Space News ROUNDUP!

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First Manned Gemini Mission

Grissom-Young Flight Scheduled Next Week

The launching of the first manned Gemini spacecraft, the first manned spacecraft that will be able to change the size of its orbit during flight and fly a controlled re-entry, has been scheduled for a three-orbit mission next week.

Countdown for the flight will begin seven hours before launch, with liftoff at T plus four seconds and orbit confirmation at LO plus 5 minutes 58 seconds.

Designated Gemini 3, the flight is to be launched from Complex 19 at Cape Kennedy, Fla., no earlier than Tuesday March 23.

The flight crew is Virgil I. (Gus) Grissom, command pilot, and John W. Young Jr., pilot. The backup crew is Walter M. Schirra Jr., command pilot, and Thomas P. Stafford, pilot.

Approximately 4 hours and 50 minutes after lift-off, the spacecraft is scheduled to land in the Atlantic Ocean near Grand Turk Island in the West Indies, where it will be recovered by U.S. Naval forces.

The first of the manned Gemini test flights, this flight is designed to validate the man-machine relationship and make the Gemini program fully operational. The flight crew will manage all on-board systems. The first two Gemini flights qualified the launch vehicle and the spacecraft.

The spacecraft will be launched on a true azimuth heading of 72 degrees east of north into an 87-130 nautical-mile orbit (100-150 statute miles). To test the ability of the spacecraft and crew to maneuver in space and make substantial velocity changes, the astronauts will use the spacecraft thrusters to achieve a near circular orbit of 87-93 nautical miles (100-107 statute miles) as they pass over Texas near the end of their first

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READY FOR FLIGHT—The GT-3 crew Command Pilot Virgil I. (Gus) Grissom (right) and Pilot John W. Young, are shown suited up much like they will be next week for their historic first Gemini flight. The Pad 19 gantry from which they will begin their flight is in the background.

Communications, Live Organisms, Subject Of Inflight Experiments

Three inflight experiments will be conducted on the three-orbit flight of GT-3 along with other evaluations, plus preflight and postflight experiments.

Experiment No. S-2 "Effects of Zero Gravity on the Growth of Sea Urchin Eggs" will explore the possibility of the existence of a gravitational field effect on cells exposed to low gravity conditions.

The experiment consists of a metal cylinder containing eight separate samples of sea urchin eggs, sperm, and a fixitive solution. At designated times, the eggs and sperm will be united to start fertilization and growth

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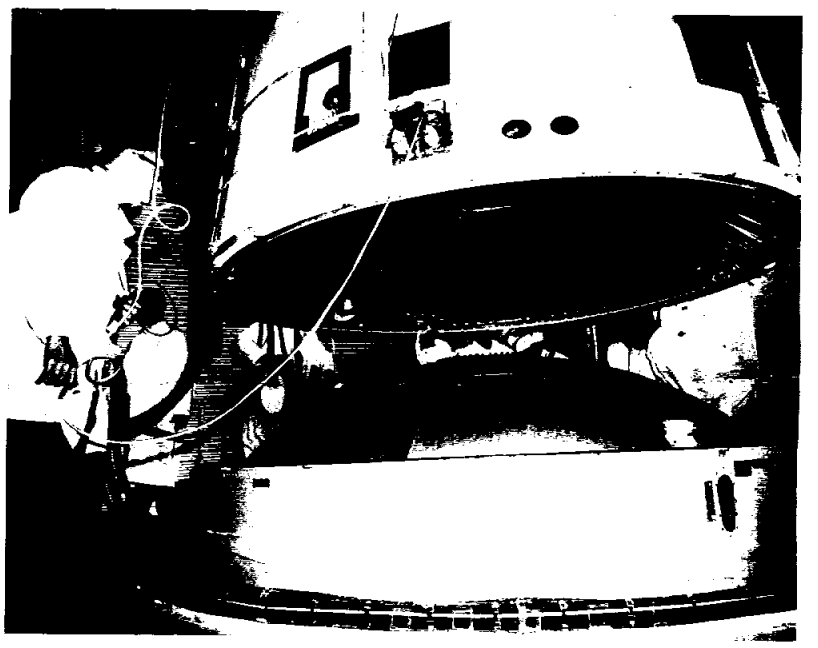

SPACECRAFT MATING—Gemini spacecraft 3 is mated to the Gemini Launch Vehicle in the white room of Pad 19.

House Space Committee Members Visit Center

PRESS CONFERENCE—Dr. Robert R. Gilruth (left), director, MSC, is shown with congressmen (l. to r.) George P. Miller, D., Calif.; Olin Teague, D., Texas; and Bob Casey, D., Texas; at a press conference for news media here March 5. The congressmen were here for a budget hearing. Miller is chairman of the House Committee on Science and Astronautics, and Teague is chairman of the Subcommittee on Manned Space Flight. Other committee members here for the budget hearing were Joe D. Waggoner, D., La.; Don Fuqua, D., Fla.; James G. Fulton, R., Penn.; Edward J. Gurney, R., Fla.; Brockman Adams, D., Wash.; and Gale Schisler, D., Ill. The GT-2 spacecraft is shown in the background above.

MSC Technical Symposium Scheduled Here March 29

The regular monthly MSC Technical Symposium will be held from 6:15 to 8:15 p.m., Monday, March 29, in the Auditorium of Building 1.

On the program will be the following topics:

"Real Time Computing Support for Manned Space Flight Missions" by Lynwood Dunseith from Mission Planning and Analysis Division.

"Double Hohmann Transfer Concept for Lunar Excursion Module Intercept and Rendezvous with Command and Service Module" by Floyd V. Bennett, Guidance and Control Division.

"Project FIRE" by Richard Dingledine from the Langley Research Center.

Admission to the session requires a security clearance at the confidential level.

All interested MSC employees are invited to attend these sessions which are held the last Monday of each month. The auditorium has adequate space.

Preceding the session, a dinner will be served from 4:45 to 6:15 p.m., in the MSC Cafeteria. All divisions are requested to transmit a list of attendees to the meeting manager by March 24, designating who will eat dinner at the Cafeteria.

For additional information on the symposium, call Warren Gillespie Jr., meeting manager, at Ext. 3711.

GT-3 Flight

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revolution around the earth.

During their second orbit, they will make slight out-of-plane or lateral maneuvers to test further the spacecraft's ability to change its flight path.

Shortly before retrofire time on their third orbit, the astronauts will put their spacecraft into a reentry elliptical orbit with a perigee, or low point, of 45 nautical miles (52 statute miles).

Thus the flight is to provide the first orbital test of the spacecraft's propulsion system, so important in later Gemini and Apollo missions in the development of space rendezvous techniques.

A computer, an inertial platform and a reentry control system on board the spacecraft will be used to calculate the proper bank angles and maneuver the spacecraft for a controlled reentry and landing at the prescribed point.

The spacecraft's center of gravity is offset from the geometric center and results in aerodynamic lift during reentry. The pilots will use this lift to "fly" the spacecraft to a specified landing point.

Three in-flight experiments are planned for this mission. One will test the effects of weightlessness on living cells, another will measure the effect of weightlessness and radiation on human white blood cells, and the third will be an effort to send radio signals through the ionized layer of air that envelopes the spacecraft during reentry.

In addition, the study of cardiovascular effects of space flight which began in Project Mercury will be continued.

During the second orbit, the pilot will evaluate Gemini flight food for ease of access, handling and preparation.

Improved countdown procedures for the Gemini launch vehicle will permit the flight crew to enter the spacecraft about an hour and a half before launch.

The satisfactory completion of the following objectives is mandatory for mission success:

1. Demonstrate manned orbital flight in the Gemini spacecraft and further qualify spacecraft and launch vehicle systems for future manned missions.

2. Demonstrate and evaluate operations of the world-wide tracking network with a spacecraft and crew.

3. Evaluate Gemini design and its effects on crew performance.

4. Demonstrate and evaluate capability to maneuver spacecraft in orbit using the Orbital Attitude and Maneuvering System (OAMS).

5. Demonstrate capability to control re-entry flight path to a preselected landing point.

6. Evaluate performance of certain spacecraft systems.

7. Demonstrate systems checkout, prelaunch and launch procedures for manned spacecraft.

8. Recover spacecraft and evaluate recovery systems.

Dr. George E. Mueller, NASA associate administrator for Manned Space Flight, NASA Headquarters, Washington, D. C., is acting Gemini program director. William C. Schneider of the same office is deputy director.

The program is managed by the Manned Spacecraft Center's Gemini Program Office, headed by Charles W. Mathews. Col. Richard C. Dineen, USAF Space Systems Division; and Lt. Col. John G. Albert, 6555th Aerospace Test Wing, Patrick Air Force Base, Fla., are responsible for the development and launch, respectively, of the Gemini Launch Vehicle (GLV), a modified Titan II rocket.

Christopher C. Kraft Jr., MSC assistant director for Flight Operations, has been designated Gemini 3 Mission Operations Director. He also will serve as Flight Director.

A wide range of Department of Defense support for this mission, including tracking, recovery ships and launch services, is under the direction of Lt. Gen. Leighton I. Davis, USAF, National Range Division commander and DOD manager of Manned Flight Support Operations.

Prime contractor for supplying the Gemini spacecraft is McDonnell Aircraft Corp., St. Louis. The Martin Co., Baltimore, manufactures the Gemini Launch Vehicle, which is supplied to NASA through the Space Systems Division of the Air Force Systems Command.

PRE-FLIGHT TRAINING—Astronauts John W. Young (left), pilot, and Virgil I. (Gus) Grissom (right), command pilot for the GT-3 flight are shown during a training exercise in the crews ready-room. The facility is located in a large house trailer at Pad 16.

By U.S., Mexico Agreement

Guaymas Tracking Station Operation Extended To 1970

The Mexican and U.S. governments have agreed to extend to 1970 the existing agreement for operation of the National Aeronautics and Space Administration tracking station at Guaymas, Mexico.

Extension of the agreement will continue the former Project Mercury tracking station for the Project Gemini and Project Apollo programs.

The agreement, which established the station in 1960 for the Mercury program, was amplified in 1963 to include unmanned scientific satellites as well. The two governments also have agreed upon other areas of cooperation, particularly in meteorological sounding programs.

In support of Project Gemini, the Guaymas station will provide dual capacity in tracking the Gemini spacecraft and the Agena rendezvous vehicle simultaneously. It will be the first North American land station to establish voice communication with the Gemini astronauts after their orbit sweeps them past Australia across the Pacific Ocean toward the United States.

2d Space Congress Set For April 5-6-7 At Cocoa Beach, Fla.

The Second Space Congress, sponsored by the Canaveral Council of Technical Societies, will be held April 5-6-7 in Cocoa Beach, Fla., with "New Dimensions in Space Technology" as its theme.

Featured speakers on the program will include Congressman Olin E. Teague; NASA Administrator James E. Webb; Dr. George E. Mueller, associate administrator, NASA's Office of Manned Space Flight; Maj. Gen. D. R. Ostrander, commander, Office of Aerospace Research; and J. L. Atwood president, North American Aviation.

Papers will be presented which will cover new and projected aspects of space science. Sessions will include Space Communications, Re-Entry, Ground Support and Launch, Missions and Programs, Navigation and Control, Propulsion, Quality, Value and Reliability, Life Support Systems and Bio-Astronautics, Advanced Range Instrumentation and Techniques, Management, and Space Power.

The Congress will also feature special tours and briefings of Cape Kennedy and the Merritt Island Launch Area.

Registration for the Congress will be held from 4 to 6 p.m., April 4, and each day beginning at 8 a.m., during the Congress, for those who do not register in advance.

Gemini Pressure Suit Passes Final Test, Declared 'Ready To Go' For First Flight

Crew Systems Division Engineers at Manned Spacecraft Center have completed final phases of the pressure suit qualification test program, and the flight suits have been declared "ready to go" for the first manned Gemini launch.

Major tests on the suits were completed in December 1964, and the final tests run have provided added insurance for the suit's reliability as a back-up for the cabin pressurization system.

In addition to the qualification tests, a series of manned decompressions were performed with a suited subject in the 20-foot vacuum chamber in the Crew Systems laboratory at the Manned Spacecraft Center. The decompressions were run to demonstrate confidence in suit performance under worst emergency conditions.

In this test, the subject is placed in a parasite chamber three feet wide, five feet high and four feet deep. The chamber pressure is maintained at 5.1 psi, approximately the same as Gemini cabin pressure. The main 20 foot diameter chamber is then evacuated to a high vacuum such as exists 240,000 feet above the earth.

When a decompression valve is opened between the two chambers, the air rushes into the vacuum in the large chamber in two tenths of a second, and the Gemini suit pressurizes to 3.9 psi to protect the subject from the hard vacuum.

The test demonstrates the back-up role of the suit to protect the astronauts if they should lose cabin pressure while orbiting in space.

Earlier in the week, engineers had tested the visor of the helmet under conditions which might cause it to fog and restrict the astronaut's visibility. These tests were preceded by a series in the thermal chamber which tested the suit cooling system under reentry, orbital, and pad abort excessive heating conditions.

At the same time, in El Centro, Calif., the suit successfully passed tests in Gemini ejection seats and in parachute jump tests.

More than 47 tests were performed in the qualification program for the suit. They include such tests as life cycling, comfort tests, mobility tests, and suit component testing.

The final nod was given for the Gemini suit only after it had met the exacting standards for each of these tests, and the results were analyzed by MSC engineers and management.

Glenn Returns To NASA Program As Consultant To Administrator Webb

Col. John H. Glenn Jr., America's first astronaut to orit the Earth, was sworn in as a consultant to the National Aeronautics and Space Administration February 26 by NASA Administrator James E. Webb.

Glenn, who retired from the Marine Corps in January, will work with Administrator Webb in various aspects of NASA programs as his time and interest allow, including participation in conferences, appearances both in the United States and overseas, and following up on developments underway.

One of Glenn's first tasks for NASA will be to attend the quarterly meeting of the Aerospace Research Applications Center at the University of Indiana, Bloomington, April 8.

ARAC was established at the university in 1962 under a NASA contract to accelerate transfer results to industry of the space agency's research and development effort. The university uses a computer to store data and make it available to some 35 midwest companies which have subscribed to the program.

Experiments

(Continued from Page 1)

process. After a specified time, the fixative solution will be applied to the egg embryo to stop its growth.

Dr. Richard Young of NASA Ames Research Center is in charge of this experiment which is sponsored by the NASA Office of Space Sciences.

Experiment No. S-4 "Synergistic Effect of Zero Gravity and Radiation on White Blood Cells." The Atomic Energy Commission will conduct this Office of Space Sciences experiment, with Dr. Michael Bender in charge.

The experiment will measure the changes in human blood samples exposed to a known quantity of radiation during the zero gravity phase of the mission. For comparison, a similar series of control samples will be exposed simultaneously at the launch site. An analysis also will be made on blood samples taken from the flight crew immediately before and after the mission.

Experiment No. T-1 "Re-entry Communications" is designed to restore radio communications during the ionizing of the plasma sheath that surrounds the spacecraft upon re-entry into the earth's atmosphere.

The experiment was designed by NASA Langley Research Center and is sponsored by the NASA Office of Advanced Research and Technology. The experimenters are W. F. Cuddihy, L. C. Schroeder, and Theo Simms, all of Langley.

By injecting water into the sheath around the nose of small objects re-entering the atmosphere, the technique has worked. In this experiment an extension of this technique will be tried on a large, blunt, high velocity vehicle.

Water will be injected in timed pulses at different flow rates into the ionized plasma sheath, and ground stations will receive UHF signals in phase with the timed water injections. Signal levels received will be monitored and recorded for use in evaluating the effectiveness of the different flow rates.

Experiment No. M-2 "Cardiovascular Effects of Space Flight" is a continuation of studies begun during Project Mercury to evaluate the effects of prolonged weightlessness on the cardiovascular system. Astronauts Schirra and Cooper experienced lower than normal blood pressure in the erect position immediately after emerging from the spacecraft.

This experiment, conducted by the Space Medicine Branch of the Crew System Division of the Manned Spacecraft Center, is sponsored by the NASA Office of Manned Space Flight.

Comparisons will be made of the astronauts' preflight and postflight blood pressures, blood volumes, pulse rates, and electrocardiograms.

During the mission an evaluation of flight food packaging will be made during the second orbit. Two meals of four items each will be aboard the spacecraft.

The food will be stowed in a box on the left side of the Gemini cockpit. During the second orbit, the command pilot (Grissom) will transfer the meals to the pilot (Young) who will evaluate each item.

For photography on the flight, a 70mm Hasselblad still camera and a 16mm movie camera will be available for use by the crew.

Medical checks during flight will be based on biomedical telemetry and voice communications. This data will be used to evaluate general conditions of the crew, blood pressure, and oral temperature.

PRIME-BACKUP CREWS—Astronauts Virgil I. (Gus) Grissom and John W. Young board the vehicle at the ready room on the way to the launch pad, in a practice training exercise. The backup crew of Astronauts Walter M. Schirra Jr., command pilot, and Thomas P. Stafford, pilot, observe the exercise.

Atomic Energy Commission

Radiobiology Orientation Course To Be Offered Here, April 1-2

A technical Radiobiology Orientation Course will be offered here at the Manned Spacecraft Center, April 1-2, for those directly or indirectly concerned with spacecraft hardware, mission planning, and related fields.

The Crew Systems Division has organized the course in conjunction with the Atomic Energy Commission's Division of Biological and Medical Research, Argonne National Laboratory, Argonne, Ill.

Richard S. Johnston, chief, Crew Systems Division will welcome the group, and Dr. John Billingham, chief, Environmental Physiology Branch, CSD, will introduce the speakers for the course which will begin at 8:30 a.m., April 1.

Subjects to be covered in the lectures during the two days include: History of Radiation Research; Cellular and Systemic Basis of Radiation Injury: Radiation Toxicity; Radiation Genetics; Biophysical Aspects of Radiation Injury, Radiation Instrumentation, Radiation Protection and Therapy: Human Radiobiology (including reference to skin damage, radiation sickness and task performance); and Applications of Radiation in Space Flight (including on-board use of radioisotopes and nuclear power and propulsion units).

Lecturers from Argonne Laboratory will include Dr. William Norris, Dr. John Thomson, Dr. Douglas Grahn, and Frank Williamson.

FM Radio Station Joins Other Media Reporting On MSC

A new neighbor of the Manned Spacecraft Center recently joined other news media in the area in covering and reporting on Center programs.

The neighbor is the new FM radio station KMSC, broadcasting on the FM dial at 102.1 mc. The last three call letters of the station coincide with the abbreviation of the Center's name.

Three Abort Modes For Gemini Available In Case Of Malfunction

In the event of a malfunction after lift-off from Cape Kennedy, the Gemini pilots will follow one of the following modes to accomplish an abort of the mission.

Abort modes consist of (1) ejection seats, (2) firing the retrorockets to separate the spacecraft from the launch vehicle, then initiating the spacecraft recovery system, (3) normal spacecraft separation using the OAMS thrusters.

For malfunctions dictating retro-abort mode which occur between 15,000 and 70,000 feet, the astronauts will not initiate abort until aerodynamic pressure has decreased to the point where successful separation of the spacecraft from the launch vehicle is assured.

Escape procedures will be initiated by the command pilot following two valid cues that a malfunction has occurred. The particular malfunction and the time at which it occurs will determine abort procedures as follows:

1. Lift-off to 15,000 feet—Immediate ejection for all malfunctions.

2. 15,000 to 70,000 feet—Delayed retro-abort for all malfunctions. This action consists of arming abort circuits, waiting until aerodynamic pressure has decreased, then salvo firing the four retrorockets to separate from the launch vehicle. This delay requires approximately 5

Caused Delay Of Three Mercury Flights

Weather Plays Big Part In Manned Launch; Meteorologists Supply World-Wide Forecast

If Project Mercury is any indication, the odds are 50-50 that weather could delay the launching of America's first two-manned Gemini spacecraft scheduled for next week.

Half of the six manned Mercury flights were postponed because of bad weather: Astronaut Alan B. Shepard's flight was held up once for weather in the Atlantic recovery area; Virgil I. Grissom Jr's flight was halted once because of clouds over Cape Kennedy, and John H. Glenn's orbital flight was delayed four times because of weather.

Grissom, who made his suborbital, 15-minute space flight on July 21, 1961, is command pilot for the first Gemini flight of as many as three orbits. With him will be fellow NASA astronaut, Navy Lt. Cmdr. John W. Young.

Weather plays a large role in the National Aeronautics and Space Administration's manned space programs, Gemini and Apollo. One of the last things an astronaut does before a flight is attend a weather briefing, usually at the launch pad just an hour or so before the mission.

And the job of providing up-to-the-minute weather data from all over the world for NASA's manned space operations is accomplished by a group of 17 men from the Spaceflight Meteorology Group, a unit of the National Weather Satellite Center of the U. S. Weather Bureau.

Four of these men are stationed here at the NASA Manned Spacecraft Center; two are at Cape Kennedy; six are in Miami, Fla., and five are at the Group's headquarters in Suitland, Md., six miles from the nation's capitol.

But 17 men can't forecast the world's weather without help. They get information from other weathermen in North and South America, Europe, Russia, China and other countries around the globe—members of the World Meteorological Organization. They also get data from Air Force and Navy airborne and shipboard weathermen.

And just before and during manned space flights, additional efforts are made by countries along the flight path, like Australia, which funnel detailed information to the Group—information not normally sent in the four daily international weather reports.

Information also comes in from weather satellites, like Tiros 9, NASA's high-orbiting camera carrier, identifying large storms and frontal areas in such isolated places as the Indian, Atlantic and South Pacific oceans.

The chances of finding good weather all over the world at any one time are "minute," according to Kenneth M. Nagler, the Weather Bureau's head of the Spaceflight Meteorology Group. "There's always bound to be bad weather at certain portions of the track," he says.

Nagler says some months are better than others for world-wide weather. February, he says, is the worst weather month of the year, and March is nearly as bad.

WEATHER BRIEFING—Hal Granger (center), head of the Advanced Planning Section of the Landing and Recovery Division at the NASA Manned Spacecraft Center, gets a briefing on world-wide weather from Kenneth Nagler (left), head of the Weather Bureau's Spaceflight Meteorology Group, and Alan Sanderson, head of the Group's four-man section stationed at the Mission Control Center in Houston.

Mississippi Test Operations

Proving Grounds For NASA's Apollo Moon Rockets, Isolates

You have to be the possessor of some terrifically loud noise makers to justify surrounding yourself with 141,950 acres of land just to keep from disturbing the neighbors.

This is the case with the people at NASA's Mississippi Test Operations near New Orleans, La. They will be testing the giant Saturn rockets that will lift the Apollo spacecraft and astronauts on the half-million mile round-trip to the Moon.

The route for these rockets on their way to the Moon will pass through an area that was once a booming lumber center and more recently a quiet easy-going recreation and paper pulp growing area, located in the southwest corner of the state of Mississippi, in a county called Hancock.

Once again a financial boom, this time resulting from the NASA activity, is being experienced by the local residents, a boom that will soon be joined by the sounds of rumbling rocket engines reverberating through the low lying timberland.

EDITOR'S NOTE: This article is presented to help keep MSC employees informed of the part other NASA installations are playing in the manned space program.

Located between Picayune and Bay St. Louis, Miss., the site was selected by NASA to ground test engines and stages of the Saturn V/Apollo Moon rocket before they go to Cape Kennedy for launching. The site also provides adequate room for future expansion and testing of larger rockets should the need arise.

It is located 38 miles from NASA's Michoud Operation near New Orleans, where the Saturn booster stages are being fabricated. MTO and Michoud are sister organizations under the direction of the NASA George C. Marshall Space Flight Center in Huntsville, Ala.

William C. Fortune is manager of Mississippi Test Operations. The site is located on some 13,500 acres of "fee" land and is surrounded by an additional 128,000 acres that will serve as a buffer zone.

The 13,500 acre site was purchased outright by NASA and the buffer area is being acquired by easement and purchase.

Farming, timber growing, hunting and fishing will be permitted in the buffer zone, but because of the tremendous sound waves that will be generated by the rocket tests, people will not be allowed to live in the area. All habitable structures, other than NASA facilities, are being removed from the entire area.

Gainsville was the only community in the "fee" area that had to be moved. In the buffer zone, residents of the communities of Logtown, Napoleon, Westonia and Santa Rosa had to be relocated.

The test site was selected mainly because of its access to water routes and its closeness to Michoud. The location of the static test facility was announced by NASA, Oct. 25, 1961, and the first tree was felled May 17, 1963, to begin a three-year construction program.

The area where the facility is located has a rich history. In the early 1700's, French settlers found large oysters on the banks of a nameless stream, and, hopefully, christened it the Pearl River.

Located near the center of the test site, is the remains of the community of Gainsville, once a booming river town on the East Pearl River.

At one time or another, the community had three newspapers, and had one of the few post offices along the Gulf Coast from Mobile to New Orleans. Legend has it that Andrew Jackson and his army camped at old Gainsville on their way to fight the Battle of New Orleans in 1815.

When the lumber business was booming in the area, the Pearl River was alive with cargoes shipped from a community just south of Gainsville, appropriately named Logtown. Logtown, like Gainesville, has been moved.

The U. S. Army Corps of Engineers has the responsibility at MTO for land acquisition, design engineering and construction.

At the present time, 29 active construction contracts are in effect for a total cost of nearly $97-million. Since the beginning of the test facility at MTO, a total of almost $256-million has been appropriated for the project through fiscal year 1965.

The predominant features of the test site will be three stands to test fire the 7.5-million-pound thrust first stage and the one-million-pound thrust second stage of the Saturn V. There will be a 400-foot tall dual position stand to test the first stage and two stands to static fire the second stage.

To support these test stands, there will be a Laboratory and Engineering Complex, an Industrial Complex, a harbor and dock, seven and one-half miles of man-made canals, a lock and bridge, and a network of roads and railroads connecting the various facilities.

MTO is a government-owned, contractor-operated facility and NASA people will have management and supervisory responsibilities in overseeing the work of the contractors.

MTO ADMINISTRATION BUILDING—TH Operations will house NASA, General building was recently occupied by NASA

The Boeing Company and North American Aviation, Inc., manufacturers of the S-IC and S-II stages respectively, will conduct tests on their vehicles and perform all other operations within their individual test complexes and stage storage areas at MTO. The General Electric Company is NASA's contractor for plant and technical support.

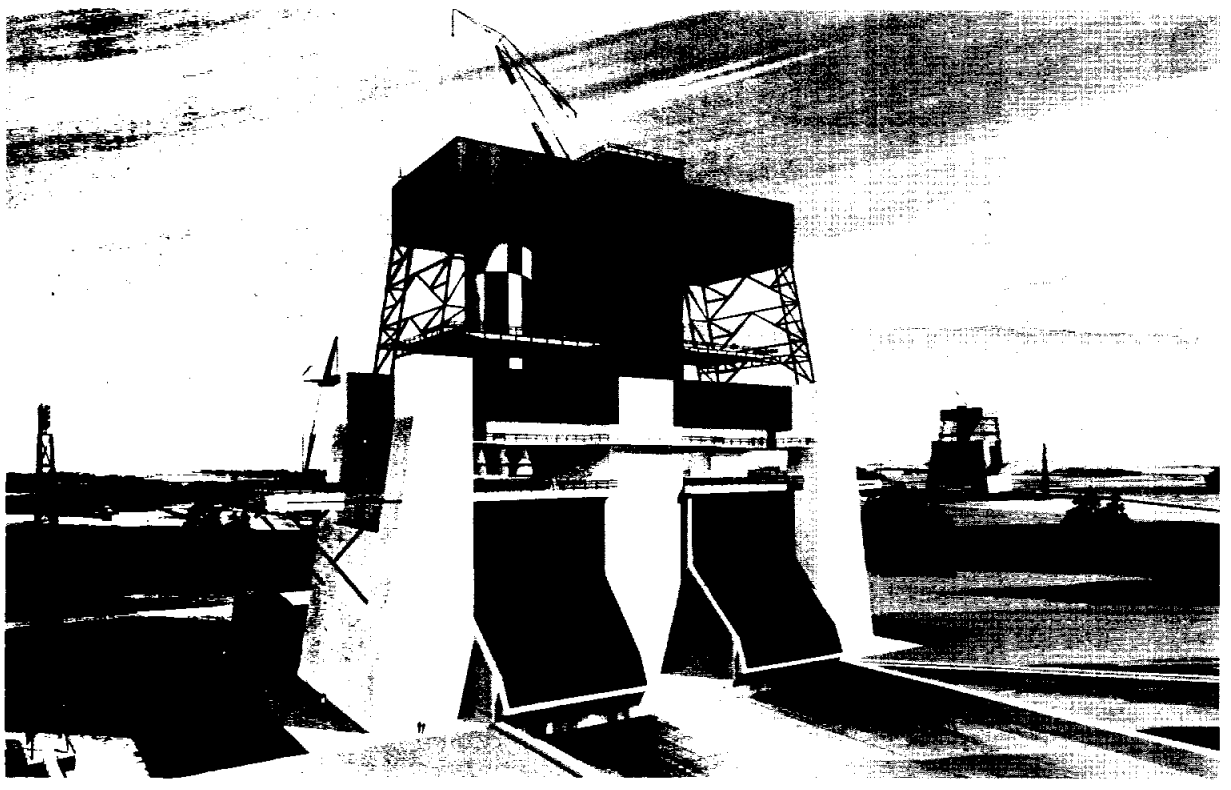
The rockets that are being developed at the Marshall Center, fabricated and assembled at Michoud Operations and in California, will be static tested at MTO, and then shipped to Cape Kennedy for the final assembly and launch.

Developing the spacecraft that will fly atop the Saturn V, and training the astronauts to fly it, is the responsibility of the Manned Spacecraft Center.

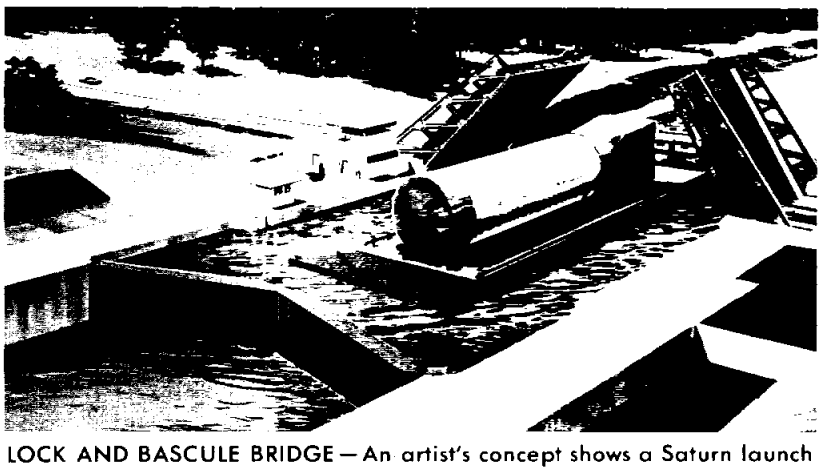
Rockets will be locked in huge test stands for static firing, like the S-IC test tower now under construction.

During static firing, the rockets will develop the same amount of thrust, and function basically just as they would in space. Hundreds of measurements will be taken as the rockets undergo tests. Engineers and scientists can determine from these static tests just how flight-worthy the rocket is before it is delivered to a launch pad.

Testing rockets is MTO's mission and the entire complex, consisting of some 20 support buildings will be located adjacent to the test stands.



S-IC STAGE STATIC TEST COMPLEX—In the lower photo the substructure of the Saturn S-IC test stand is shown. The base is 378 by 146-feet and 40-feet tall. When completed, the structure will appear like the artist's concept in the upper photo. The stand will be over 400 feet tall to the top of the overhead crane and be capable of handling two S-IC stages at the same time.



LOCK AND BASCULE BRIDGE—An artist's concept shows a Saturn launch vehicle going under the bascule bridge as it moves through the navigation lock at Mississippi Test Operations.

MSC Secretaries Eligible To Attend Houston Seminar

The 12th Annual Seminar for Secretaries, sponsored by the Houston chapter of the National Secretaries Association will be held from 8 a.m. to 2:30 p.m., March 27, at the Rice Hotel in Houston, with Judge Sarah T. Hughes as the keynote speaker.

This seminar is sponsored in cooperation with the University of Houston and is not limited to those who serve in a secretarial capacity. Those working with management in any of the areas of office administration are welcome to attend.

MSC's Training Branch will pay the registration fees for MSC people with at least one year of Government service, whose job performance will be improved through attendance at this seminar, and who have been nominated by their supervisor to attend.

Nominations must be submitted on MSC Form 75 to the Training Branch (BP7) no later than today, to be eligible for payment of fees by MSC. Secretaries not nominated by their supervisor are invited to attend, but must pay their own registration fee.

Workshops will be held on Human Relations, Office Procedures, and Investments. The fee for NSA members is $5, and for non-members $6.

For additional information call the MSC Training Branch at Ext. 7311.

EAA Questionnaire To Determine Interest In Forming Theater Group

To determine the number of MSC employees that are interested in organizing a theater group, orchestra, and chorus, a questionnaire is being distributed by the Employees Activities Association.

All interested in the above activities, are urged to fill out the questionnaire promptly and return it to Jakey Wood, code BF. Additional copies of the questionnaire are available from Rita Sommer, corresponding secretary of EAA, Ext. 2397.

Questionnaires must be returned to code BF by April 1, and the response by MSC employees and their families will determine the undertaking of such a project.

MSC Training Branch Offering Courses For All Employee Levels

The MSC Training Branch is providing courses for secretaries, managers, scientists, engineers, and other technical employees on a continuing basis. Courses being planned in the near future include the following:

Starting Date	Course
March 23, 1965	Records Management Course
March 23, 1965	Introductory Supervision
March 29, 1965	Clear Writing I
March 29, 1965	Analog Computers in Engineering Problems
March 29, 1965	Advanced Secretarial Seminar
April 5, 1965	Cryogenic Engineering
April 6, 1965	Effective Oral Presentations
April 12, 1965	Procurement Management
April 12, 1965	Middle Management Seminar
April 27, 1965	Intermediate Supervision
April 15, 1965	New Employee Orientation

MSC employees may be nominated for these courses by sending MSC form 75 through appropriate supervisory channels to the Training Branch. Any questions about these courses should be addressed to the Training Branch, Ext. 7311.

MSC Historian Earns Award

SERVICE AWARD—Jim Grimwood (right), historian for the Manned Spacecraft Center, is presented a 15-year certificate and pin for government service, by Paul Haney, Public Affairs Officer.

Two In Audit Office Presented 15-Year Awards

15-YEAR AWARDS—Robert H. Voight (left), manager, NASA Regional Audit Office, presents 15-year government service awards to Ester T. Hurdle, secretary; and Leslie D. Thorn, assistant manager for Gemini matters. Both are in the audit office.

Next Meeting April 1

Photo Club Competition Open To Visitors

Members of the Photographic Club, at the March 4, bi-weekly meeting, saw presentations and judging of black and white prints and color transparencies in two categories.

Block assignments of members were presented in the black and white category with first place going to Fran Johnson and second to Ken Cashion.

The scheduled competition on the subject of portraiture attracted an unusually large number of entries in both black and white and color transparencies. The results of the judging gave first and third place to Brian Morris and second place to Ken Cashion.

Last night's meeting of the club was to have had as its subject of competition — self-portraiture. The subject was not to be limited to conventional studio sitting poses, but was to have included character portraiture.

The subject of presentation for the April 1 meeting is open. Members and visitors are invited to bring black and white prints and color transparencies on any subject.

The club meets at 7:30 p.m. every other Thursday, in the East Conference Room of Building 1 (Auditorium).

For more information concerning club activities or membership, call Ken Cashion, Ext. 7673 or Fran Johnson 3584.

PAO Film Library Movies Available For Employee Use

The Release Film Library of the MSC Public Affairs Office, now has over 125 release motion picture film subjects that are available for loan.

These movies may be borrowed by NASA-MSC people, contractors, and bonafide representatives of news media, civic clubs, community organizations, educational, industrial, professional, religious, and youth groups.

The MSC-Film Library is located in Building 1, Room 170. Film summaries and supplements are available from the library and the film library staff will assist in selecting films for program presentations.

All the motion picture productions are complete with narrated sound tracks, and geared for viewing by the general public.

Recent films added to the library that are related to MSC operations include: "Step Into Space," "A Year of Development Testing," and "Apollo Lunar Mission Profile."

In addition to the release films, inhouse films on various subjects are available for official use by NASA-MSC and contractor people.

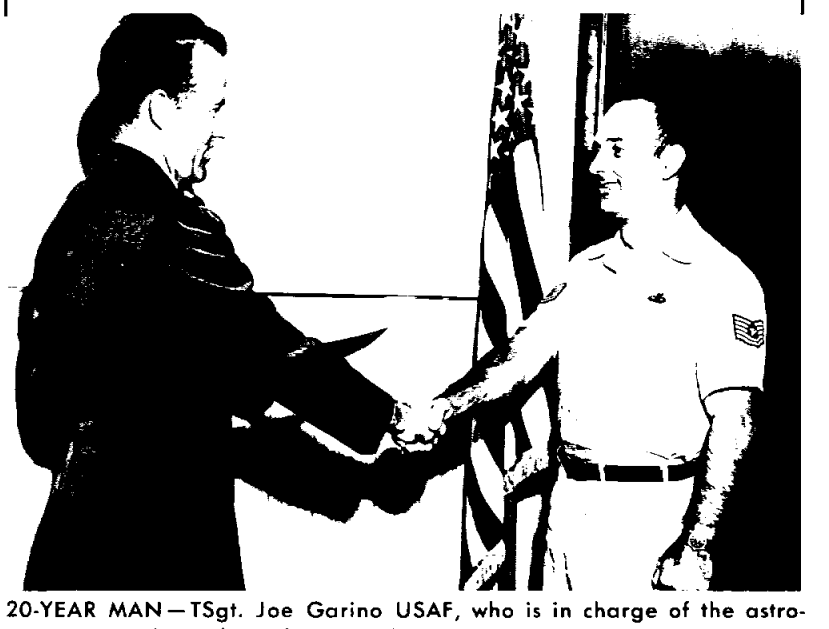
For more information on the availability of motion picture films for loan, call Ext. 4141, or come by Room 170 in Building 1.

Credit Union Office Changes Locations

The MSC Credit Union offices were relocated early this week from Room 120 on the first floor of the Project Management Building (Bldg. 2) to Room 24, down the hall.

Offices are now located down the hall, just west of the snack facility. Hours of operation will remain the same: Monday through Friday from 10 a.m. to 2:30 p.m., except on payday week when the Credit Union will be open Monday and Tuesday from 10 a.m. to 4:30 p.m.

Cooper Swears In Sergeant Garino



20-YEAR MAN—TSgt. Joe Garino USAF, who is in charge of the astronauts' new physical conditioning facility in Building 260-A, was sworn into the Air Force for a four-year reenlistment recently by Astronaut Major L. Gordon Cooper, Jr., GT-5 prime crew command pilot. Sergeant Garino has been on assignment with MSC since November 1962, working with the astronauts.

MSC at work...

RAMON Z. PETROWSKI, experimental facilities mechanic, Field Test Branch, Technical Services Division, is shown in the Systems Evaluation Laboratory, Bldg. 13, working on a one-sixth scale model of a lunar excursion module, reloading struts with honeycomb to calibrate impact.

VERNON HAMMERSLEY, aerospace engineer, and project engineer for the assembly of the lunar excursion module (LEM) mock-up at the lunar landing site, checks the operation of the access hatch to the LEM. Hammersley is in the Crew Stations Branch, Flight Crew Support Division.

THOMAS L. BARROW, Crew Stations Branch, Flight Crew Support Division, places the window bracket assembly for mounting an experimental camera in the Gemini spacecraft.

MSC BOWLING ROUNDUP

MSC MIXED LEAGUE
Standings as of March 8

TEAM	WON	LOST
Celestials	68½	23½
Virginians	59	33
Alley Cats	55	37
Chugg-a-Luggs	47	46
Play Mates	46	46
Dusters	45	47
Falcons	44½	47½
Gutter Nuts	42½	49½
Shakers	42	50
Hawks	40½	51½
Eight Balls	40	42
Goofballs	27	65

High Game Women: Barnes 225, Smith 192, Gassett 179.

High Game Men: McDonald 245, Morris 230, Schmidt, Zwolinski, Sargent, Morgan 221.

High Series Women: Barnes 575, Gassett 474, Morris 466.

High Series Men: Kelly 588, Sargent 580, Spivey 574.

High Team Game: Celestials 854, Virginians 840, Eight Balls, Shakers 823.

High Team Series: Celestials 2399, Eight Balls 2321, Chugg-a-Luggs 2286.

Jim Burgett of the Falcons bowled 100 pins over his average on March 9 and will receive a patch from ABC.

NASA MIXED LEAGUE
White Sands Operations
Standings as of March 4

TEAM	WON	LOST
Goofballs	26½	9½
Roadrunners	25	11
Bad Guys	19	17
Pinbusters	19	17
Misfits	18	18
Woodbusters	16	20
Good Guys	10½	25½
Scatterpins	10	26

High Game: J. Winn 243, B. Tillett 224, T. Matuszewski 223.

High Series: B. Tillett 626, B. Colston 596, T. Matuszewski 561.

High Team Game: Roadrunners 863, Goofballs 794, Pinbuster 763.

High Team Series: Roadrunners 2386, Misfits 2276, Goofballs 2263.

NASA 5 O'CLOCK MON.
Standings as of March 8

TEAM	WON	LOST
Foul Five	54	34
Suppliers	53	35
Computers	46	42
Sombreros	43	45
Hot Shots	41	47
Alley Gators	29	59

High Game: W. Kutalek 244, T. Hutchens 232, J. McDowell 230.

High Series: H. Erickson 595, E. R. Walker 591, D. Hendricks 571.

High Team Game: Computers 880, Suppliers 865, Foul Five 862.

High Team Series: Suppliers 2411, Foul Five 2341, Computers 2321.

MSC COUPLES LEAGUE
Standings as of March 9

TEAM	WON	LOST
EZ-Go	23	9
Schplitz	22	10
Wha' Hoppen?	21	11
Goofballs	17	15
Alley Cats	16½	15½
Bltzf	16	16
Pin Splitters	16	16
Sandbaggers	15	17
Bowlernauts	14	18
Crickets	11	21
Thinkers	11	21
Hi-Ho's	9½	22½

High Game Women: J. Foster 228, K. Gentile 224.

High Game Men: J. Garino 246, D. Kennedy 244.

High Series Women: J. Foster 564, W. Townsend 510.

High Series Men: J. Garino 642, B. Jones 628.

MIMOSA MEN'S LEAGUE
Standings as of March 4

TEAM	WON	LOST
Roadrunners	15	9
Spastics	14	10
Fabricators	13½	10½
Sizzlers	13	11
Whirlwinds	13	11
Technics	13	11
Alley Oops	12½	11½
Green Giants	11	13
Fireballs	11	13
Pseudonauts	4	20

High Game: Grimwood 244, Petersen 244, Amason 233.

High Series: Lee 645, Morgan 629, McBride 587.

High Team Game: Fabricators 990, Alley Oops 975, Spastics 908.

High Team Series: Roadrunners 2681, Fabricators 2641, Spastics 2585.

Free Classes For Bridge Players Announced By Club

Bridge classes designed for players who are familiar with contract bridge, but who wish to improve their playing skill, are being conducted at 7:15 p.m. each Monday at the Ellington AFB NCO Club.

Art Manson is conducting the free classes which are open to all MSC and contractor employees and members of their immediate families.

Instruction for beginners is also planned. Information about these classes may be obtained from the Duplicate Bridge Club secretary, Evelyn Huvar, Ext. 2541.

The club meets at 7:15 p.m., each Tuesday in the EAFB NCO Club.

Winners at the Monthly Club Master Point game on March 2 were—Section A: North-South, Sara and William Stewart, first: Iris and Jim O'Neill, second: East-West, Sue Shrader and Leona Kempainen, first: J. W. LaMarche and J. R. Arnett, second. Section B: North-South, Brian Conrey and Nancy McCracken, first: Chuck and Nancy Sheridan, second: East-West, Charlie and Eugenia Brown, first: Robert Clark and R. B. Bliesner, second.

Results of the February 23 rating game: North-South: Bob and Terry Hodgson, first: Richard Reid and Charlie Brown, second: East-West, Rita O'Boyle and Emer St. Leger, first: Brian Conrey and Sylvia Dalton, second.

Team From MSC Places In Finals

LEAGUE RUNNER-UP—The AV Corp basketball team composed of NASA and MSC contractor people took second place honors in the recent playoffs of the American and National basketball leagues at Ellington AFB. The final game March 8 was between the AV Corp and the EAFB 747th Rams, 49 to 60. Team members are (front row l. to r.) Johnny Gonzalez, Floyd Buckner and Bill Roberts; (back row l. to r.) Frank Foster, Jerry Lynch, Eugene Rogers, Joe Rogers, and David Schwartz. Joe Rogers is the team coach.

MSC Employees Reminded To Get Auto License Plates

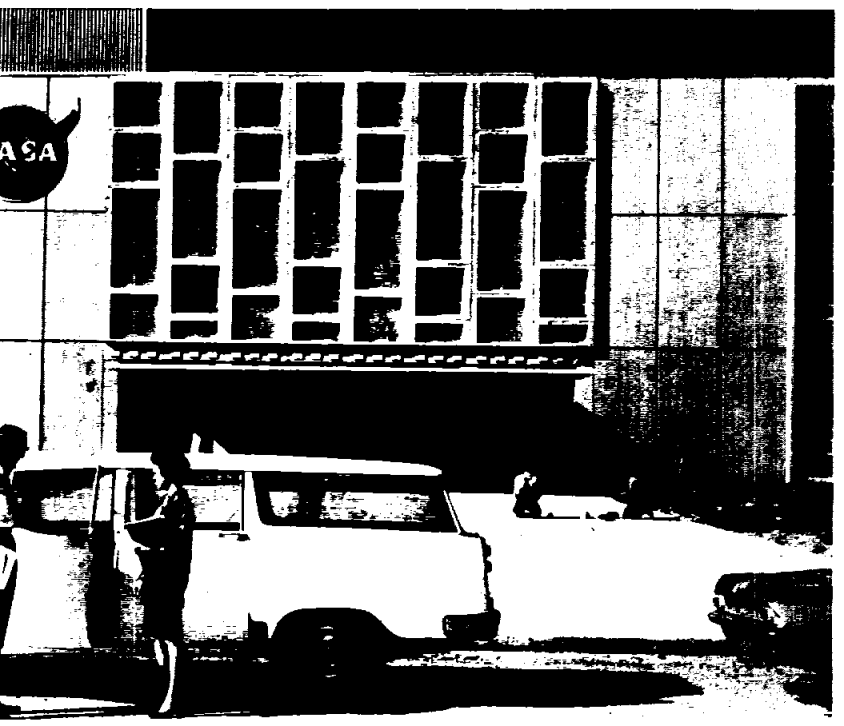
For the benefit of those not familiar with the Texas automobile licensing law, and as a reminder to others, the following is presented.

April 1 is the deadline to purchase automobile registration plates in Texas, and the plates are now available at many locations including: auto dealers, grocery stores, banks and other types of businesses, in addition to the local county tax offices.

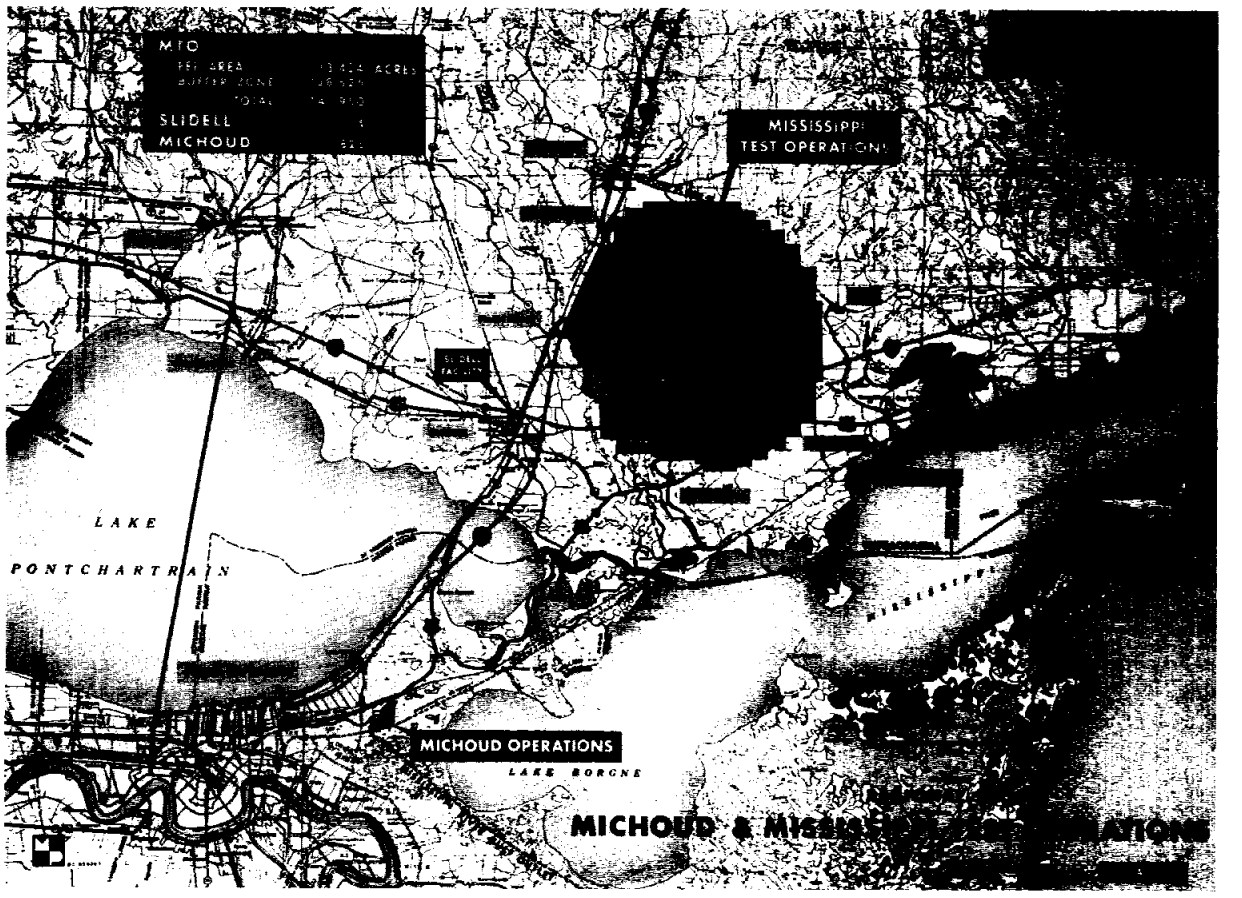
License plates must be purchased in the county in which you reside, and the local county tax authorities require that purchases be made by cash only, checks will not be accepted.

To purchase license plates you are required to present your Texas title or certified duplicate copy, and your 1964 Texas registration license receipt for the automobile that you wish to register.

Its Noise Problems



nearly completed Office and Administration Building of Mississippi Test
lectric, North American Aviation, and Boeing people. The first floor of the
and GE employees.



Water transportation will play a major role in the operation of MTO. So far a total of 50 acres of water area has been created for the harbor and connecting channels to the test stands. The 13-foot deep, 35 acre harbor will connect MTO with the Pearl River and the Gulf of Mexico.

The navigation lock above the harbor will lift the barges with the Saturn launch vehicles over 20-feet, to permit them to be transported to the test stands through the canals. The lock is 110 feet wide and 670 feet long.

Spanning the lock will be a 115-foot long bascule drawbridge which will carry the traffic of the main road that traverses the test site in a north-south direction.

The S-II second stage Saturn V rocket test stand will be completed and ready to test fire launch vehicles early next year. A second S-II stand is well underway also.

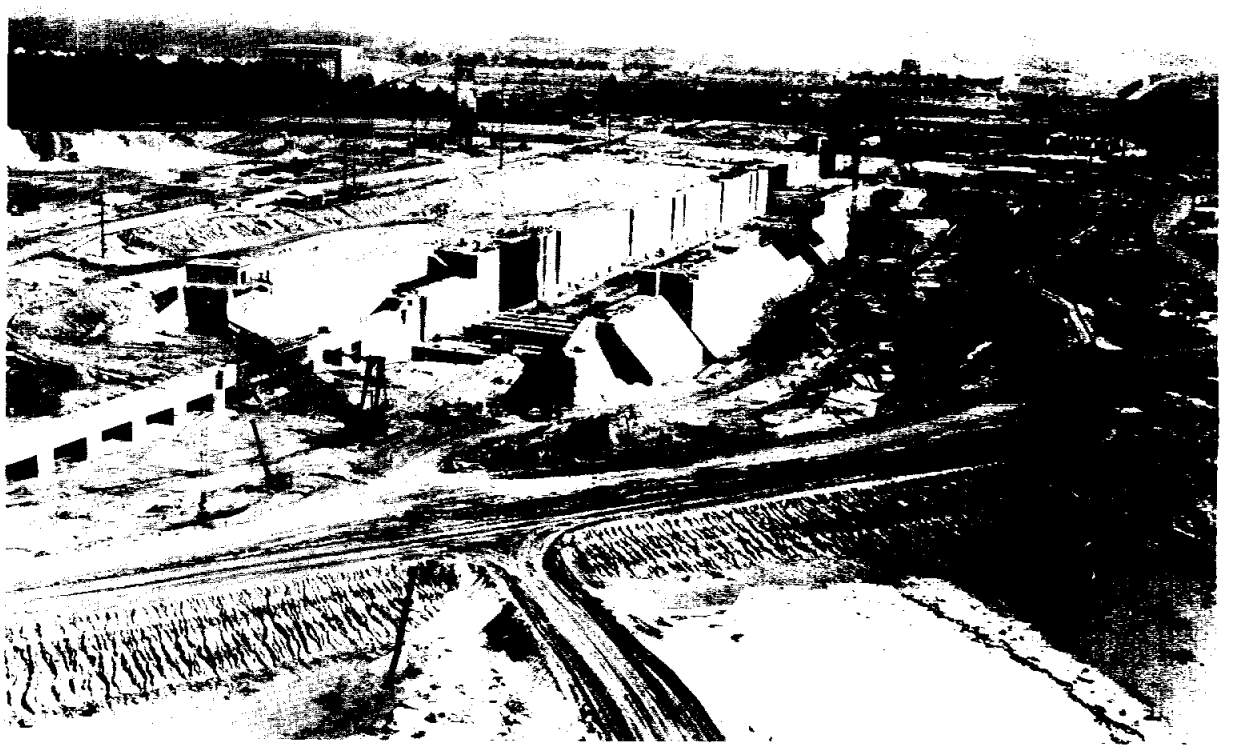
Substructure for the giant S-IC test tower is nearing completion, and the dual test stand superstructure is scheduled to start rising soon. The base for the stand is 378 feet long and 146 feet wide and 40 feet high.

When MTO, the proving ground for rocket engines and stages used in the manned lunar landing program, is completed and fully operational in early 1967, there will be about 2,600 permanent employees at the test facility.

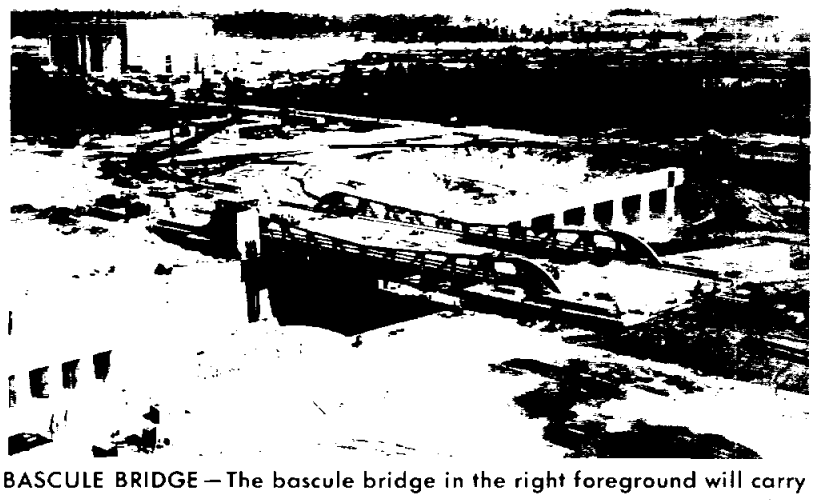
Twenty-eight projects had been completed at MTO as of the first of March, at a cost of nearly $14-million. In addition to the modification of some existing buildings, these completed projects included: harbor dredging, dock construction, roads, clearing of the Saturn V complex, and excavation for the lock and bascule bridge, the cryogenics docks and five buildings.

The Southern Railway System, at its own expense, built 10.5 miles of track from Nicholson to the site. Since completion of this railroad, nearly 12,000 cars of equipment and freight have been shipped to MTO.

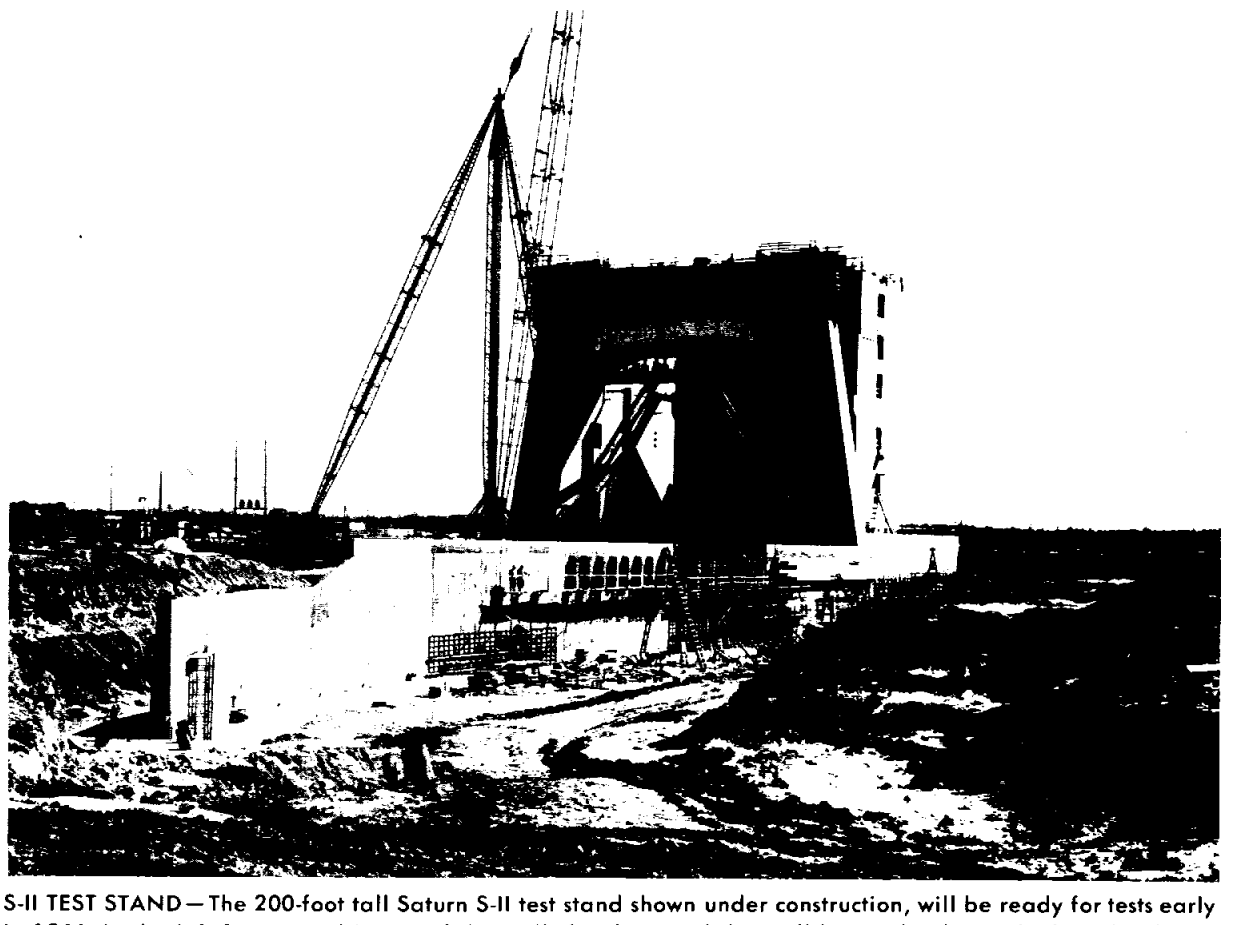
WILLIAM C. FORTUNE
manager MTO



NAVIGATION LOCK—The quarter of a mile long navigation lock with its upstream and downstream guard walls, is shown under construction. The lock will lift the barges with the saturn rockets some 23 feet to the canals that service the test stands. The lock length from gate to gate is 670-feet.



BASCULE BRIDGE—The bascule bridge in the right foreground will carry the main artery of traffic through the Mississippi Test Operation complex. In the left background is the S-IC Booster Storage Building. The building is 71-feet tall and will house two boosters at a time.

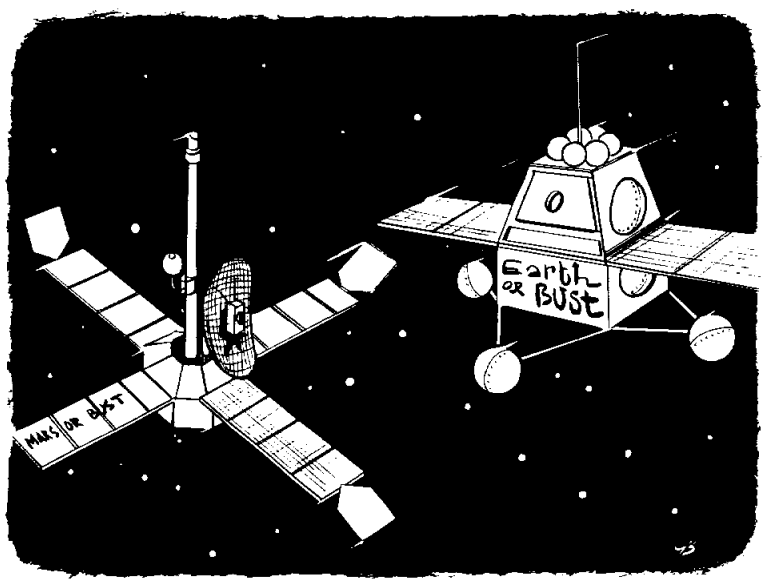


S-II TEST STAND—The 200-foot tall Saturn S-II test stand shown under construction, will be ready for tests early in 1966. In the left foreground is one of the walls for the canal that will be used to bring the launch vehicles to the testing site.

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.

Director . . . . . Robert R. Gilruth
Public Affairs Officer . . . . . Paul Haney
Editor . . . . . Milton E. Reim
Staff Photographer . . . . . A. "Pat" Patnesky

On The Lighter Side



SPACE QUOTES

JAMES E. WEBB, administrator of NASA, speaking in Chicago, Ill., Dec. 21, 1964.

"If in our minds we reduce the quarter of a million miles between the Earth and the Moon to half a mile, then men have gone one foot into space. On this scale, it is still a hundred miles to Mars. Remember though, that progress in manned flight will not be arithmetical but will be geometrical. In other words, the technology developed in near-Earth flights within the next few years will enable us to make a great outward leap in manned space flight and land explorers on the Moon.

Abort

(Continued from Page 3)

seconds.

3. After the launch vehicle is above 70,000 feet, aerodynamic drag will have decreased to the point where no delay between engine shutdown and retro-abort is required for successful separation. Retro-abort will be used until a velocity of approximately 20,700 ft/sec (14,000 mph) is achieved. For rapid malfunctions, retro-abort will be initiated immediately after receipt of two valid cues. For slow malfunctions, and nose spacecraft malfunctions, retro-abort will be initiated at the next occurring fixed time in order to land near pre-positioned recovery vessels.

4. For velocities exceeding 20,700 ft/sec, but less than orbital velocity minus 300 ft/sec, the normal spacecraft separation abort sequence is used for all malfunctions. The most probable cause of abort at this time would be early shutdown of the booster due to fuel depletion. Also, abort may be requested by ground monitors if the trajectory exceeds acceptable limits. The general abort plan in this flight regime is to separate from the launch vehicle, assume retro-attitude, insert landing area parameters in the spacecraft computer, retrofire, and descend to a planned recovery area.

GT-3 SPACECRAFT CHECKOUT—Astronauts Virgil I. (Gus) Grissom (left), command pilot, and John W. Young, pilot, in the GT-3 spacecraft during systems checkout.

Welcome Aboard

During the last reporting period, 17 new employees joined the Manned Spacecraft Center.

Office Services Division: Beulah M. McCaghren.

Photographic Division: Richard W. Underwood.

Flight Crew Support Division: Rosalyn J. Linsicombe.

Computation and Analysis Division: John S. Hyams, and Carlton H. Price.

Guidance and Control Division: Donald C. Raschke, and Rudolph L. Saldana.

Propulsion and Power Division: Francis D. Freeburn.

Advanced Spacecraft Technology Division: Bonnie R. King.

Flight Operations Directorate: Patsy W. Eubanks.

Flight Control Division: Lawrence S. Canin, James E. I'Anson, and Robert L. Myers.

Mission Planning and Analysis Division: Janetta B. Harrison, and Hazel M. Johnson.

Flight Support Division: Brice M. Jernigan.

MSC-Florida Operations (Cape Kennedy, Fla.): Margaret D. Rauch.

Space News Of Five Years Ago

March 19, 1960 – An agreement between the United States and Spain on the Project Mercury tracking station in the Canary Islands was announced (one of 16 similar agreements with other nations).

March 28, 1960 – Two of Saturn's first stage engines passed an initial static firing test of 7.83 seconds duration at Huntsville, Ala.

March 28, 1960 – Between this date and April 1, the astronauts received their first open-water egress training in the Gulf of Mexico off the coast of Pensacola, Fla., in cooperation with the Navy's School of Aviation Medicine. The average egress time was about four minutes from a completely restrained condition in the spacecraft to getting into the life raft.

March 29, 1960 – A decision was made by NASA Hq. that the spacecraft prelaunch operation facility at Huntsville, Ala., was no longer required. Spacecraft that were designated for Mercury Redstone missions were to be shipped directly from McDonnell to Cape Canaveral, thereby gaining approximately two months in the launch schedule.

During March – Qualification tests were started on the escape tower rocket for the Mercury spacecraft. As a part of the qualification program, three escape-rockets were successfully fired on a spacecraft model at conditions corresponding to approximately 100,000 feet altitude, in the Lewis Research Center's altitude wind tunnel.

April 1, 1960 – The first known weather observation satellite, TIROS I (Television Infra-Red Observation Satellite), was launched into orbit by a Thor-Able rocket, and took pictures of earth's cloud cover on a global scale from 450 miles above until June 29.

April 1, 1960 – The first McDonnell production Mercury spacecraft was delivered to NASA at Wallops Island for a beach-abort test.

MSC PERSONALITY

Dr. Minners Is Prime Recovery Physician For GT-3 Flight Crew

When the GT-3 astronauts complete their three orbits of the earth later this month, Dr. Howard A. Minners, astronaut flight surgeon, will be there to give them a thorough physical examination.

Dr. Minners, head of the Flight Crew Effectiveness Branch, Center Medical Operations Office, is the prime area NASA recovery physician on the recovery ship for the GT-3 flight. He will be responsible for examination of the astronauts immediately after their recovery in the Atlantic Ocean.

He will remain with the GT-3 astronauts and accompany them back to Cape Kennedy.

Dr. Minners, a captain in the USAF, was assigned to the Manned Spacecraft Center in November 1961. He served as flight surgeon for the MA-7 flight of Astronaut M. Scott Carpenter, the MA-8 flight of Astronaut Walter M. Schirra Jr., and the MA-9 flight of L. Gordon Cooper Jr.

Formerly assigned to the Office of the Surgeon, Hq., Tactical Air Command at Langley AFB, Va., Dr. Minners served as assistant to the former flight surgeon, Dr. William K. Douglas, during the MA-6 flight of Astronaut John H. Glenn Jr., Feb. 20, 1962.

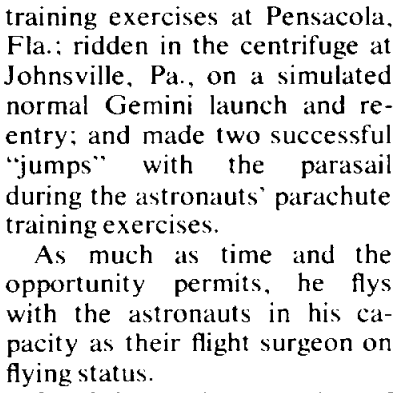
On the Carpenter flight, the two doctors reversed roles after Dr. Douglas was reassigned to the Air Force as assistant to the deputy for bioastronautics at the Air Force Missile Test Center, Patrick AFB, Fla.

During MA-7, MA-8, and MA-9, Dr. Minners acted as the primary physician concerned with astronaut preparation, insertion and care. He was also responsible for the Cape area emergency medical aid in the event of an early abort. He was then flown to the debriefing areas to handle the medical support for the astronaut and for the debriefing.

As head of the Crew Effectiveness Branch here at MSC, Dr. Minners monitors the medical condition of astronauts during their training and testing. He is also responsible for providing the day-to-day clinical care required by the astronauts, their wives and children. Two flight surgeons and nurses work with Dr. Minners in the performance of his duties.

Dr. Minners was born in Rockville Centre, N. Y. He completed his early schooling in Garden City, Long Island, N. Y., and was graduated from Princeton University in 1953 with a bachelor of arts degree. He received his MD from the Yale University School of Medicine in 1957, and his master of public health degree in 1960 from Harvard University. His formal residency training was in the aviation medicine field.

In his job of monitoring the astronauts during their training, he often finds himself participating in the actual training exercises in addition to monitoring duties.



DR. HOWARD A. MINNERS

This past summer he accompanied the newest group of astronauts on the jungle training exercise in Panama and as he put it "was right in the thick of the exercise." He has taken the ride on the Dilbert Dunker used in the water egress training exercises at Pensacola, Fla.; ridden in the centrifuge at Johnsville, Pa., on a simulated normal Gemini launch and reentry; and made two successful "jumps" with the parasail during the astronauts' parachute training exercises.

As much as time and the opportunity permits, he flys with the astronauts in his capacity as their flight surgeon on flying status.

Dr. Minners is a member of the Aerospace Medical Association, the Society of Air Force Flight Surgeons, and Nu Sigma Nu medical fraternity. He also served as senior author of post-flight medical papers for both the MA-6 and MA-7 flights.

He is married to the former Gretchen Paffenbarger of Washington, D. C., and the couple has one child, Howard Jr., age one year, and the family resides in Swan Lagoon, across the road from the Center.

Coin collecting is the favorite hobby of Dr. Minners and as a numismatist, his prize coin is one he acquired from treasure hunters off Cape Kennedy. It is a Spanish four-bit piece called a reales.

Singing and playing musical instruments is another pastime that Dr. Minners enjoys. He had to give up his hobby of sail boating because of insufficient time to devote to the sport.

Flight Controllers Attend 'School' In MSC Control Center

There is a school here at the NASA Manned Spacecraft Center from which no one ever graduates and where there is no summer vacation.

The school house is the Mission Control Center-Houston from which the nation's manned space flights will be controlled starting in mid-1965. The massive three-story Control Center houses the communications, computer and flight control facilities for monitoring and controlling earth-orbital two-man Gemini space flights, developmental earth-orbital three-man Apollo flights and the Apollo lunar landing mission set for late in this decade.

School begins when a prospective flight controller joins the flight operations organization at the Manned Spacecraft Center and continues throughout his tenure. As booster and spacecraft systems evolve, flight controllers' knowledge must keep pace with these systems from a functional standpoint.

The first phase in the education of a flight controller is some 140 hours of rather straightforward classroom instruction and general orientation in spacecraft and ground support systems and operation of flight control equipment and consoles.

Included in the classroom work are 30 hours of spaceflight trajectory instruction by instructors from the Mission Planning and Analysis Division, and instruction in the functions of the world-wide spaceflight tracking network by the Network Controller staff from Flight Support Division. In most instances, the instructors are flight controllers who work the same positions during a mission.

Through on-the-job training, neophyte flight controllers develop an extensive knowledge of spaceflight operational details which allows them to make use of spacecraft systems and flight manuals, engineering drawings, and other highly-detailed documentation. This phase brings the flight controller student to the second level of training—to a sort of sophomore status.

The third level of training—continuing all the while with refresher courses in spacecraft systems—is directed toward developing in the flight controller the capability for developing and writing operational handbooks and procedures.

When the flight controller reaches the fourth, or "senior" level of training, his own initiative is his best teacher, for here he must be a "self-starter" capable of polishing and improving his knowledge of the flight operations business to a degree that cannot be learned by lecture or group briefing. Again, refresher courses covering spacecraft systems, supplemented by visits to spacecraft manufacturers' plants, keep the flight controller in pace with late developments and changes in design.

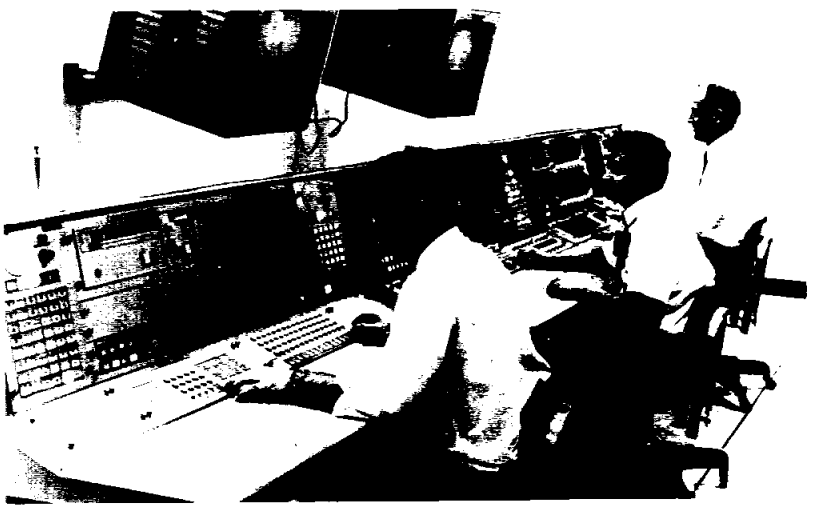
Training does not end with the fourth level self-learning and classroom work; training, in fact, never ends for the flight controller. But, instead of getting more instruction and on-the-job training as an individual, he begins now to become a part of a flight controller team. He takes part in monitoring actual spaceflight missions and in realistic computer-generated mission simulations in which flight crews also take part.

Astronauts assigned to the flight crew for a specific mission actively participate in mission simulations by means of spacecraft simulators in another building at the Manned Spacecraft Center. The simulators are linked to the Control Center so that the flight crew's control actions and the status of spacecraft systems are transmitted to Control Center console meters and displays in the same way they would be relayed by telemetry during an actual flight.

Simulated systems' malfunctions and other abnormalities can also be injected into the training, both for crew training purposes and for flight controller training.

The mission simulation business is a profession in itself. Simulation specialists first prepare a computer program for a specific mission which, when recorded on computer tapes, produces realistic responses in flight control equipment in the Control Center and in tracking stations located around the belt of the earth covered by orbital space flights. In addition to the straightforward computer programs representing nominal or ideal flight conditions and performance, the simulation specialists act as "devil's advocates" by writing simulation scripts that provide for introducing the abnormal into the simulation of a flight.

Special consoles allow simulation specialists to inject indications of systems failures, loss of communications and other malfunctions into control room flight displays and flight controller consoles—a purposeful harrassment intended to develop a keen sense of judgment that could mean the difference between a successful and an unsuccessful future real mission. "Never give a flight controller an even break," is the motto voiced by the mission simulation group.



SIMULATED FLIGHTS—Simulation specialists play the role of "devil's advocates" during simulated flights in the training process for flight controllers. From these simulation control consoles, the simulation specialists can introduce indications of failures and malfunctions of spacecraft systems into the displays seen by flight controllers in the Mission Operations Control Room. Such harassment sharpens the judgement and reaction of flight controllers in evaluating abnormal situations, an ability that can spell success or failure of an actual spaceflight mission.

Another device used for flight controller training is the Simulated Remote Site — an exact duplicate of the flight controller consoles located in the world-wide Manned Spaceflight Network stations. Two simulated remote sites are located on the second floor of the Mission Control Center—Houston. Network station flight controllers receive training in a realistic setting without having to travel half-way around the world to their station until just before the actual mission.

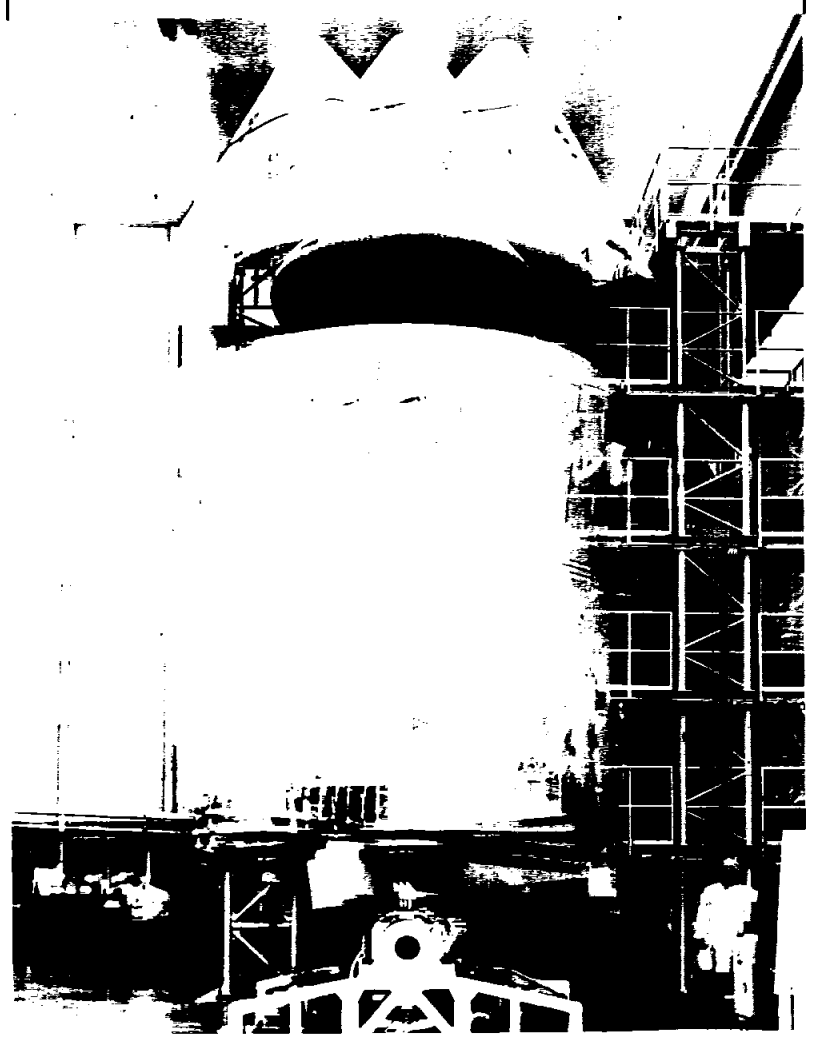
Each team of remote site flight controllers waits its turn to man the simulated remote sites as the imaginary spacecraft and flight crew approach the range of radar and voice communications coverage of its station. Thus, the two simulated remote sites may in the same flight simulation play the role of network stations at Guaymas, Mexico or Carnarvon, Australia.

Not only are simulation tapes used to generate displays for flight controller training, but data recorded from previous flights is played back through the Control Center's computer equipment and displays for critiques of the missions—sort of like watching re-runs on television.

A visitor putting on a headset and listening to the conversations on the various communications loops in the Mission Control Center would hear regional inflections ranging from crisp British and Tidewater Virginia accents to soft southern drawls and "standard American" mid-West accents.

But regardless of the backgrounds of the flight controllers, their judgement and technical knowledge are essential to the success of a spaceflight mission and to the safety of the astronauts aboard. Such judgement and knowledge is not gained by accident. It is the result of living a career as a flight controller, and a continuous process of learning performance and technical details of new boosters and new spacecraft from conception to flight status.

Apollo 'Polarity Checker'



APOLLO ROCK—Spacecraft gets rock 'n' roll treatment atop an Apollo "polarity checker" in nation's largest cleanroom situated at North American's Space and Information Systems Division, Downey, Calif. Rocker tests the guidance and navigation unit to be aboard NASA's moon-bound Apollo vehicle. Polarity checker includes rocking unit, on which Apollo spacecraft sits, and associated electronic checkout equipment, to measure the response of gyroscopes. Rocker can lean six degrees to right or left, in addition to providing pitch, yaw or roll. It may rotate clockwise or counter clockwise.

MISSION CONTROL CENTER—This interior view of the MSC Mission Control Center shows the flight controllers at their consoles.

Space News ROUNDUP!

SECOND FRONT PAGE

President's Safety Program To Receive Center Support

The Safety Office here at the Manned Spacecraft Center has pledged support for mission "Safety 70," a program recently initiated and signed as an Executive Order by President Johnson, in a war on the waste of human resources, productive skills and money in Federal government.

Federal agencies were ordered by the President, February 17, to reduce their accident rate 30 per cent by 1970.

The President said reaching this goal would prevent 45,000 injuries and save the government nearly a quarter of a billion dollars of direct and indirect costs.

In seven years, more than 1200 federal workers have been killed and nearly 300,000 disabling injuries were suffered, resulting in a loss of 18.5-million man-days of work, he said.

Loss of manpower and revenue from federal accidents is "inexcusable waste because nearly all of these deaths and injuries are preventable," the President said.

President Johnson, in a memorandum to all heads of departments and agencies, asked for a realistic review, and where necessary, a revision of the safety programs of each agency of the government. He also requested a report be made to him within 90 days on the results of the review.

The Safety Office at MSC has requested full cooperation and assistance from all employees at the Center in order to achieve the goals established in reducing accidental losses of manpower and material resources.

Addition information will be distributed by the Safety Office regarding this program and the achievements that are accomplished.

For Apollo Guidance And Navigation

$235-Million Incentive Contract Signed By MSC, AC Spark Plug

The National Aeronautics and Space Administration has signed a five-year contract with the AC Spark Plug Division of General Motors Corporation for the guidance and navigation systems slated to guide American astronauts safely to the surface of the moon and back before 1970.

The $235 million contract is the second major incentive agreement entered into by the Manned Spacecraft Center this year. A Gemini spacecraft contract of $712 million with McDonnell Aircraft Corporation, St. Louis, Mo., was signed recently.

AC Spark Plug Division in Milwaukee, Wisc., is responsible for the manufacture, testing and delivery of primary navigation and guidance systems for Apollo's three-man command module and the two-man lunar excursion module. The systems are being designed by the Massachusetts Institute of Technology.

Most of the money to be spent by AC will go to vendors and subcontractors for system components, such as the computer, manufactured by Raytheon Company, Sudbury, Mass., and the optical subsystem, built by Kollsman Instrument Corporation, Long Island, N.Y. AC provides the inertial platform for the system, called the IMU, or inertial measurement unit.

AC had formerly been on a cost plus fixed fee contract with MSC, and had spent $43 million since 1962. The new contract will be completed in December, 1969.

The transition to incentive contracts by NASA is a major step in improving performance, meeting schedules and controlling costs of manned space programs. It provides for rewards when contractors keep costs down and meet early schedules. The contractor can only get the full contract value if his performance is above average, delivery schedules are met and costs are minimized.

The AC guidance and navigation systems in the command and lunar excursion modules are backups to ground-based systems, and are used to make frequent cross-checks on the ground systems' performance.

In the command module, for instance, the guidance system operates throughout the launch phase to back up the Saturn launch vehicle's guidance system. It also operates during translunar flight for mid-course corrections, guides the spacecraft into lunar orbit, back into transearth trajectory, and throughout the transearth portion of flight.

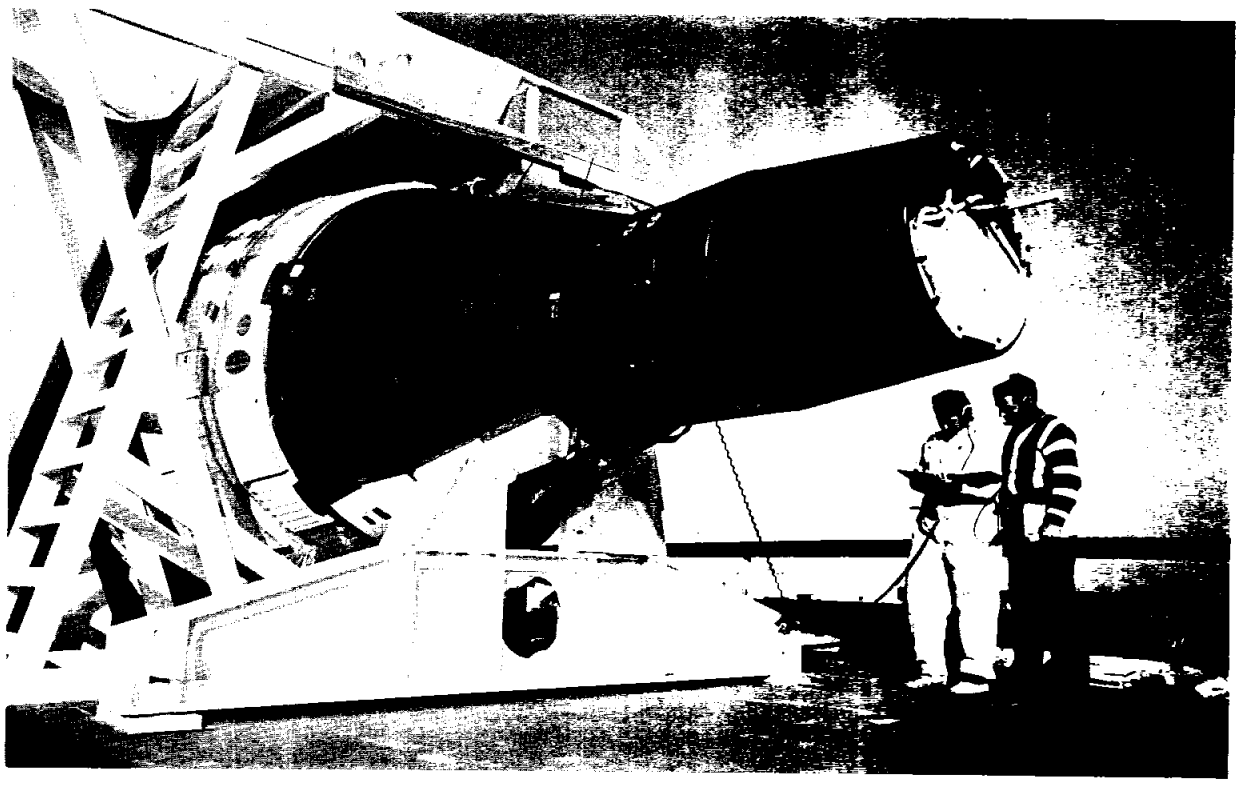
The LEM guidance and navigation unit must provide information for the transfer of the LEM from lunar orbit to the moon's surface, for the descent phase of flight until lunar touchdown, back into lunar orbit and throughout the linking-up portion of rendezvous with the command module.

In all, the onboard systems must perform as many as 15 intricate maneuvers during the lunar round trip.

The optical system, a sextant-like device, allows astronauts to make navigational sightings to update the inertial platform and correct the platform's minor drifting tendencies.

The guidance system, operating from information fed to it from the platform, operates during engine burns to make corrections required to keep the spacecraft on the proper trajectory.

Most of Apollo's navigation information will be fed to the inertial platform directly from Apollo ground stations, but onboard navigation will be conducted as a cross-reference by the crew, and in the event the spacecraft loses communications with the ground.



GEMINI 3 TESTING—Radar and horizon scanners on the Gemini 3 spacecraft are set and checked during tests at the Boresight Range on Merritt Island.

GT-3 Recovery Forces Deployed Over Planned And Contingency Landing Areas

Recovery forces will be provided by the military services and will be under the operational control of the Department of Defense representative for Gemini Support Operations during mission time.

Planned and contingency landing areas have been established. Planned areas are those where the probability of landing is sufficiently high to justify prepositioning of recovery forces for support and recovery of crew and spacecraft within given access times.

Contingency areas are all other areas along the ground track where the spacecraft could possibly land. The probability of landing in a contingency area is sufficiently low that special search and rescue techniques will provide adequate recovery support.

There are four types of planned landing areas:

1. Primary Landing Area—Landing will occur with normal termination of the mission after three orbits. This area is in the Atlantic Ocean, off Grand Turk Island in the West Indies, approximately 700 nautical miles southeast of Cape Kennedy.

2. Secondary Landing Areas—in Atlantic Ocean where a landing would occur if it is desirable to terminate the mission after the first or second orbit for any cause. Ships and aircraft will be stationed to provide support. Aircraft will be able to drop pararescue personnel and flotation equipment within one hour after spacecraft landing.

3. Launch Abort Landing Areas—Along the launch ground track between Florida and Africa where landings would occur following aborts above 45,000 feet and before orbital insertion.

Surface ships with medical personnel and retrieval equipment, and search and rescue airplanes with pararescue personnel flotation equipment and electronic search capability will be stationed in this area before launch. After the successful insertion of the spacecraft into orbit, some of the ships and planes will deploy to secondary areas to provide support on a later orbit, and the remainder will return to home stations.

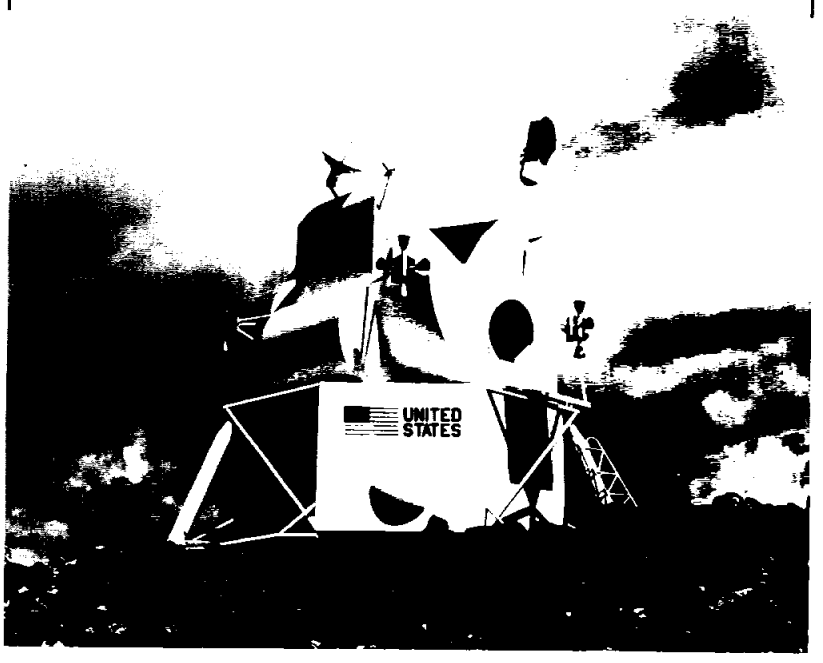
4. Launch Site Landing Area—Landing will occur following an abort during countdown, launch, and early powered flight in which ejection seats are used. It includes an area of approximately 26 miles seaward and three miles toward the Banana River from Pad 19. Its major axis is oriented along the launch azimuth.

A specialized recovery force of land vehicles, amphibious craft, ships and boats, airplanes, and helicopters will be stationed in this area from the time the astronauts enter the spacecraft until lift-off plus five minutes.

Recovery access time varies from 0 minutes for a water landing to 10 minutes for a land landing. The astronauts will be taken to the Patrick Air Force Base hospital for examinations after pickup.

In Contingency Landing Areas, search and rescue aircraft equipped with electronic search equipment, pararescue men and flotation equipment will be staged along the ground and sea track so that the spacecraft will be located and assistance given to the astronauts within 18 hours after the recovery forces are notified of the probable landing position.

MSC's Moon Training Area



LUNAR LANDING VEHICLE—A mockup of the lunar landing vehicle LEM is shown on the MSC simulated lunar surface that was constructed at the Center. Engineers and astronauts will use the vehicle and area for simulations and training exercises. Everything appears as it could possibly be on the Moon, except for the clouds. The Moon which has no atmosphere will have no clouds.