Business Administration recently instituted a joint effort aimed toward locating small businesses capable of meeting MSC's growing need for prime and subcontractors. In the photo, left to right are O. B. Gentle, Houston SBA office, Jim Edwards and H. T. Christman, both of the MSC Small Business and Industry Assistance Office. Benefits expected from the joint program are increase of small business contracting opportunities, building of a qualified source list, and providing to MSC prime contractors an access to qualified subcontractors.



'PRE-FLIGHT' PREPARATION—Bob Koning installs instrumentation leads on Command/Service module portion of the one-third scale Apollo docking rig. Dynamics are measured in both mode of Apollo docking—transposition and docking of the Command Module with the Lunar Module/S-IVB after injection, and lunar orbit rendezvous and docking following the landing on the moon.



ON TARGET—Project Engineer Charles M. Vibbart aligns the one-third scale Command/Service module docking probe toward the lunar module's hatch using the launcher scope.



TIME-LAPSE DOCKING—The multiple-exposure camera captures two docking sequences in which the one-third scale Apollo C/SM glides across the floor to dock with the lunar module's

SIMULATION IN MINIATURE—

Scale Air-Cushion Vehicles Test Translunar Docking Hardware

The first docking maneuver the astronauts must make on their way to a moon landing is being studied in miniature on an air bearing surface at MSC.

Two cylindrical vehicles fitted with a one-third scale version of Apollo docking hardware in one end glide across a level surface on large air bearing pads. They can come together and dock at different speeds and angles which can occur in Apollo Command and Service Module-Lunar Module dockings.

The one-third scale models will simulate the docking which takes place after the third stage of the Saturn rocket has launched the Apollo crew from earth orbit on a flight to the moon.

Each third scale vehicle, which weighs more than a ton, is lifted off the floor's surface by cushions of air ejected under high pressure from the pads. The air bearing reduces the friction between the vehicles and the floor and allows the docking vehicles to move freely.

The laboratory docking vehicles are thoroughly instrumented to gather information about the dynamics of the docking and whether the full scale hardware has been designed properly to make the hookup in space successfully.

In the Apollo mission maneuver called Transposition and Docking, the two upper sections of the spacecraft must separate from the total spacecraft, fly away a short distance, turn around, dock with and tow the LM away from its launch shroud, and the third stage of the Saturn.

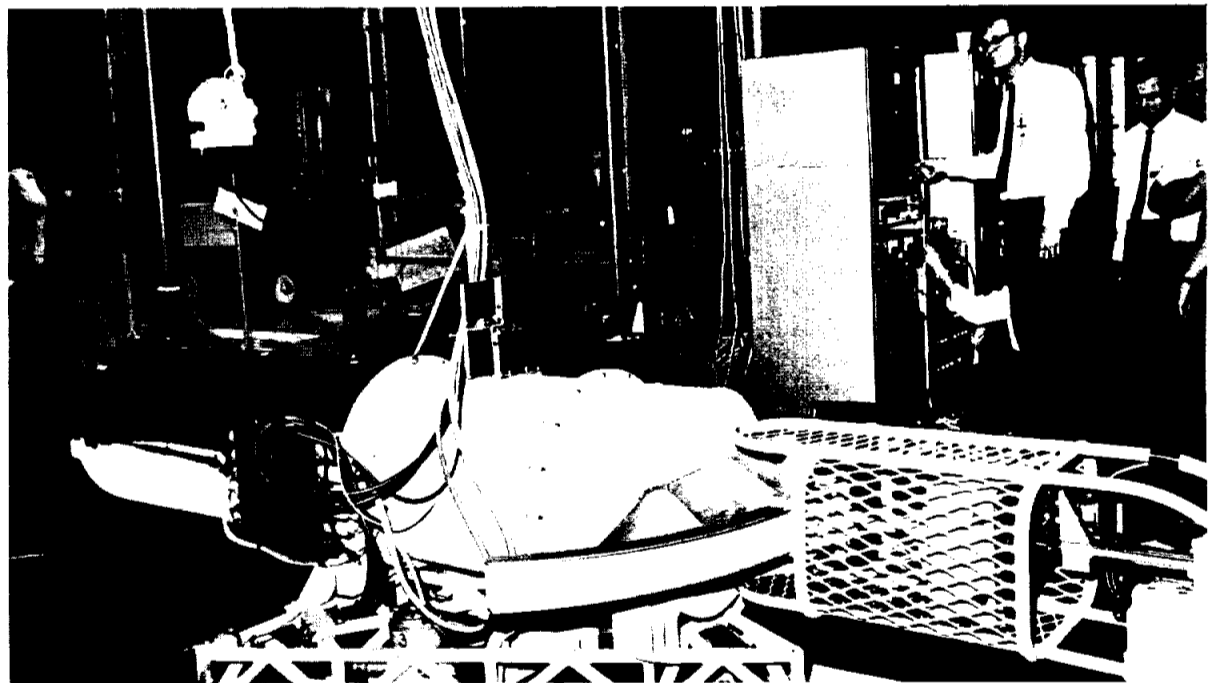
The command module must dock with the LM to allow two crewmen to transfer to the LM before the descent to the moon's surface.

To simulate docking in the laboratory, the operator aims the command and service module vehicle toward the LM vehicle using a sighting system, like a rifleman aiming his gun on a target. Then he releases a spring-driven piston which launches the smaller vehicle toward its target. The highest

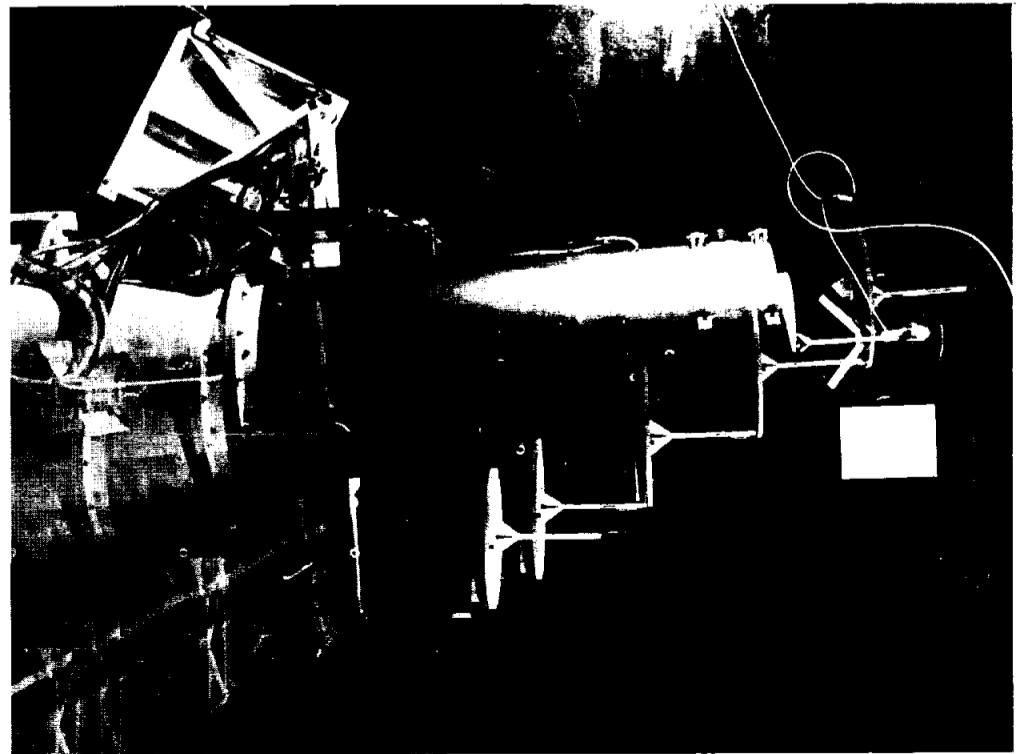
forward speeds attained are approximately one-half mile an hour with the vehicle moving as fast as a quarter of a mile an hour sideways and turning up to three degrees per second.

The docking hardware on the Apollo command module is a sliding probe with a cone-shaped tip equipped with three capture latches. To complete the docking maneuver, the probe is guided into and captured by an inverted cone type of docking collar located on the LM top hatch. Behind the probe tip are three hinged arms fitted with fluid shock absorbers. The arms pivot and cushion the docking impact as the probe recoils after capture. The docking hardware can then be removed and the two-man LEM crew can transfer through the docking tunnel.

The rig for simulating the Apollo docking was designed inhouse at MSC by the Mechanical Systems Branch of Structures and Mechanics Division. Charles Vibbart is project engineer for the One-Third Scale Apollo Docking Test Program.



CLEAR TO LAUNCH—Aligned to the desired impact angle, the C/SM test rig is prepared for launch toward the Lunar Module rig. The spring-driven piston at right propels the test rig across the smooth floor on low-friction air-bearing pads.



docking cone—first straight in, then obliquely. The hardware used in the one-third scale test rig simulates impact loadings and dynamics but does not represent flight hardware.

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Director Dr. Robert R. Gilruth
Public Affairs Officer Paul Haney
Editor Terry White
Staff Photographer A. "Pat" Patnesky

Apollo Program Draws From Gemini Learning

As the final Gemini spacecraft head for the launch pad, the Apollo program is preparing for its first manned flight.

Since Gemini was originally designed as a stepping stone between the Mercury flights and the Apollo lunar mission, what has the Gemini Program contributed to Apollo?

Aside from the obvious accomplishments of rendezvous, docking and long-duration flights, Gemini has established a sizeable base of technical knowledge and experience on which Apollo is already drawing.

In space navigation, Gemini has made contributions to the Apollo Program in two separate areas. Both Gemini and Apollo are lifting bodies, that is, they can be steered during reentry to a preselected landing point. The experience of the Gemini spacecraft in lifting reentries has provided much information for the Apollo lunar return.

Gemini pilots have also investigated the techniques of space navigation in finding the spacecraft's position by means of star sightings, earth landmarks, or the earth's horizon. Apollo must use some of these techniques to blaze a path to the moon and return.

A pool of experienced space pilots is another legacy that Gemini has willed to Apollo. Two pilots who have flown on the Gemini Program, Gus Grissom and Ed White, are currently scheduled to "wring out" the first Apollo spacecraft on an early 1967 flight that could go as long as 14 days.

For those pilots who do not yet have space flight experience, the Gemini training program has been largely adapted to the Apollo missions. With the knowledge of what training is really necessary for flight, the Apollo crews can concentrate on these areas.

The space suits which the crews of the first Apollo flights will wear are basic Gemini suits which have been adapted for use in the Apollo spacecraft. Similarly, the Apollo crews will eat the same types of freeze-dried and cube-size food which was carried for all the Gemini flights. One important difference in this area is that Apollo crews will be able to have hot meals.

The problems which were encountered with cryogenic storage of hydrogen and oxygen and with fuel cells in Gemini have given Apollo engineers an insight in dealing with cryogenics and fuel cells for the Apollo missions.

In ground based capability, the same manned tracking network and experienced flight control personnel which are being used for Gemini flights will track the Apollo spacecraft in earth orbit. Three deep space tracking stations are being added for communications at lunar distances.

Both Gemini and Apollo plan for water landings, and the skills and training which have been developed in recovering Gemini spacecraft are available for the Apollo Program.

All these capabilities which the Gemini Program has developed are being woven into the framework of the Apollo missions. Equipped with this knowledge, the Apollo engineers can concentrate on aspects of the program which Gemini did not perform, such as deep space operations and the lunar landing and exploration.

'Full Coverage' is Myth If Applied to Accidents

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

Few people ever stop to think how much an accident can hurt physically and financially; getting hurt is always something that happens to the other fellow.

It's too easy to say, "It's only a scratch," and then ignore it. But "only a scratch" is all it

SPACE QUOTES

OPERATIONAL STATUS OF SPACE PROJECTS INCREASED FOR 1967, President Lyndon B. Johnson, 1967 Budget Message to Congress:

"Just over 60 years ago man entered the age of controlled flight. Today, men orbit the earth in speeds measured in thousands of miles an hour. In 1967, less than six years after this nation set the goal of a manned landing on the moon within the present decade, we will begin unmanned test flights of the giant Saturn V rocket and the Apollo spacecraft—the complete space vehicle required for achieving that goal. Later in the 1960's, we will undertake the manned lunar mission itself."

OUT OF TEXAS' PAST—

Confederate Spy Witnessed Both Lincoln and Davis Inaugurations

Capt. Levi Simmons, C.S.A., kept stations briefly with national history and personal fame in 1861, but he elected not to dock with either. So chances are you never heard of him. A Confederate intelligence agent, he could have altered history and become famous by drawing a loaded revolver that he carried in a shoulder-holster and shooting Abraham Lincoln at the inaugural ball.

Despite some Union shrapnel that he carried to the grave, Capt. Simmons lived to be 84, an age he probably could not have achieved had he chosen the fame that later fell upon the shoulders of John Wilkes Booth. Anyway, he was a good soldier; he had his orders.

The story comes from the family archives of Capt. N. Simmons of Houston, a retired merchant mariner and grandson of Levi. Documents in the case include copies of *Leslie's Illustrated Newspaper* dated March 9 and March 23, 1861, which Levi carried in his pockets during his tour of duty as a Southern spy in New York and Washington.

The March 23 newspaper describes and pictures both the Lincoln inaugural ball and the inauguration of Jefferson Davis

as president of the Confederacy —both of which Levi witnessed. So he achieved a kind of fame after all. Probably he was the only person to attend both of those events!

Before the war Levi had been a civilian scout for the United States Army in the Indian country. When Alabama, his native state, seceded on Jan. 11, 1861, he resigned and went home, arriving in Montgomery in time to attend President Davis' inauguration on Feb. 18.

Having volunteered for any duty in the service of his state, Levi was made a secret agent and was sent to the New York-Washington area to observe and report troop movements. He traveled first to New York City and arrived in Washington some time before March 4.

The March 23 *Leslie's* gives the Lincoln ball and the Davis inauguration almost equal prominence, the Montgomery date-line being just across the page from and only two inches lower than the Washington report.

The March 9 *Leslie's* carried a large portrait of President Davis on its front page, with a notation that it was sketched from a photograph taken by "Lincoln's photographer," Matthew Brady!

"That paper with the picture of Jeff Davis," Capt. N. Simmons said, "Grandfather carried next to his heart. He had it there when he stood at the entrance to the ballroom when Abe Lincoln got out of his carriage and went in with Vice President Hamlin and Senator Anthony of Rhode Island."

Immediately behind them, reported *Leslie's* on March 23, to the intense astonishment of all, came Mrs. Lincoln, leaning on the arm of Senator Douglas, more popularly known as the *Little Giant*.

It seemed to predicate that the two ancient enemies had buried the hatchet. As the party entered, the band struck up "Hail Columbia." As all balls

are more or less alike, we merely give the names of a few distinguished guests . . .

Leslie's, the *Life* of its day, carried its preference for pictures over letterpress a bit far.

"Grandfather always said when the band started playing," said Levi's grandson, "he was standing close enough to Lincoln to have 'blowed him half in two' with that big old Smith & Wesson seven-shooter that he carried. That's what he always said: 'I could have blowed Abe Lincoln half in two!'"

Capt. N. Simmons was asked if he supposed it was a difficult decision that his ancestor had to make.

"No, I don't think so," he replied. "You see, later on Grandfather asked for and got transfer to a combat outfit. But he always said the hardest thing he ever had to do—even at Vicksburg—was to shoot at the United States flag. Him having been a United States scout and all."

"Anyway, whenever he told the story about Abe, we kids would ask, 'And what did you do when you saw him, Grandfather?'"

"And the old man would smile and say: 'Why, I just tipped my hat and walked on down the street.'"

—Sigman Byrd

Radiological Committee Members Appointed

Members have been named to the MSC Radiological Control Committee headed by Chairman Shell E. Martin. They are Warren Gillespie, executive secretary, and members John C. French, Perry E. Westerfield (Alternate to French), Alfred B. Eickmeier, Caldwell C. Johnson and H. Kurt Strass.

The Committee reports to the Director through Dr. Charles A. Berry, Director of Medical Research and Operations.

Space News Of Five Years Ago

June 24, 1961—Modifications were made to the spacecraft designated for the second manned suborbital Mercury flight. An observation window replaced two view ports and an improved manual control system was installed.

President Kennedy assigned Vice President Johnson the task of unifying the nation's communications satellite programs in a letter which stressed urgency and "highest priority" for the public interest.

June 27, 1961—Senate Aeronautical and Space Sciences Committee unanimously approved the administration's \$1,782,300,000 budget for NASA in fiscal year 1962.

Eight-engine test of Saturn SA-T2 of 29.9 seconds' duration successful at Marshall Space Flight Center.

June 28, 1961—Using Space-

craft No. 5, a spacecraft seaworthiness test was conducted 65 miles east of Wallops Island. Sea conditions varied with 2 to 4-foot ground swells and wave heights of from 1 to 2 feet. Spacecraft floatation characteristics were found to be quite satisfactory.

Tracking network requirements for the Mercury extended range or 1-day mission were discussed between Space Task Group and Goddard Space Flight Center personnel.

June 29, 1961—Personnel strength for the Space Task Group was 794.

July 1, 1961—Responsibility for the operation of the Mercury global network was assigned to the Goddard Space Flight Center. During active mission periods network control would revert to Space Task Group personnel.

Champions of the Lanes



TROPHY ROW—Members of the "Chizzlers" team of the MSC Mimosa Men's Bowling League show off their trophies for having taken first place in the 1965-1966 League season. Left to right are Bob Graham, Dan Kennedy, Earl Patterson, John Sargent, Dex Haven and George Amason. Not in the photo are Chizzlers John Dornbach and Tom Brahm.

MSC Campaign Afoot To Banish Wasteniks

"MSC Days" is part of MSC's continuing effort to support President Johnson's war on waste. Beginning Monday, June 27, all employees will have a chance to unload. Get rid of all of excess office supplies, furniture, equipment, tools, and miscellaneous items that are cluttering up the office or lab space.

MSC Days gives each employee a chance to get rid of all surplus without having to bother about paper work, trips to the supply service center, or any other administrative detail. Labeled boxes will be provided. Put excess items in the right box. Report excess furniture, office, shop, or lab equipment to the Area Campaigner. He will do the rest.

Three days, Monday, Tuesday, and Wednesday, June 27, 28, and 29 have been selected to clear out the hoards. To be a big success MSC Day program needs the support and active participation of each MSC employee.

The Area Campaigner can give help and advice, or call the MSC Cost Reduction Office on extension 5256.

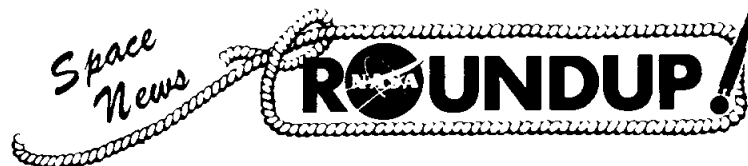
Masons to Organize New MSC-Area Lodge

Organizational meetings for a new MSC-area Masonic Lodge will be held each Thursday at 7:30 pm at the Congress Inn. All Master Masons are urged to attend or contact Tom Tucker at HU 8-3300, Ext. 398 or at 932-3927.

Aero Clubbers Asked To Pledge Flight Time

The MSC Aero Club has asked that each member make a commitment to fly at least one hour each month. Commitment forms are being collected by Mel Feldman with a deadline of Tuesday, July 5.

The Club has scheduled an Instrument Ground School Seminar for Wednesday, July 6 in the New Center Auditorium at 5 pm. The next regular meeting will be on July 12 in the News Center at 5 pm.



MANNED SPACECRAFT CENTER, HOUSTON, TEXAS

EMPLOYEE NEWS

1966 MSC/EAFB Fast-Pitch Softball League

American Division			National Division	
1. TRW			11. Lockheed Electronics	
2. IBM/RTCC			12. McDonnell Aircraft	
3. Lonestars (ASTD)			13. NAA	
4. Link			14. Brown & Root	
5. Graham			15. Hustlers (Comp & Anal)	
6. IESD/LEC			16. MSC/Pyros	
7. MSC/AF MOLS			17. Weather	
8. FCD			18. IESD	
9. Philco/WDL			19. CG/Houston	
10. 747th Rams			20. 2578th	

All games are played on EAFB Diamond No. 1. Game times are at 6 and 8 pm. Teams are listed in schedule by numbers assigned above.

June 27	June 28	June 29	June 30	July 1
15 vs 16	12 vs 19	11 vs 20	14 vs 17	13 vs 18
2 vs 9	5 vs 6	1 vs 10	4 vs 7	3 vs 8
July 4	July 5	July 6	July 7	July 8
8 vs 4	10 vs 2	6 vs 1	7 vs 5	20 vs 12
18 vs 14	13 vs 19	16 vs 11	17 vs 15	3 vs 9

1966 MSC/EAFB Slow-Pitch Softball League

American Division			National Division	
1. TSD All Stars			13. SMD Moonrakers	
2. LRD			14. IBM	
3. TRW OGOS			15. CSD	
4. FSD Batmen			16. Univac	
5. MPAD/FAB			17. FSD Dirty Sox	
6. APSO Lunatics			18. RMD Plus	
7. IESD Misfits			19. P&PD Hustlers	
8. Security Mets			20. SSD	
9. Pro & Con			21. TSD Virginians	
10. MPAD/Animals			22. MPAD/RAB	
11. FCSD			23. Lockheed Operators	
12. GE			24. CG/EAFB	

All games are played on EAFB Diamond No. 3. Game times are 6, 7:30 and 9 pm. Teams are listed in schedule by numbers assigned above.

June 27	June 28	June 29	June 30
11 vs 12	8 vs 4	23 vs 24	20 vs 16
6 vs 1	9 vs 3	18 vs 13	21 vs 15
7 vs 5	10 vs 2	19 vs 17	22 vs 14
July 4	July 5	July 6	July 7
3 vs 8	12 vs 10	15 vs 20	24 vs 22
2 vs 9	1 vs 11	14 vs 21	13 vs 23
5 vs 6	4 vs 7	17 vs 18	16 vs 19

Roundup Swap-Shop

(Deadline for classified ads is the Friday preceding Roundup publication date. Ads received after the deadline will be run in the next following issue. Send ads in writing to Roundup Editor, AP3. Ads will not be repeated unless requested. Use name and home telephone number.)

FOR SALE

Lotus 7 spares for many engines. Pair of 1 1/2" SU carbs, Volvo w/ford-Lotus manifolds and linkage \$35. (Healey, TR, etc) Coxworth A-111 billet cam \$40. Stock Anglia 105-E gearbox \$35 complete. Jon Farberman, WA 6-7192 or RI 7-3435.

Self-contained travel trailer, air conditioned, sleeps six, two years old. Low down payment; low monthly terms. Lloyd Arnold, HO 5-1877.

32-foot ChrisCraft cruiser, sleeps 6, new upholstery, rebuilt engines and hull. Stall 36 Lakeside Boat Storage. NASA Road 1. Asking \$4000. Henry Fancher, 877-1379.

AKC-Registered Dalmation puppies, wormed; ideal children's companion, guard dog. Donald W. Lewis, NB 591-3830.

1965 Triumph Spitfire convertible, like new. \$1200. L. Fry, HU 4-5644 after 6 pm.

Royal portable typewriter with electrical engineering keyboard, good condition, \$45. David Hench, HU 6-3229.

AKC-registered Beagles, 6-weeks old, champion sired, shots, wormed. H. S. Cobb, 748-5034.

3-bdr, 2-bath 1-story brick in Swan Lagoon across from MSC, central heat/air, fenced yard, landscaped. \$22,500 or equity plus assume 6% loan and \$142/mo payments. Dr. Howard A. Minners, 2523 Lazy Lake Drive, 932-2417.

Two-wheel auto trailer, 14-inch wheels, leaf and coil springs, chocks. \$75. Frank Stafford, HU 6-0138.

Factory manual for 1960 Rambler Classic, Ambassador, and Rebel, \$4. Paul Marchal, 534-3021.

4-bdr 2-story Colonial in El Lago, large upstairs playroom, formal dining room, carpet, drapes, shaded corner lot, 3200 sq ft. Paul Foote, Kemah 877-2395.

120x150 wooded lot, cleared, ready for house, El Lago Estates, swimming pool membership. HA 4-2457.

15-foot Smithcraft runabout, deep sided-broad beam, sleeps 2, convertible top, like-

new 40-hp electric-start motor, tilt trailer, ski equipment, \$850. R. Herold, PA 9-0852.

3-bdr, 2-bath, 2-car garage, central heat/air, carpets, built-ins, intercom, large family room, 1900 sq ft. \$17,600. Low down to existing FHA loan; \$131/mo including everything. Warren J. Wood, HA 4-2769.

16-ft Jetcraft, 90-hp inboard, perfect condition. \$800 including trailer. Rauscher, HA 4-3337 after 6 pm.

1 1/2-cu ft Servel electric Wonder Bar refrigerator for game room, bar or bedroom, \$35. Rauscher, HA 4-3337 after 6 pm.

3-bdr 2-bath brick colonial in El Lago, air conditioned, landscaped, GE built-ins, \$23,400 or equity plus assume \$110/mo payments. Frank Samonski, 877-4795.

3-bdr 2-bath in MacGregor Palms, large den, living/dining room, central heat/air, carpets, dishwasher, sewing room, \$14,425 FHA. Don Donohoe, MI 5-6751.

Trumpet and saxophone in fair condition, make offer. Dale Nussman, HU 6-0359.

3-bdr 3-bath, large screened area, wooded site, 277-ft Clear Creek frontage, electric boat lift and boat barn, central air/heat, carpets, drapes. Off Deepwood Drive, Friendswood. Bonnie Langston, HU 2-7478 or MO 4-2452.

3-bdr 2-bath brick in Sagemont area, air conditioned, big den, 2-car garage, \$16,500. \$1200 down, assume 6% loan. George Duke, HU 7-2471.

1962 19-ft Glastron Gulfstream boat, 100-hp Volvo inbd/otbd engine; top, side and aft curtains, 1962 Gater tandem trailer, \$2400. Don Andrews, 877-4111.

GE under-counter copper-tone dishwasher, \$50. Formica dinette w/4 chairs, \$35. Baby crib and mattress, \$15. Jack Hartung, 877-1284.

FOR RENT

Furnished or part-furnished 4-bdr 2-bath in Imperial Estates, Friendswood, fireplace, 2-car garage. Available late August thru June 1967, \$265/mo. James E. Powers, HU 2-7940.

EAA Schedules Rollerskate Party For Youngsters

The MSC Employees Activities Association has scheduled a roller skating party for MSC youngsters and friends from 4 to 6 pm, Sunday, July 10. The party will be held at the Gulf-gate Roller Rink, 6839 Holmes Road. Children under 10 years of age must be accompanied by a parent.

Admission will be ten cents per person, including skate rental. Refreshments can be purchased at the rink.

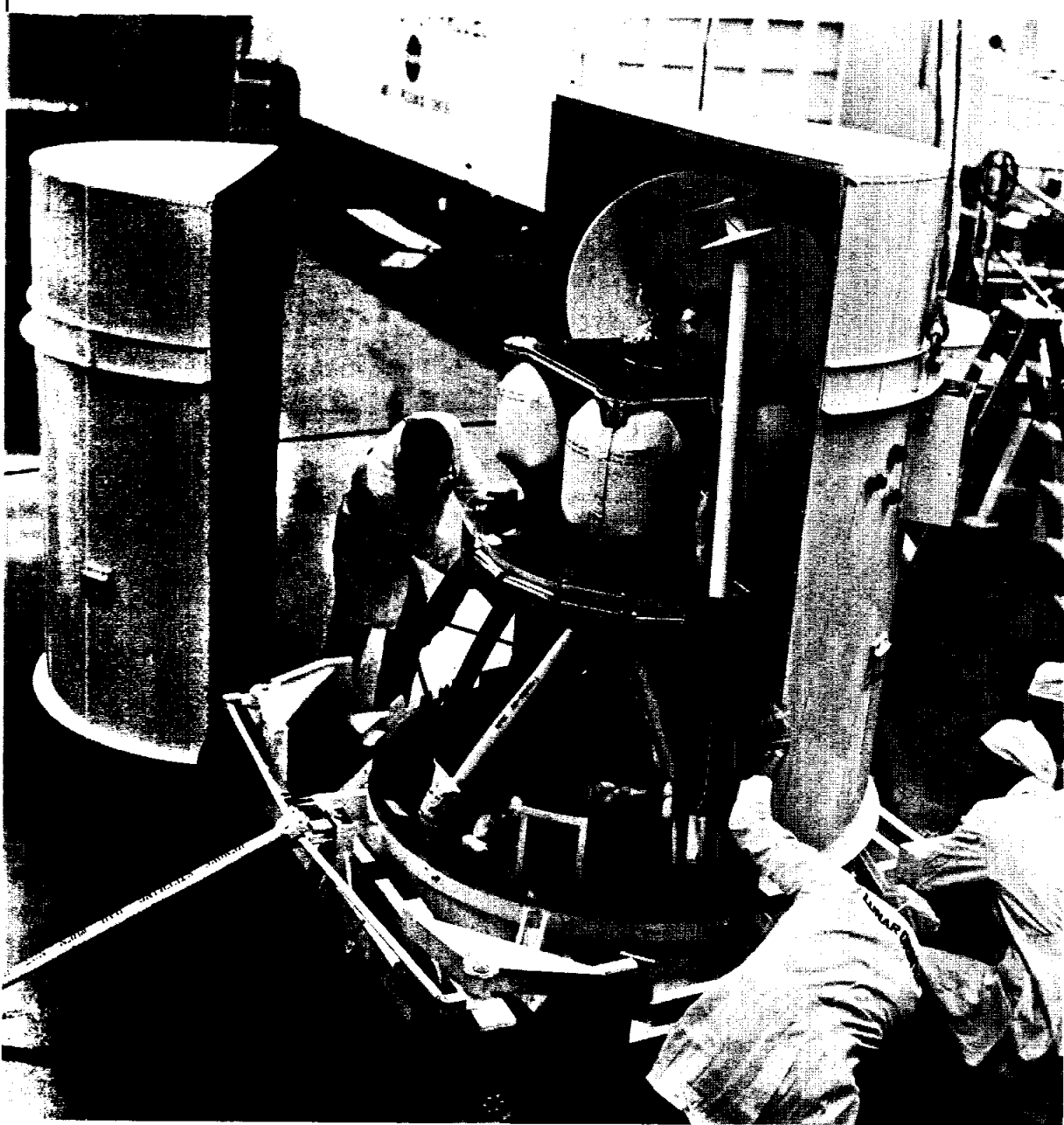
Children, parents, and guests are asked to meet at the Visitor Control parking lot, Gate 1, at MSC. Buses will depart at 3:00 pm for the trip to the rink, and will return to MSC at approximately 6:45 pm. Participants may also drive directly to the skating rink if they so desire.

Ticket sales are currently limited to 450 persons. Tickets may be purchased from EAA district representatives. The February 27 ice skating party had a good turnout, and this party promises as much fun.

For further information on the skating party, contact Barbara Vickers at 5241 or Sandra Burdsal at 5156.



Advance Scout for Apollo



FIRST FLIGHT ARTICLE—Boeing technicians prepare the first flight model of the Lunar Orbiter spacecraft for shipment to Kennedy Space Center where it will be launched during the second half of 1966 by an Atlas/Agena launch vehicle. The Lunar Orbiter series spacecraft will take high-resolution photographs of likely Apollo landing sites. Boeing is building eight Lunar Orbiters, including three ground test vehicles, for the NASA Langley Research Center.

Flight Research Center Schedules First Flight of External-Tank X-15

The NASA Flight Research Center at *Roundup* press time had scheduled the first free flight of the number two X-15 with full external propellant tanks for Wednesday, June 22. Air Force Lt. Col. Robert A. Rushworth was the pilot.

Primary purpose of the flight

was a complete checkout of the external tanks' transfer system and an investigation of the tank separation characteristics. Aircraft handling qualities with full tanks was also to be evaluated. Ablative material for heat dissipation was planned to be carried on different areas of the aircraft.

The two 25-foot-long tanks contain 13,500 lbs. of anhydrous ammonia and liquid oxygen. This is in addition to the 18,500 lbs. of propellant carried internally by the X-15. The additional propellant can increase the burning time of the X-15's rocket engine from 85 seconds to 145 seconds at full power. The additional engine burn time was expected to increase the X-15's speed capability up to almost eight times the speed of sound, over 5,000 mph.

On the first flight, Rushworth was to shutdown the X-15's rocket engine after 132 seconds of burn time and use speed brakes. Programmed maximum speed is approximately 4,000 mph, six times the speed of sound.

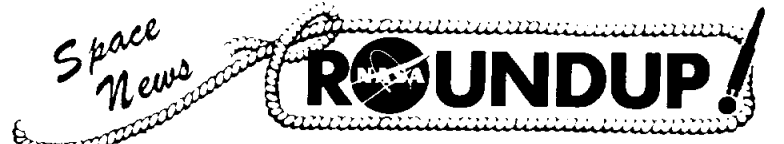
The X-15 was to be air-launched from a B-52 near Mud Lake, Nevada. Engine propellant is supplied from the external tanks during the first 60 seconds of powered flight. Once empty, they are jettisoned for a parachute descent and recovery for re-use.

The final 72 seconds of powered flight utilizes internal propellant. Planned maximum altitude was 100,000 feet. Maximum anticipated temperatures were 1200°F.

Hit a Brace There, Mister!



TEN-SHUN!—Frank Borman relives his experiences of 16 years ago as he watches cadets at the US Military Academy in their noon meal formation. Borman, a 1950 West Point graduate, presented to the Corps of Cadets the flag of the cadet company he commanded while at West Point and which he carried with him in the Gemini VIII mission. During his two-day visit to the Academy, Borman spoke to the cadets about the US space program and the Apollo lunar landing.



SECOND FRONT PAGE

Engert Speaks to ISA On Apollo TV System

Max Engert, Apollo television system project engineer in the MSC Instrumentation and Electronic Systems Division, will be the principal speaker at the June 29 meeting of the Apollo Section of the Instrument Society of America.

Engert will discuss the problems which were faced in the design of the Apollo real-time television system which will permit viewers on earth to observe Apollo spacecraft on-board activities and lunar surface explorations. Since power available from Apollo spacecraft electrical systems would not permit the TV system to have commercial bandwidths and frame rates, a set of Apollo TV Standards were evolved. Apollo TV's frame rate is 10 per second instead of commercial TV's 30 frames per second. Pictures quite close to commercial broadcast quality are produced by pumping the Apollo TV camera's image through a scan converter.

Engert will demonstrate for ISA members a Lunar Block II Apollo TV camera and the scan

converter operation.

Non-ISA members are invited to attend the meeting. For reservations, call Lawrence Lockwood at HU 8-0850, Ext. 332.

The meeting will be at the Holiday Inn on NASA Road 1, with cocktails at 6:15, dinner at 7:15 (\$3.25/person) and the meeting at 8.



Lovell, Aldrin Prime Crewmen For Gemini XII

Astronauts James A. Lovell, Jr., and Edwin E. Aldrin, Jr., will be prime crewmen for Gemini XII, the final mission in the Gemini Program.

Backup crewmen are L. Gordon Cooper, command pilot, and Eugene A. Cernan.

Lovell, a Navy captain, was the pilot of the Gemini VII mission. Gemini XII will be the first space flight for Aldrin, an Air Force major. Lovell and Aldrin were backup crewmen for Gemini IX. Cooper, an Air Force colonel, was pilot of the final Mercury flight and was command pilot of Gemini V. Cernan, a Navy commander, was the pilot in the Gemini IX mission.

Gemini XII is officially scheduled for the first quarter of 1967; however, the Gemini Program Office is trying to maintain a pace which permits a flight every other month.

As presently planned, Gemini XII will include an early rendezvous between the spacecraft and an Agena Target Vehicle, dual rendezvous similar to that scheduled for Gemini X, standup extravehicular activity, and EVA to evaluate the Astronaut Maneuvering Unit. The exact revolution for initial rendezvous has not been determined.

The standup EVA will closely parallel the Gemini X activity. Aldrin will use a short oxygen and electrical umbilical to enable him to stand in the open hatch and conduct a series of photographic experiments. His EVA, using the AMU, will be similar to the plan which was set up for Cernan on Gemini IX.

A decision on whether the passive target for Gemini XII is to be the Gemini VIII Agena or the Gemini X Agena will be made after orbital figures and decay rates for both vehicles are firmly established.

Gemini XII will be a three-day mission. The flight plan will include repeats of many experiments plus activities, such as the AMU evaluation, which were not completed on earlier flights.

Gemini X

(Continued from page 1)

era (S-13), Ion Wake Measurement (S-26), and Bioassays of Body Fluids (M-5).

Landing of Gemini X is planned at the beginning of the 45th revolution in the Western Atlantic recovery zone.

Nozzle Check



ABLATION—Even in a smock, this Aerojet-General technician improves the appearance of an Apollo service module engine thrust chamber as she measures throat diameter following a test firing.