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MICHOUD ASSEMBLY FACILITY
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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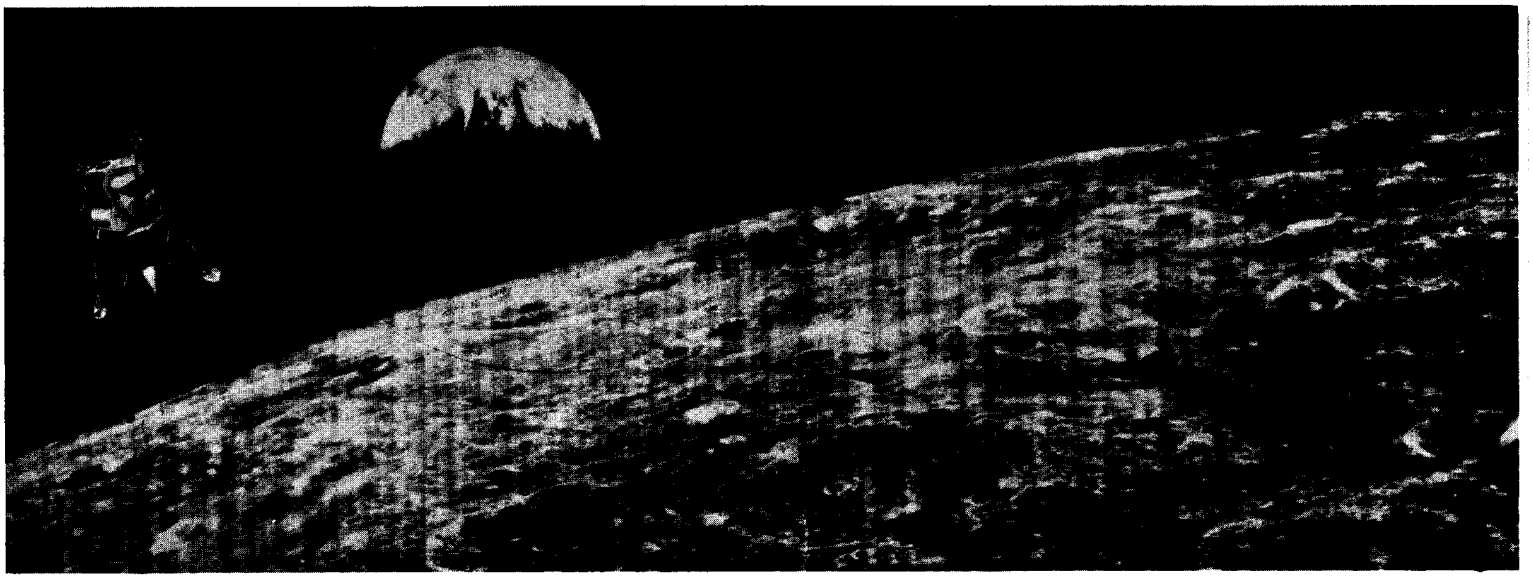
A TRIP TO THE MOON IN PROJECT APOLLO

When the day comes within this decade for three Americans to ride a thundering Saturn V rocket as it blasts off for the moon, everything humanly possible will have been done to insure their safe return. That day will bring the acid test for the years of preparation in Project Apollo, the United States' manned lunar landing program.

Following are descriptions of the National Aeronautics and Space Administration's Saturn V space vehicle, Apollo spacecraft and lunar flight plan:

SATURN V

The three-stage Saturn V rocket is the largest and most powerful launch vehicle under development in the United States today. It is taller at 365 feet than the Statue of Liberty, and its first stage is more powerful than a string of main line diesel locomotives coupled end-to-end reaching from Chicago to New York.



Saturn V's first stage is the largest known rocket stage in the world, measuring 138 feet tall and 33 feet in diameter. Its five liquid oxygen and kerosene-fueled F-1 engines produce 7,500,000 pounds of thrust, or about 160,000,000 horsepower. The Saturn V's second stage produces one million pounds thrust from five J-2 engines, which burn liquid oxygen and liquid hydrogen. One 200,000-pound-thrust J-2 engine is used in the third stage.

APOLLO SPACECRAFT

The 95,000-pound Apollo spacecraft is comprised of three separate parts. The cone-shaped command module, which is 11 feet high and 13 feet in diameter at its base, houses the three-man crew during most phases of the journey. Beneath the command module is the 14-foot-tall, 13-foot-diameter service module, containing the propulsion system used for midcourse maneuvering, braking into lunar orbit and boosting the command module on its return flight to earth. The third element of the spacecraft is the lunar module (LM). Standing 20 feet in height and measuring an average of 19 feet in diameter, the LM is a two-stage, self-contained vehicle. It will be used for descent to and ascent from the moon's surface by two of the three-man Apollo crew.

LUNAR FLIGHT PLAN

The jumping off place for a trip to the moon is NASA's Launch Complex 39 at the Kennedy Space Center in Florida. There, the Saturn V launch vehicle and Apollo spacecraft are assembled in a vertical position in a huge building more than three miles from the launch pad. After checkout is completed, they are brought in an upright position to the launch site on an enormous tracked vehicle, the base of which is as large as a baseball diamond.

A 380-foot-tall mobile launcher provides support and checkout interface for the space vehicle from assembly to liftoff. It supports propellant, pneumatic, electrical, water, communications and other service lines to the vehicle.

After placing the mobile launcher and Saturn V vehicle on the launch pad, the crawler next brings up the mobile servicing structure. It has five platforms for access to the vehicle. It remains in position until a few hours before launch, then is moved back to its parking area.

The Saturn V is fueled with almost 3,000 tons of kerosene, liquid oxygen and liquid hydrogen. Propellant loading of the spacecraft is accomplished first. Then kerosene is loaded into the first stage. Then just hours before launch, cryogenic propellant (liquid oxygen and liquid hydrogen) loading for the launch vehicle begins.

Above the command module is the launch escape tower, which has much the same function as the escape seat in a jet plane. If something should go wrong during the first stage of flight, the astronauts would have to abandon ship. It would be very difficult to eject yourself from the cabin and parachute from the rocket, and you would not get far away fast enough. The solution is to provide a very powerful rocket that jerks the entire command module away from the aborting booster. The escape tower used three solid propellant rockets that would get the astronauts away very swiftly from a fireball should the rocket explode.

After the propellants are loaded, the three astronauts will enter the spacecraft over the swing arm walkway from the umbilical tower. They will literally walk the plank to enter the command module through a sealed, environmentally controlled chamber at the end of the swing arm.

Their pressure suits are connected, checked out, and regulated. The astronauts position themselves in their couches, the command pilot on the left, pilot on the right and the senior pilot in the middle.

While the senior pilot and pilot monitor spacecraft systems, the command pilot and the operations director jointly make a decision to launch. It is based on their evaluation of the readiness of support facilities, the range, and space vehicle, completion of fueling operations, removal of the service tower and launch area clearance. When all these areas check out satisfactorily through the final seconds of the countdown, the six-million-pound space vehicle is ready for launching.

While the astronauts tick off the last minutes of the countdown in the confines of the command module, a large crew in the blockhouse handles the complicated launch operations. Here, located more than three miles from the launch site, are the men who actually launch the rocket. They monitor all phases of the countdown and keep in touch with the tracking stations to make sure that everything is in good working order. They also maintain contact with the astronauts. Both sides must reach agreement before the "Go" order is given. Either party can hold the count at any time should they observe something that is not in order.

For the last two minutes the countdown is fully automatic. There are so many operations to be switched on that the entire procedure is computer controlled. If something should go wrong at this late time, the automated sequencing stops in a safe position. When the trouble is remedied, the countdown is recycled and proceeds again.

At ignition, the five F-1 engines in the first stage flame to life, producing 7,500,000 pounds of thrust. The holddown arms release the giant vehicle, and our three astronauts have begun their ride to the moon.

Turbopumps, working together with the strength of 30 diesel locomotives, force 15 tons of fuel per second into the engines. Steadily increasing acceleration pushes the astronauts back into their couches as they feel the crush of gravity of four and one-half times that on earth. It is also a noisy ride, with considerable vibration.

After 2-1/2 minutes, the first stage has burned up its 4,700,000 pounds of propellants and is discarded. The roughest part of the ride is over. As the booster drops away, the five J-2 engines are ignited in the second stage. They burn the exotic new propellant, liquid oxygen and liquid hydrogen, which gives about 40 percent more thrust than the kerosene-oxygen combination used in the first stage. Speed at this moment is about 6,000 miles per hour. Altitude is approximately 36 miles, and the angle of climb is about 30 degrees against the horizon.

After second stage ignition the escape tower is discarded, since it will not be needed. The five J-2 engines provide one million pounds of thrust. Burning for about 6-1/2 minutes, they push the Apollo spacecraft to an altitude of about 100 miles and near-orbital velocity. After burnout the second stage drops away. Retrorockets kick it backwards, and it falls into the atmosphere in the Atlantic Ocean this side of Africa.

The single J-2 engine in the third stage now ignites, providing 200,000 pounds of thrust. Burning for about two minutes, it boosts the spacecraft to orbital velocity, about 17,400 miles an hour. The spacecraft, with the third stage still attached, goes into orbit about 12 minutes after liftoff. The propellants in the third stage are not depleted when the engine is shut down. This stage stays with the spacecraft in earth orbit, for its engine will be needed again.

Throughout the launch phase of the mission, telemetry systems are continuously transmitting; tracking systems are locked on and voice communications are used to keep in touch with the astronauts. All stage separations and engine thrust terminations are reported to the Integrated Mission Control Center at Houston, Texas.

The astronauts are now in a weightless condition as they circle the earth in what we call a "parking" orbit. Why do we have an earth parking orbit when we are bound for the moon? There is really no necessity from the celestial mechanics standpoint. It is more or less a matter of operational convenience.

You all recall delays in launching Mercury-Atlas and Gemini-Titan rockets. We can expect very much the same kind of delay with a new-fangled rocket as big as the Saturn V. Now, while you can inject into earth orbit anytime you choose -- or whenever you are able -- the moon is unforgivable with respect to the timing of the translunar trajectory. This moment is governed by the moon's own motion through its orbit of the earth. So we plan to get into earth orbit ahead of time and wait there for the moon. If we should get there earlier, we simply wait a little longer.

The first attempt at a lunar landing will be an "open-ended" mission with detailed plans at every stage for mission termination if necessary. A comprehensive set of alternate flight plans will be laid out and fully rehearsed for use if such a decision should prove necessary. For example, a decision might be made in the earth parking orbit not to continue with the mission. At every stage of the mission, right up to touchdown on the moon, this termination decision can be made and an earth return flight plan initiated.

We may circle the earth from one to three times while in the parking orbit. This time is used for a complete check of the third stage and spacecraft. This is not done by the astronauts aboard, but from the ground. The astronauts will check some gear, such as their oxygen masks, but 98 percent of the equipment check will be made from earth.

When the precise moment comes for injection into a translunar trajectory, the third stage J-2 engine is re-ignited. Burning for about 6-1/2 minutes, it accelerates the spacecraft from its earth orbital speed of 17,400 miles an hour to about 24,300 miles an hour. This velocity is needed to overcome the earth's gravity on the way to the moon.

If a major spacecraft failure should occur, this trajectory would carry the astronauts around the moon. Without further thrust the spacecraft would return to earth for re-entry. If everything is going according to schedule, however, it is now time to realign the modules of the spacecraft from the order they were placed in for launch. This series of intricate maneuvers will have been rehearsed thoroughly in earth orbit using the Uprated Saturn I vehicle and the Apollo spacecraft.

At this point, four panels of the structural support housing the lunar module are swung back on hinges to expose the LM. The LM has been nicknamed the "bug" because of its bulging cockpit and extended landing gear. Auxiliary propulsion engines on the service module and the conical-shaped command module are ignited briefly to push them away from the third stage of the Saturn V and the lunar module.

One moment later, the attitude control nozzles on the command module are used for a 180-degree turn around of the service and command modules.

Although this maneuver is completed while whizzing through space at nearly 25,000 miles an hour, the astronauts feel no sensation of speed, because there are no telephone poles zipping by outside their window. The relative speed of the two units that are being joined is just a few inches per second.

Using the reaction control system, the command pilot orients the command and service modules so that the top of the command module docks to the top of the exposed bug.

Once the docking maneuver has been completed, the lunar landing craft is pulled out of the forward end of the Saturn V third stage.

Now the spacecraft will coast upwards toward the rendezvous point with the moon, gradually being slowed in speed, however, by the pull of earth's gravity.

Since the moon is 238,000 miles away, we must expect that our injection was not as precise as we would like. So, the astronauts must check their highway map to determine if they are on course.

Using a device that combines a sextant with the inertial navigation unit, the astronauts determine the angle between selected stars and the horizon of the earth and moon. This information is fed into a computer. In a very short time the computer will tell the astronauts exactly where they are between the earth and the moon, and whether they are on the right course. If they are not, the computer goes through a second exercise and hands out the information for a mid-course correction maneuver.

The flight path is also continuously computed on the ground.

The first mid-course correction is made from five to twelve hours after lift-off. The inertial navigation unit has determined the direction

in space in which there may be needed a velocity change. The service module engine, with a thrust of 21,900 pounds, is fired to correct for the error in injection. This correction maneuver may be repeated a second or a third time, with the final mid-course correction being made about 67 hours after launch.

During the trip to the moon, the crew monitors the operation of the spacecraft, performs navigational fixes, monitors the environment of the cabin and performs required scientific observations and experimentation.

The spacecraft slows to about 6,500 miles an hour after one day and to about 1,500 miles an hour after two days, as if it were climbing a steep hill. About seven-eighth's of the way from the earth to the moon they will seem to go over the top of a hill, as they pass the point where the gravitational pull of the moon becomes stronger than earth's. Now the spacecraft speeds up again as it falls toward the moon.

Just before insertion into lunar orbit, one astronaut enters the lunar module to activate and checkout its system.

Near the end of the flight path to the moon, the initial requirements for entering lunar orbit are computed by the command module guidance computer and ground crews. The spacecraft approaches the moon with the service module engine pointed forward. In this manner its thrust can be used as braking power to slow the spacecraft from about 5,700 miles per hour to an orbital speed of about 3,600 miles per hour. This power is applied when the spacecraft is almost directly behind the moon. The engine burns about six minutes for this braking maneuver. It uses aerozine fuel and nitrogen tetroxide as an oxidizer. After emerging from behind the moon, the crew transmits engine and trajectory data to the ground for verification or orbit data.

Based on systems status, orbital information and other data, the command pilot makes a preliminary decision to continue the mission. During this period, the pilot observes the selected landing site, performs spacecraft systems checks and scientific duties.

Possible landing sites on the lunar surface will be within the limits of from 10 degrees north of the moon's equator to 10 degrees south and from plus 45 degrees in longitude, an area about 1,500 miles long and 200 miles wide. He communicates the scientific data and television data to the Manned Space Flight network. Because communications with earth are not possible when the spacecraft is behind the moon in lunar orbit, telemetry data are recorded on the far side of the moon and transmitted on the earth side. Each orbit of the moon requires about two hours.

Now firmly established in lunar orbit, the astronauts decide to attempt their landing on the moon's surface. The command pilot and the pilot crawl through a hatch from the command module to the flight deck of the lunar landing craft. The senior pilot remains in the orbiting command module -- which is still attached to the service module. He is the storekeeper, or shipkeeper. He does not get to set foot on the moon, but he will be needed to observe and assist in the landing of the two astronauts, to communicate with earth and to help in the rendezvous maneuver as the two explorers return from the moon's surface. The LM is checked out once more and the command pilot makes the final decision to separate from the command module.

Three days have now passed since the astronauts left earth and it is time to land on the moon. The engine in the landing stage of the bug is

fired up to lower it to an altitude of 50,000 feet, just over the selected landing site.

The landing maneuver begins at an altitude of 50,000 feet and a range of about 170 nautical miles from the landing site. During this maneuver, the navigation and guidance system automatically controls attitude and engine thrust angle. The engine can be throttled down so that the bug hovers about 200 feet above the lunar surface. The commander takes over manual controls at this point.

The landing will be made during lunar day to provide the best possible lighting conditions for control of touchdown.

Looking out the windows, the astronauts watch for obstacles such as boulders, pits or crevices. From its hovering position, the bug can move laterally to a desired point. The command pilot has about two minutes to decide whether to land or return to lunar orbit. If he should decide that the area selected is absolutely impossible to land on, he can gun the engine, and without touching down on the moon's surface, go back into lunar orbit and rendezvous with the shipkeeper.

If everything looks okay, he brings the bug down to a landing with a crunching jolt about like a helicopter landing.

"Touchdown," cries the command pilot to the astronaut orbiting overhead.

"They're on the moon," he calls to earth.

This is an historic moment. But the first thought of the astronauts must be, "Will the bug fly again?"

Before any attempt is made to explore the moon's surface, a thorough checkout is made of the lunar module and a capability is established to launch at any time.

The checkout completed, the astronauts lower their face plates and depressurize the flight deck of their landing craft. The astronauts disembark through the docking doors, and set foot on the lunar surface. They will probably make two excursions outside the vehicle and will remain together. Total lunar surface stay time will be about 18 hours.

Our scientific capability on the first lunar landing will naturally be limited -- not so much by payload limitations as by the fatigue problem. The touchdown on the moon's surface came about 75 hours after launch, and the astronauts still have more than 120 hours ahead of them before they get back to earth. We must stay within the fatigue limitations of the astronauts.

So the first order of business for the first flight is not predominantly science, but survival and successful mission accomplishment.

As long as we have no logistics provisions on the moon to ease the rigors of their environment, we will have to keep their stay on the moon short. Apollo follow-on programs will provide what every civilized traveler needs nowadays away from home--a motel room and a you-drive-it car. Lunar bases will provide a shelter where the astronauts can get out of their pressure suits, eat, sleep and do a little work. Ground transportation will be furnished to extend their explorations of the lunar surface.

The astronaut's 50-pound life support pack contains oxygen, temperature control devices, facilities for removing carbon monoxide, moisture and other contaminants, and communications and medical monitoring equipment.

He may wear a cape made of a reflective metallic material designed to protect him from micrometeorite hits and the extreme heat from the sun. In the direct sunlight the temperature may climb to 250 degrees Fahrenheit.

At night it may drop to 250 degrees below zero.

The astronauts will make photographs of the surroundings, collect samples of materials for detailed study by geologists, and position instruments which will measure radiation, moon quakes, solar winds, and magnetic fields, telemetering data back to earth long after his departure.

And a small television camera will give an audience on earth its first "live" lunar scenario.

Preparing for the homeward journey the two astronauts board the same flight deck in the lunar craft.

When they left the earth for the moon, hundreds of technicians with the aid of a great deal of equipment performed the launch. Now, they must launch themselves with the limited equipment carried for this purpose.

The moon departure must be properly timed to make the rendezvous possible. The orbital path of the command module has been nailed down precisely by earth tracking, supported by landmark tracking conducted by the shipkeeper. A computer on earth and one aboard the spacecraft define the exact time for the two returning astronauts to blast off from the moon's surface.

The landing stage of the bug has completed its primary mission, and now serves as a launch pad for the upper part of the lunar module which has its own propulsion system. A countdown is performed, and the 3,500-pound thrust engine of the upper stage is fired just after the orbiting shipkeeper comes into view over the horizon. The landing stage is abandoned on the moon.

The lunar craft flies upward in a slanting flight path that brings it into orbit behind the circling command and service modules, halfway around the moon from the launch site. Attitude control is provided automatically by small auxiliary jets which create a few pounds of thrust.

After the two units get within 50 miles of one another, radars will establish contact and measure the line of sight, direction and the closing rate; that is, the relative speed at which the two units are approaching one another. These radars will then trigger a system to fire the ascent engine again, instructing it on what angle to fire and how long to burn. The two orbiting modules ultimately come to a complete standstill in relation to one another, about 50 feet apart.

In addition to radar and computers, the rendezvous maneuver is aided by visual observations.

Both units have maneuvering capabilities, and several modes are possible to complete docking. The two astronauts simply drive the bug the last few feet, with micro-thrusts of a few pounds, into the nose of the command module.

The senior pilot in the command module assures that the pressures in the docked craft are about the same before opening the hatches between the two spacecraft. The command pilot and pilot deactivate certain LM systems and crawl back through the tunnel, bringing scientific samples with them.

The three astronauts position themselves in their couches and fasten the restraints. The command pilot separates the unmanned lunar craft and it is abandoned in lunar orbit. The senior pilot orients the spacecraft and takes a navigational fix on a star. With this information and data transmitted from earth, he updates the computer. The navigation and guidance

system then calculates the time for firing the service module engine and the velocity needed for injection into the flight path back to earth. After systems checks are again performed, the command pilot positions the spacecraft for the injection maneuver.

About one orbit after rendezvous, the service module engine is fired to accelerate the craft to about 5,400 miles per hour. This velocity will take the spacecraft out of the gravitational field of the moon to the point where the gravitational field of the earth becomes stronger. From this point on, it falls like a stone toward the center of the earth.

The unpowered flight back to earth takes about 93 hours. And here again mid-course maneuvers may be necessary to nail down the approach to earth with the necessary high precision. The spacecraft navigation and guidance system, as well as the large antenna stations of the manned space flight tracking network, is used to verify the trajectory. The first correction is made about 18 hours after leaving lunar orbit.

Re-entry is made by shooting tangentially into the uppermost layers of the atmosphere and using the aerodynamic drag to retard the command module, which will approach the earth with a velocity of more than 24,000 miles per hour.

There is a narrow corridor available in which such a re-entry is permissible. If the approach is too steep, the deceleration encountered by the rapidly increasing aerodynamic drag may crush the astronauts, and the capsule may even be burned up by overheating. If the approach is too high, the command module may skip out of the atmosphere again, like a stone skipping across a mill pond. The re-entry window is 30 miles high and 400 miles wide.

However, we believe we can nail this approach down very precisely with earth-based radar. A final mid-course correction may be made up to five or six hours before starting re-entry.

After the final mid-course is made, the service module is jettisoned. It will zoom into the atmosphere, but being built of aluminum, it will be destroyed in a spectacular shooting star type re-entry.

Of the 3,000 tons launched from Cape Kennedy, only the six-ton command module will return safely to earth.

The astronaut's cabin is air-conditioned at 72 degrees. We don't expect this inside temperature to rise more than two degrees during the blazing re-entry which is about to take place.

The command module approaches the earth with its pointed end forward. Now it must be turned around with its heat-protected blunt end forward, just as the Mercury and Gemini capsules have re-entered. This is done with attitude control nozzles.

The blunt end is more effective for producing drag and reducing velocity. In addition, most of the energy that must be dissipated goes into a shock wave which travels away from the capsule. This allows us to keep the weight of the heat shield to a minimum.

Just prior to re-entry, the computer is switched to automatic entry, and the correct attitude is established.

At an altitude of about 400,000 feet the spacecraft hits the earth's atmosphere at a speed of more than 24,000 miles an hour. Speeding swiftly through the upper reaches of the atmosphere, it slams into denser air and glows at a fiery 5,000 degrees Fahrenheit. With their backs toward the earth, the astronauts again feel the crushing force of gravity as the spacecraft loses speed.

The command module is tilted at an angle of attack of 30 degrees. This creates lift as well as drag.

The direction of this lift vector can be controlled. Should the astronauts feel they are shooting out of the atmosphere, they can activate their control nozzles and turn the spacecraft so that the lift vector points downward, forcing them deeper into the atmosphere. They can even apply the lift vector to the right or the left to make changes in direction. Information is provided through computers that know the re-entry groove the capsule is in, and its selected landing site. Because of this tremendous flexibility, we believe we can land the returning lunar explorers within 10 miles of the intended target area.

The forward compartment heat shield has a protective layer of ablative material designed to evaporate and carry away the tremendous heat caused by friction and pressure of the atmosphere. Its job done, the heat shield is jettisoned at 50,000 feet.

At an altitude of 30,000 feet, the capsule is slowed down to the speed of sound.

At 80 percent of the speed of sound, small drogue parachutes are deployed. These small chutes are designed primarily to stabilize the capsule, which at subsonic speeds might otherwise rock a little. The drogue chutes are not for braking purposes.

At an altitude of 10,000 to 12,000 feet the drogue parachute pulls out the three main parachutes. They are not opened fully at first, but in three successive steps. Cords running through the periphery of each chute reduce its diameter. Built-in line cutters sever the cords at scheduled steps, allowing the chutes to open a little at a time and avoid the shock of an ordinary quick-opening parachute.

The first Apollo returns will be water landings, as in Project Mercury and Gemini. Water landings offer increased safety margins. Later in the program, land landings may be attempted.

Touchdown comes 196.3 hours after blast-off from the earth, or about eight days and four hours.

The recovery crews take over now, just as they have in the Mercury and Gemini flights.

When this nation makes its first manned expedition to the moon, one rocket and one spacecraft will be used in the mission. But what will we have to show for our investment?

We will have the full value of the years of effort it took to learn how to build such a powerful rocket and such a versatile and advanced space-craft.

We will have the vast complex of ground facilities it took to build, test, transport, launch and control this rocket and spacecraft.

We will have 5,000 man-hours of flight experience in earth orbit in Projects Gemini and Apollo before the date for the lunar takeoff is set.

We will have the trained manpower and the industrial facilities that are needed for American strength and security in the space age. And these are new national resources which can only come from carrying a major effort like the Apollo-Saturn moon program through to success.

We will have laid the groundwork and acquired the experience and skill and technological knowledge for more advanced space missions that the national interest may require.

We will have won a major political and strategic victory by demonstrating our pre-eminence in the vital field of manned space flight.

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NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
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FOR RELEASE: IMMEDIATELY
December 8, 1961

Release No. 61-274

NASA SELECTS SUPPORT FIRM
FOR MICHOUD PLANT

The National Aeronautics and Space Administration today selected Mason-Rust for negotiation of a contract to provide support services at NASA's Michoud Operations, New Orleans, La.

Mason-Rust's parent organizations are Rust Engineering Co. of Pittsburgh, Pa. and Mason and Hanger-Silas Mason Co. of Lexington, Ky.

NASA's Marshall Space Flight Center, Huntsville, Ala., which has charge of the Michoud Operations, will enter negotiations with the firm at an early date. The contract will be effective through June 30, 1962, with a one year renewal option. Estimated cost is $1,250,000.

The Michoud plant will be the site of production of three large space vehicle stages: Saturn S-I booster, advanced Saturn S-IB booster, and RIFT (Reactor-in-Flight-Test) nuclear vehicle which will be launched as an upper stage of a Saturn. The plant has more than 2 million square feet of floor space.

Mason-Rust will provide certain common services to all contractors operating in the Michoud plant as well as the Marshall Center element which will be assigned to Michoud.

These services include transportation, security, fire protection, photographic, medical, food service, communications, custodial, plant maintenance and repair, engineering, messenger, mail, refuse disposal, printing, and utilities.

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Mason-Rust was among 36 firms entering proposals for the work. Proposals were requested by Marshall October 24 and were received November 7.

The Chrysler Corp. has been chosen to produce the Saturn S-I booster at Michoud. Proposals from five firms for development and production of Saturn S-IB are under evaluation by NASA. Initial proposals on the RIFT vehicle are due at Marshall on January 3.

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NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
400 MARYLAND AVENUE, SW, WASHINGTON 25, D.C.
TELEPHONES: WORTH 2-4155 — WORTH 3-1110

FOR RELEASE: Sunday - October 14, 1962

RELEASE NO. 62-219

NASA TO BUILD LANDING DOCK NEAR MICHOUD FOR HANDLING LAUNCH VEHICLES

The National Aeronautics and Space Administration and the Department of the Army have signed an agreement whereby NASA will be permitted to use a portion of the Army Michoud storage area at New Orleans. Duration of the agreement is 25 years.

The principal feature of the storage area is a ship basin, the eastern portion of which NASA will use for loading and unloading space vehicles at the NASA Michoud Operations Plant. The basin is located some 600 yards from the Michoud Plant, where Saturn space vehicles will be produced.

The NASA Marshall Space Flight Center, Huntsville Alabama, which is in charge of Michoud operations, is making plans to build a ship dock at the basin and to dredge a vessel turning area. Both river and sea-going vessels, up to 500 feet in length, will be accommodated at the facility. Booster stages are expected to be transported between the Michoud Plant, the Marshall Center and the Center's Mississippi Test Facility, 35 miles northeast of Michoud.

NASA obtained the right to use 14 acres at the site. The Army may continue to use the other portion of the facility. NASA was given the right to construct docks and other facilities as needed.

The basin is located at the junction of the Gulf Intracoastal Canal and Mississippi River Gulf outlet - affording easy access to connecting waterways.

The design of the NASA dock is underway. Construction bids are to be requested in December. Construction should be completed next summer.

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Trip of the President

to

MICHOUD OPERATIONS

DIVISION OF

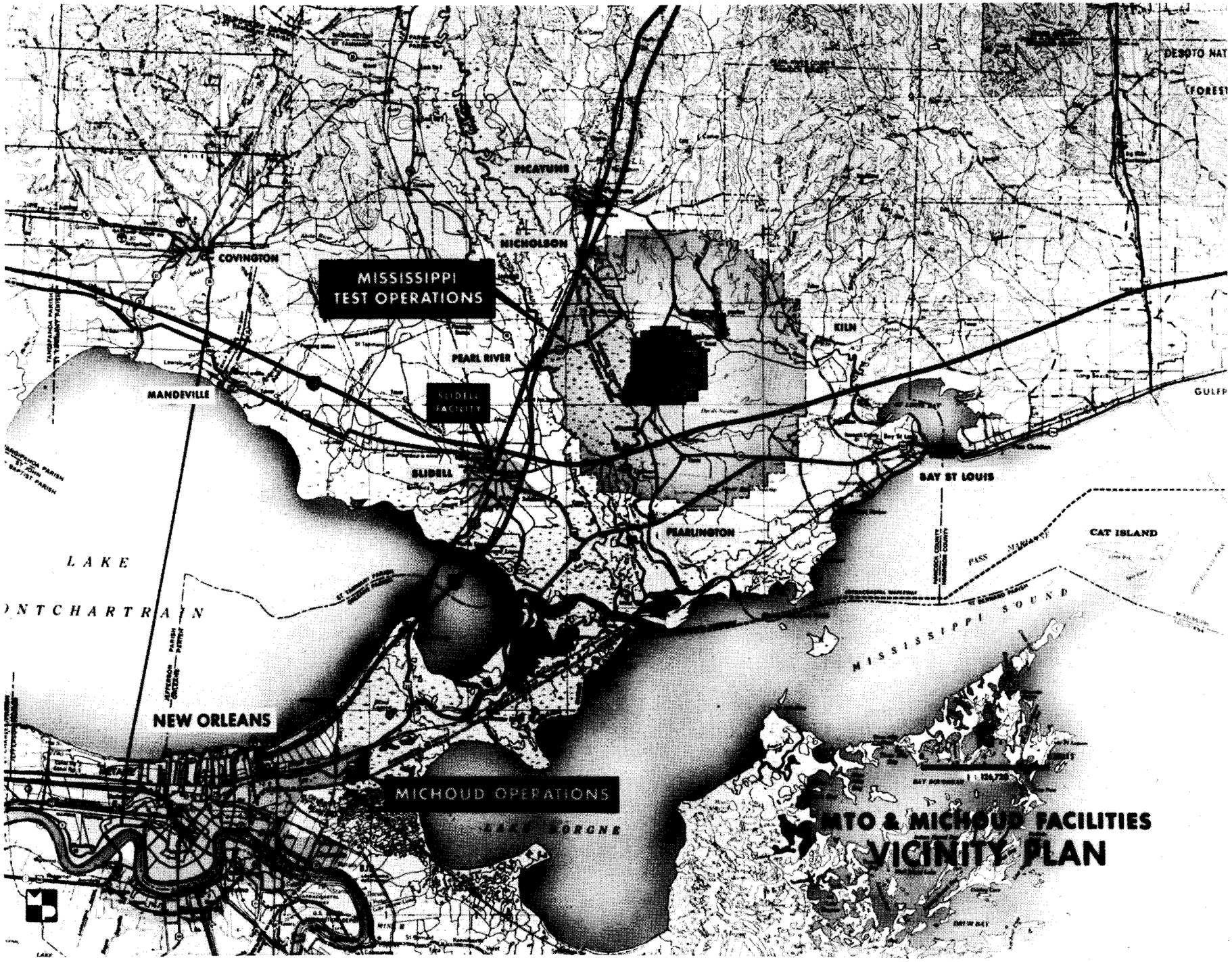
GEORGE C. MARSHALL SPACE FLIGHT CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NEW ORLEANS, LOUISIANA

Trip cancelled

OCTOBER 9, 1964



MTO & MICHOUD FACILITIES
VICINITY PLAN

VISIT OF THE PRESIDENT

to

MICHOUD OPERATIONS
Dr. George N. Constan, Manager

a division of

GEORGE C. MARSHALL SPACE FLIGHT CENTER
Dr. Wernher von Braun, Director

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
James E. Webb, Administrator

New Orleans, Louisiana October 9, 1964

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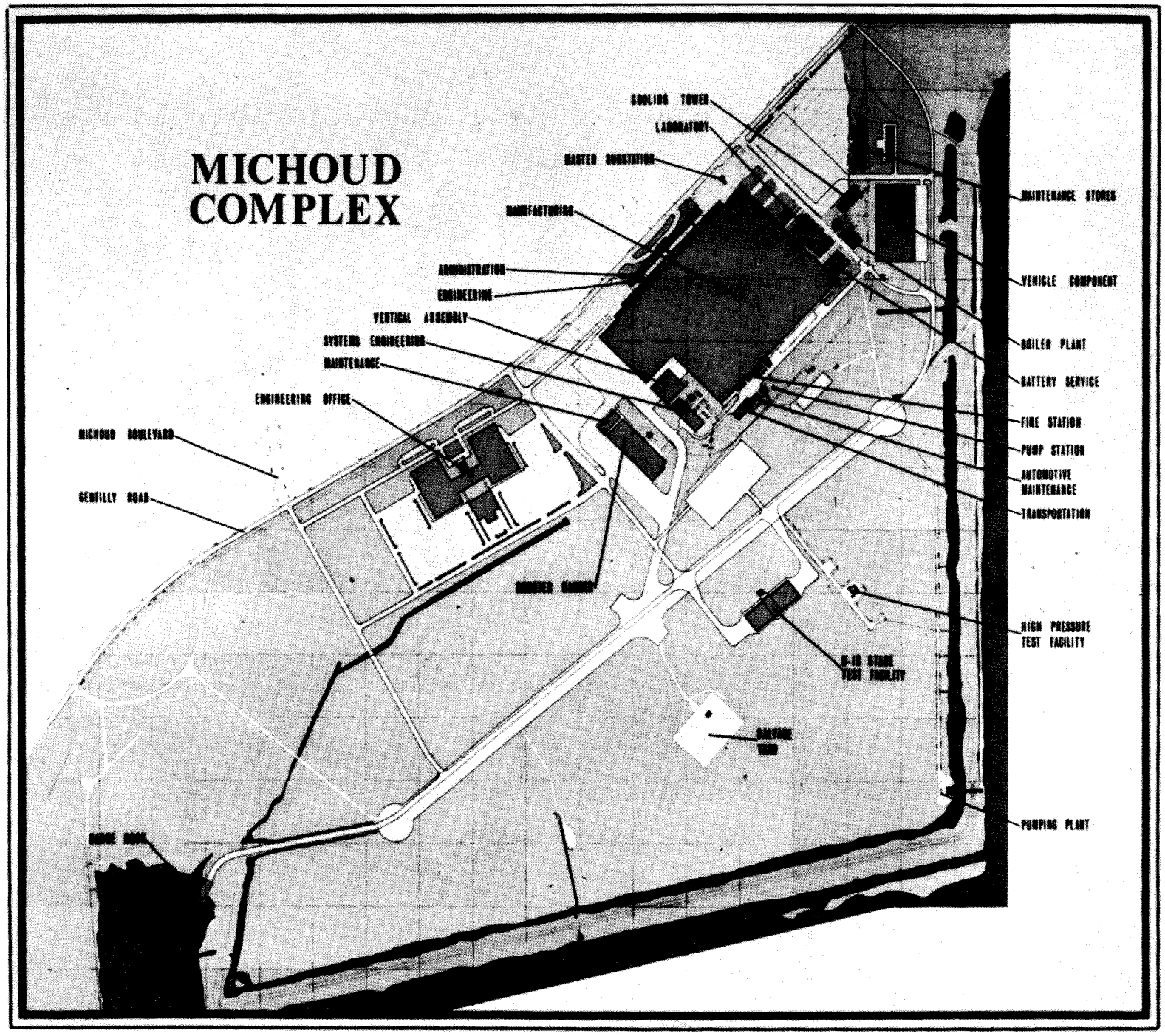
SEQUENCE OF EVENTS

Greetings by NASA, Chrysler, Boeing and Mason-Rust Representatives -- Saturn Blvd.

Tour S-IC Manufacturing Area -- Manufacturing Building

Inspect S-IC Mock-up -- Manufacturing Building

Tour S-I and S-IB Manufacturing Area -- Manufacturing Building


MICHOUD COMPLEX
COOLING TOWER
LABORATORY
MASTER SUBSTATION
MANUFACTURING
ADMINISTRATION
ENGINEERING
VERTICAL ASSEMBLY
SYSTEMS ENGINEERING
MAINTENANCE
ENGINEERING OFFICE
MICHOUD BOULEVARD
GENTILLY ROAD
BOILER HOUSE
MAINTENANCE STORES
VEHICLE COMPONENT
BOILER PLANT
BATTERY SERVICE
FIRE STATION
PUMP STATION
AUTOMOTIVE MAINTENANCE
TRANSPORTATION
HIGH PRESSURE TEST FACILITY
C-10 STORE TEST FACILITY
PUMPING PLANT

MICHOUD OPERATIONS

This government-owned Michoud plant in New Orleans, La., was selected by the National Aeronautics and Space Administration for the fabrication of large space vehicle stages.

Michoud Operations, as the mammoth facility has been designated, is now the production site for the giant first stages of the Saturn I, Saturn IB, and Saturn V launch vehicles.

Managed by Dr. George N. Constan, the Michoud Operations is a division of the George C. Marshall Space Flight Center, Huntsville, Ala. Marshall, the largest of NASA's ten major installations, is directed by Dr. Wernher von Braun.

In the Saturn program, the Marshall Center works under the direction of NASA's Office of Manned Space Flight.

NASA announced selection of the 20-year-old Michoud Ordnance Plant on Sept. 7, 1961. Until that date the facility had seen relatively little use. Designed originally in 1942 as a shipyard, the plant was used briefly for the manufacture of plywood cargo planes and later--during the Korean conflict--for the manufacture of tank engines. The plant remained idle from July 1953 until its selection by NASA.

Facilities

The 825-acre Michoud complex is located 15 miles from downtown New Orleans within the city limits. It is bordered on the south by the Intracoastal Waterway and on the north by the Old Gentilly Highway which intersects U.S. Route 90.

Three large buildings, all air-conditioned, were included in the original complex taken over by NASA. These buildings, now renovated and fully utilized, are an administration building, an engineering building, and a manufacturing building. Five additional major facilities have been or are being constructed: a vertical assembly and hydrostatic test and cleaning building; an engineering and office building; a barge dock; an S-IC stage test facility; and an S-IC pressure test facility.

Why Michoud

Michoud was chosen because it offered the government several advantages. To begin with, facilities existed at Michoud which immediately meant a savings in land, construction and utility costs. Secondly, a government-owned plant, operated by contractors, gives NASA flexibility in management.

Its geography was a considerable factor in the selection of Michoud for this operation:

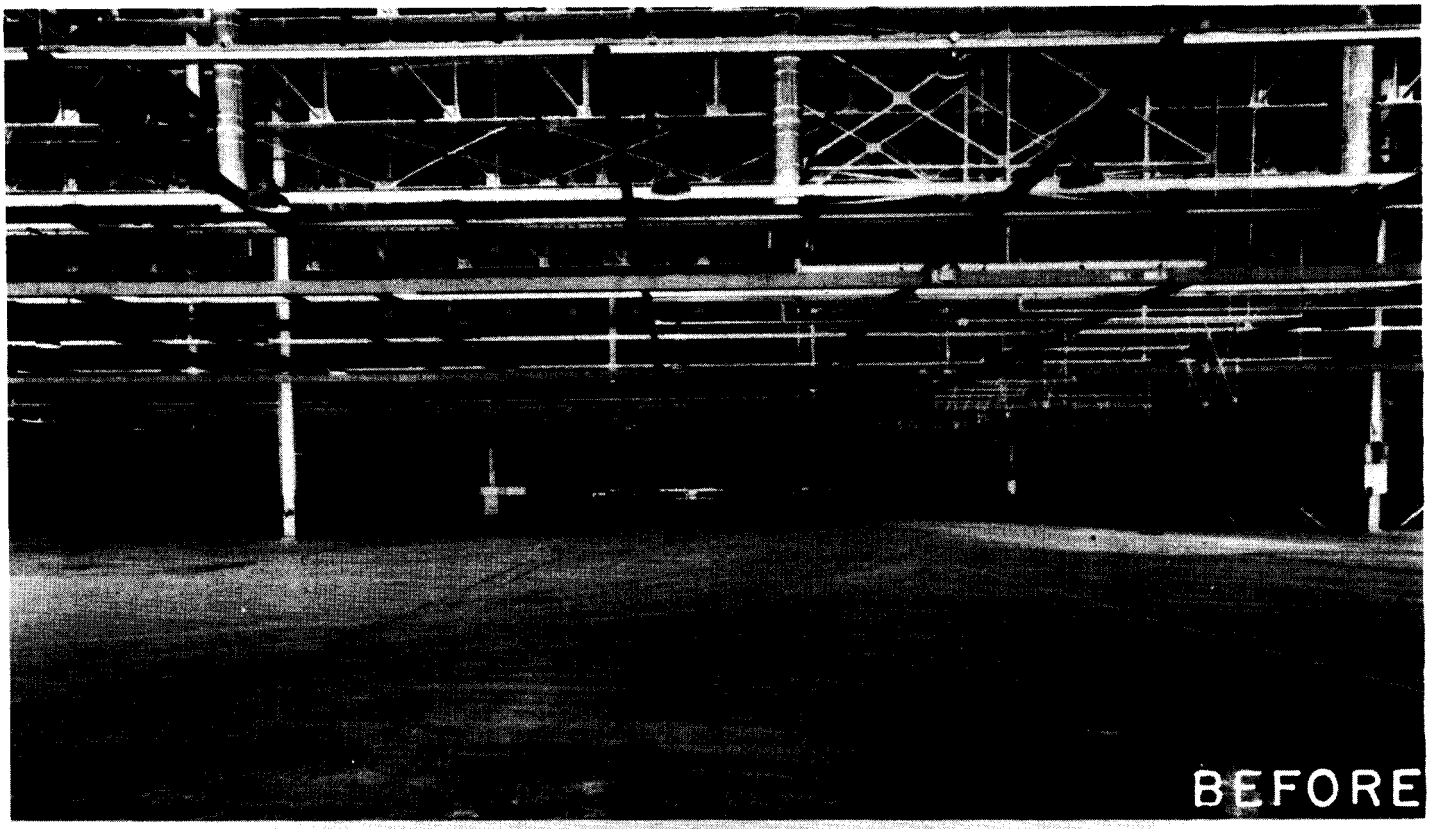
It is linked by good water routes with the Marshall Space Flight Center at Huntsville, Ala., and with the launch area at Cape Kennedy, Fla. It is also linked by water to the nearby Mississippi Test Facility. Overland transportation for these large rockets is out of the question except for very short distances.

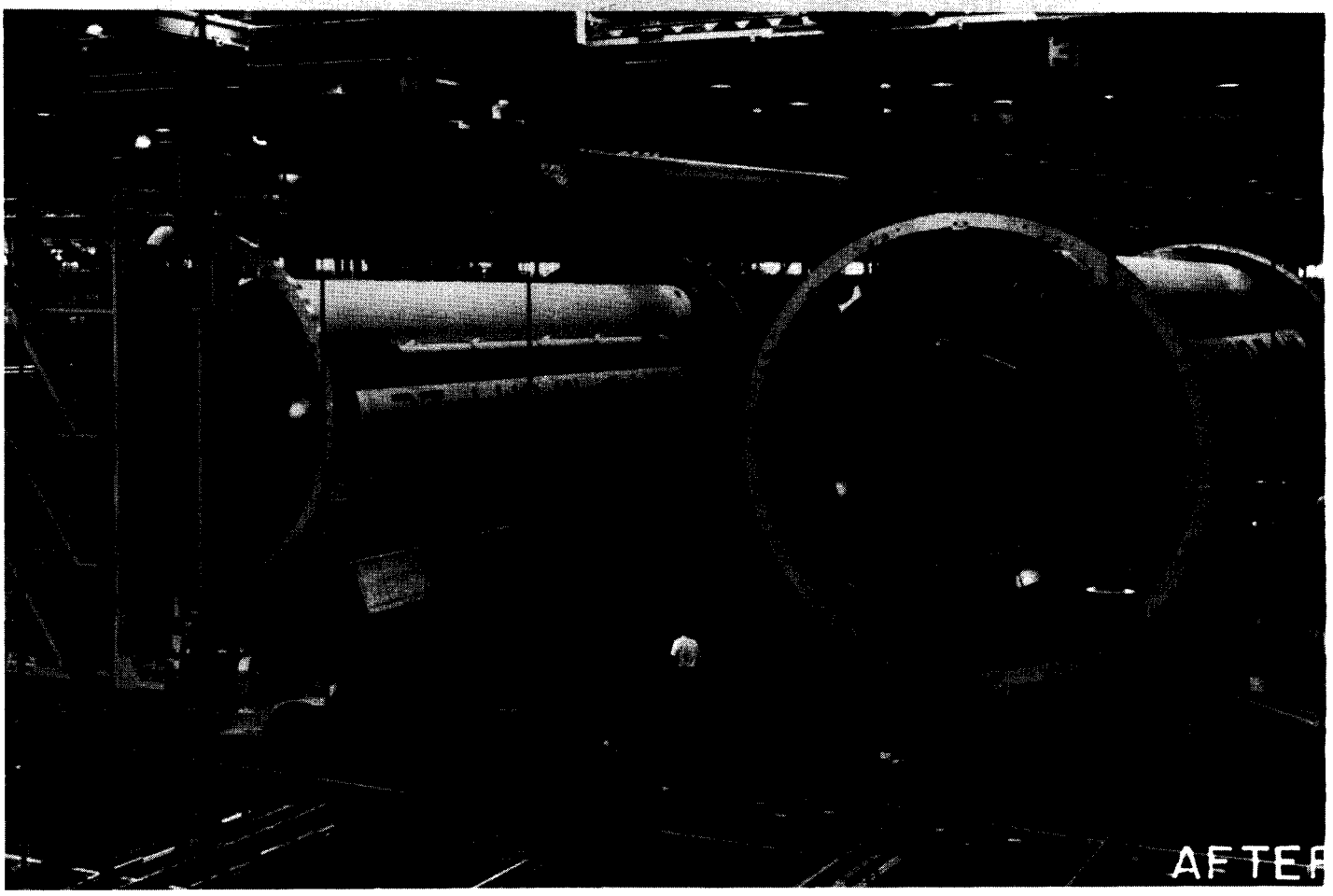
The area's climate permits outdoor work year-around.

The idle plant met most of NASA's requirements for a very large floor area with high headroom.

Skilled labor and essential industrial services are available in the area.

The universities and cultural amenities of the New Orleans area help attract the type of scientific, engineering, and managerial personnel required for the most efficient operation of the facility.





Michoud--no longer an idle plant--ideal for the Nation's space program.

CONTRACTOR OPERATED

While government-owned and managed, Michoud is operated by four principal contractors. A brief description of these contractors follows:

S-I/S-IB - Chrysler Corporation

The Chrysler Corporation was awarded its initial contract by NASA in December, 1961, to assemble and test the first stage (S-I) of the Saturn I space vehicle. A definitive contract, requiring the delivery of 21 S-I stages was received by Chrysler in August 1962.

This contract was modified in November 1962, to require the Space Division of Chrysler to build eight S-I stages for the Saturn I and 12 S-IB stages for the Saturn IB launch vehicles. The primary differences in the two stages is that the S-IB stage will be lighter in weight and will be adaptable to a new second stage. Under the change, Chrysler will perform the stage redesign limited primarily to reducing metal gage thickness and eliminating research and development-type instrumentation. There will be no significant change in the over-all configuration of the stage.

NASA announced on Oct. 30, 1963, a rephasing of manned flight missions among the Saturn vehicles. Principal changes included acceleration of the critical Saturn IB program and the deletion of six of the eight Saturn I boosters scheduled to be built by Chrysler.

Both the S-I and the S-IB will be 21½ feet in diameter and 82 feet high. They are powered by a cluster of eight H-I engines, providing a total of 1.5 million pounds of thrust. The Saturn I and Saturn IB vehicles will be used in the early phases of the Apollo program to orbit elements of the manned lunar landing spacecraft.

The major site of Chrysler's effort under the existing contract is the Michoud Operations. However, some minor components are being manufactured at the Chrysler operations in Huntsville and Detroit.

Chrysler will also conduct static firing tests of Michoud-built S-I's and S-IB's at the Marshall Center in Huntsville, as well as furnish some direct engineering support to that center and the John F. Kennedy Space Center, Cape Kennedy, Florida.

S-IC - Boeing Company

The Boeing Company was awarded its initial contract by NASA in February 1962, to develop and manufacture the first stage (S-IC) of the Saturn V space vehicle. A final, definitive contract for this work was awarded to Boeing in February 1963.

The S-IC will be the first of a three-stage launch vehicle designed to carry the three-man Apollo spacecraft on lunar landing expeditions.

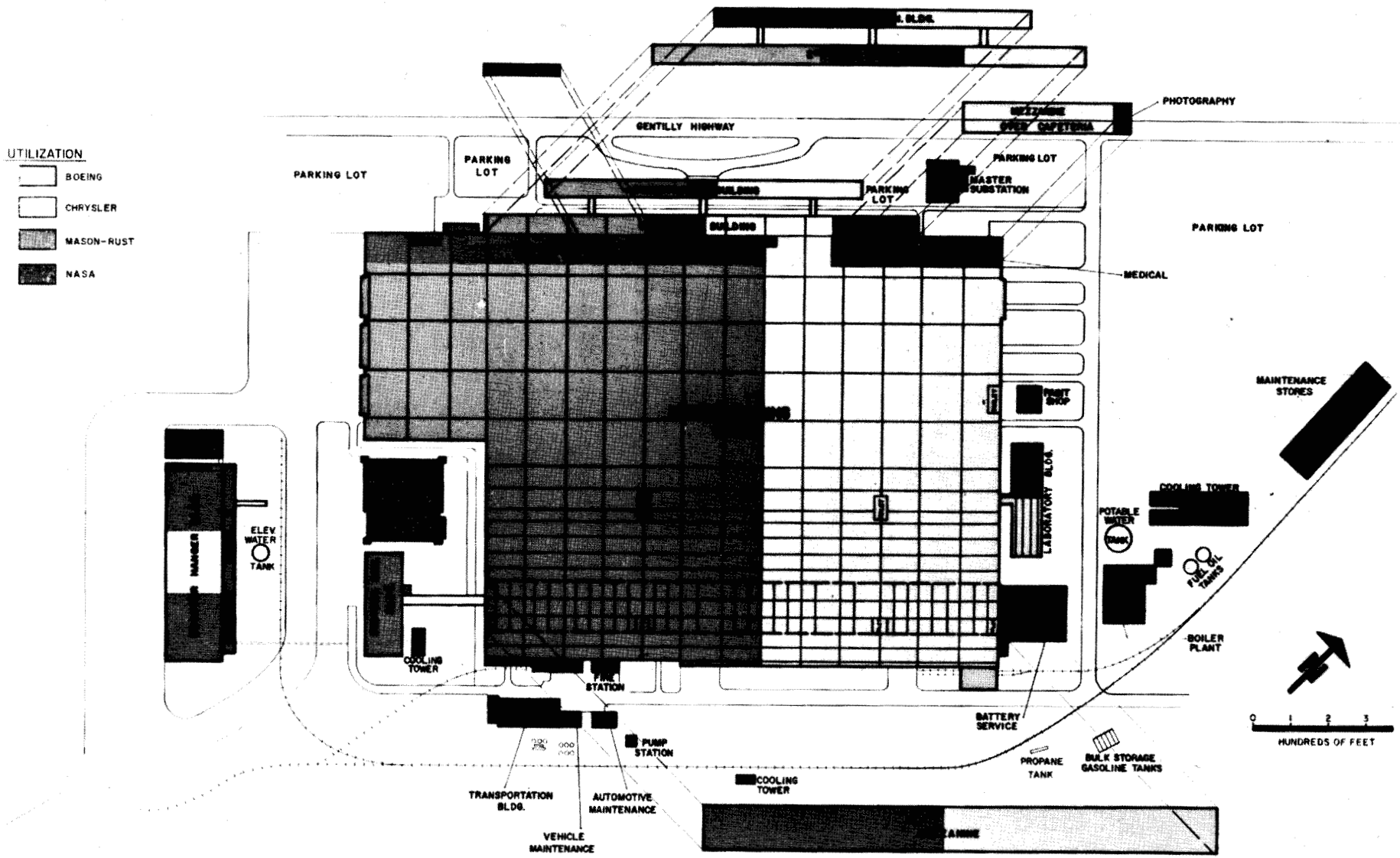
The Saturn Launch Systems Branch of the Boeing Company will build and test ten Saturn V boosters. The first two to be assembled will be dynamic test (S-IC-D) and facilities check-out (S-IC-F) stages. The remaining eight units will be flight boosters.

Measuring 33 feet in diameter and 138 feet in height, the S-IC will generate 7.5 million pounds thrust.

While the majority of the work and all final assembly of the stages will be accomplished by Boeing at the Michoud Operations, some engineering and manufacturing support will be performed at the contractor's Seattle, Wash., and Wichita, Kan., plants and at Cape Kennedy, Fla.

The S-IC-D will be shipped to the Marshall Center in Huntsville, and the S-IC-F will be barged to the Kennedy Space Center in Florida. All S-IC flight stages will be shipped first to Marshall's Mississippi Test Operations for static firing, returned to Michoud for refurbishing, and shipped on to Cape Kennedy for launching.

NASA MICHOUD OPERATIONS
PLANT UTILIZATION



Computer Services - Telecomputing Services, Inc.

Telecomputing Services, Inc., was awarded a contract by NASA in January, 1963 to operate computers and data transmission equipment in support of the Saturn booster manufacturing programs at the Michoud Operations.

The contract requires Telecomputing to provide all personnel, facilities, equipment and materials--not otherwise furnished by NASA--necessary to operate two computer complexes: A scientific data processing complex to perform engineering calculations arising in the development, fabrication, and testing of the Saturn booster; and a management data complex to process the multitude of data necessary to administer the unique Michoud projects.

The major portion of the work is being performed at Michoud's Computer Operations Office, located in Slidell, La.

Support Services - Mason-Rust

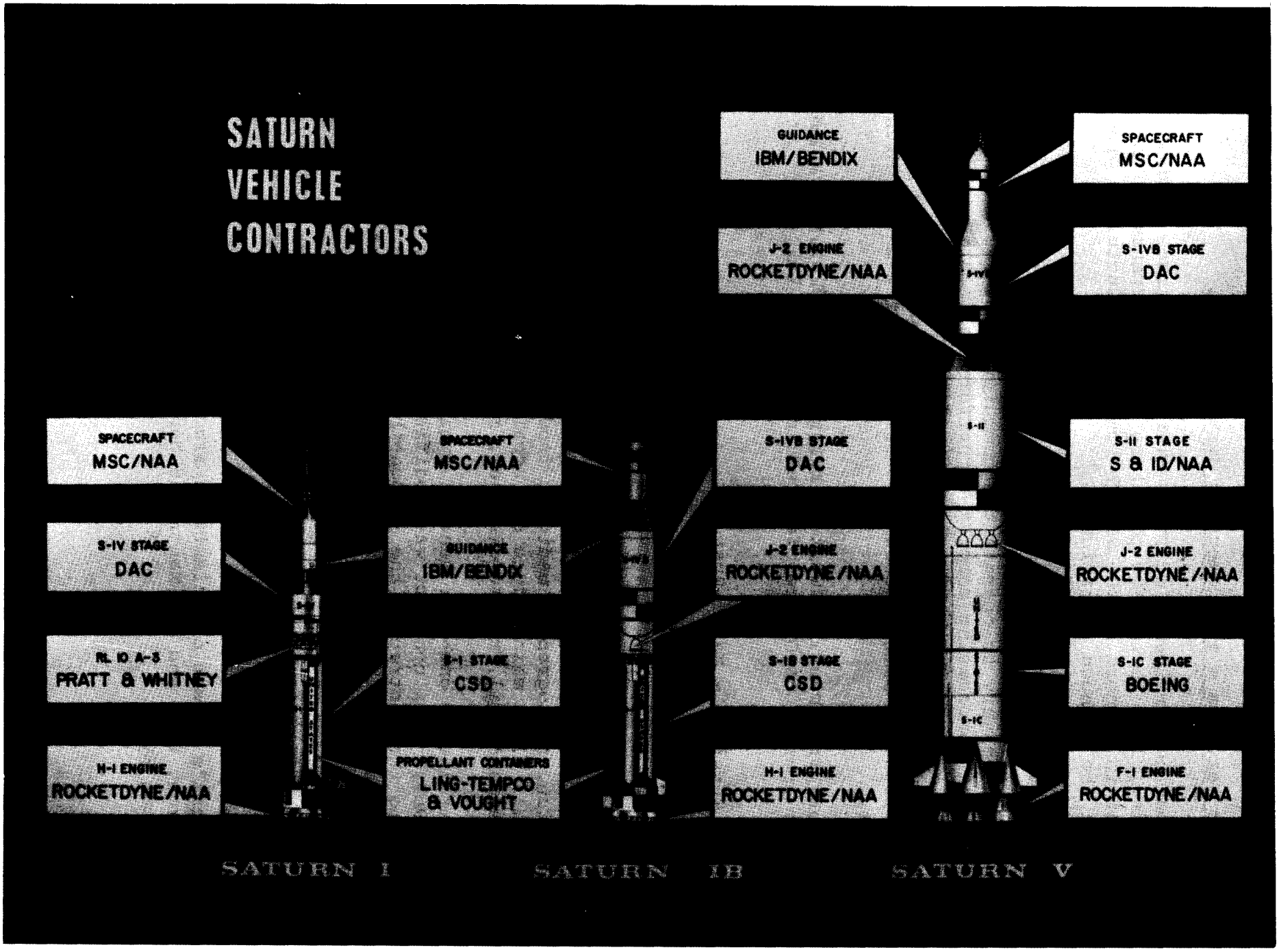
Mason-Rust was awarded its initial contract by NASA in December, 1961, to provide support services to all NASA-contractor elements at the Michoud Operations.

Included in these services are: transportation, security, fire protection, photography, medical, food, supply, communications, custodial, plant maintenance and repair, plant engineering, messenger and mail, refuse disposal, reproduction and utilities.

NASA exercised a one-year renewal option with Mason-Rust in July, 1962. This contract was modified in October, 1962, delegating to the contractor the responsibility for awarding, supervising, coordinating and maintaining construction of facilities contracts at Michoud.

A second one-year contract was awarded to Mason-Rust in July, 1963, calling for continued provision of support services at the New Orleans facility.

Mason-Rust's parent organizations are the Rust Engineering Co., Pittsburgh, Pa., and the Mason and Hanger-Silas Mason Co. of Lexington, Ky.


SATURN
VEHICLE
CONTRACTORS
SPACECRAFT
MSC/NAA
S-IV STAGE
DAC
RL 10 A-3
PRATT & WHITNEY
H-I ENGINE
ROCKETDYNE/NAA
SPACECRAFT
MSC/NAA
GUIDANCE
IBM/BENDIX
S-I STAGE
CSD
PROPELLANT CONTAINERS
LING-TEMPCO
& VOUGHT
S-IVB STAGE
DAC
J-2 ENGINE
ROCKETDYNE/NAA
S-IB STAGE
CSD
H-I ENGINE
ROCKETDYNE/NAA
GUIDANCE
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J-2 ENGINE
ROCKETDYNE/NAA
SPACECRAFT
MSC/NAA
S-IVB STAGE
DAC
S-II STAGE
S & ID/NAA
J-2 ENGINE
ROCKETDYNE/NAA
S-IC STAGE
BOEING
F-I ENGINE
ROCKETDYNE/NAA
SATURN I
SATURN IB
SATURN V

SOME FACTS AND FIGURES

27,000 New Jobs:

Michoud Employees	**11,500**
Estimated Construction Workers	1,650
Estimated Collateral Industries	5,000
Jobs Directly Attributable	**18,150**
Estimated Increased Employment in Service Industries (Retail Establishments, Wholesale Distributors, Etc.--60% of "jobs directly attributable," as per Chamber of Commerce Statistics).	10,000
TOTAL	**28,150**

$180,000,000 in Salaries and Wages:

Michoud Employees	$ 85,000,000
Construction Workers (Estimated Average Annual Wage of $6,000)	10,000,000
Collateral Industries (Estimated Average Annual Wage of $7,000)	35,000,000
Service Industries (Estimated Average Annual Wage of $5,000)	50,000,000
TOTAL	$180,000,000

$119,500,000 in Retail Sales:

By reference to the 1963 table published by Internal Revenue, the average State sales tax payments (assuming family size of 3 persons) are estimated as follows:

GROUP	ESTIMATED AVERAGE WAGE	ESTIMATED INDIVIDUAL SALES TAX
Michoud Employees	$7,500	$98
Construction Workers	6,000	82
Collateral Industries	7,000	93
Service Industries	5,000	71

Retail sales anticipated are estimated by multiplying the estimated individual sales tax by the number of workers in each group, and dividing the product by 2%, with the following result:

GROUP	
Michoud Employees	$ 53,900,000
Construction Workers	6,800,000
Collateral Industries	23,300,000
Service Industries	35,500,000
TOTAL	$119,500,000

The State Income Tax for Michoud employees is computed by using the average tax withheld as reported by the several contractors, and by using an average amount of $20 for all remaining wage earners, as follows:

GROUP	ESTIMATED STATE INCOME TAX
Michoud Employees	$467,940
Construction Workers	33,000
Collateral Industries	100,000
Service Industries	200,000
TOTAL	$800,940

The Gasoline Tax Revenue is estimated by assuming ownership by wage earners of approximately 19,000 automobiles which are driven approximately 12,000 miles within the State, averaging 15 miles per gallon of gasoline at .07¢ tax per gallon.

Increased Tax Revenues:

State sales tax is estimated by multiplying the estimated individual sales tax for each group by the number of employees in the group to arrive at a total of: $2,388,300

To which is added the estimated sales tax paid on construction materials: 45,500

TOTAL $2,433,800

City and parish sales taxes are estimated to be one-half of the State taxes on the assumption that all purchases are made in the local area.

60,000 Increase in Population

Assuming an average family size of 3½ persons per wage earner, 27,000 jobs would represent sustenance for 94,000 persons. It is estimated that about one-third of these people will be local residents, and about two-thirds will be new arrivals.

$41,000,000 of New Construction

This is the approximate total of construction contracts awarded through June 30, 1964, per Michoud Public Affairs Office.

WEEKLY PERSONNEL REPORT

NASA Michoud Operations

(As of Sept. 28, 1964)

National Aeronautics & Space Administration	279
The Boeing Company	7018
Chrysler Corporation	3140
Mason-Rust	884
Rocketdyne	16
Telecomputing Services	139
Total	11,476

THE SATURN PROJECT

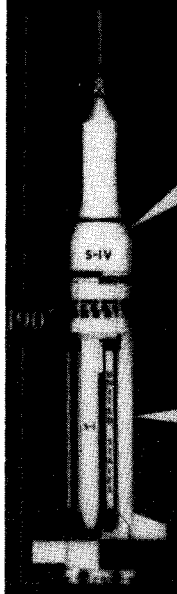
The National Aeronautics and Space Administration is developing three heavy space vehicles under the project name "Saturn." Saturn vehicles are powerful enough to send payloads of many tons into Earth orbit, to the Moon and into deep space. The main purpose of the project is to provide the launch vehicles for extended manned space flight including an expedition of Apollo astronauts to the Moon before 1970.

The Saturn I booster (S-I stage) develops 1.5 million pounds thrust. Seven of the vehicles have been launched to date, all successfully. The first four, launched over the Atlantic Missile Range Oct. 27, 1961, April 25 and November 16, 1962, and March 28, 1963, carried inert upper stages in tests of the boosters. On Jan. 29, 1964, the fifth Saturn I, the first of the finned Block II configuration, was launched from Cape Kennedy. Known as SA-5, the vehicle consisted of the booster running at full power, a "live" 90,000-pound-thrust second stage (S-IV) and an inert payload. SA-6 and SA-7 were launched May 28 and September 18, respectively. SA-5, SA-6 and SA-7 placed more than 37,000 pounds each into Earth orbit. The SA-6 and SA-7 "payloads" included early models of the Apollo spacecraft.

The missions of the remaining three Saturn I flights are to contribute to the development of the two larger and more powerful Saturn rockets, to launch unmanned Apollo command and service modules and to place into Earth orbit large satellites to detect the presence and measure the size of meteoroids in space near Earth.

The largest vehicle in the project is Saturn V which will have a booster producing 7.5 million pounds thrust--five times that of Saturn I. The Saturn V program, begun in January, 1962, will produce the three-stage rocket destined to carry the Apollo spacecraft and its crew of three to the Moon.

SATURN VEHICLE DIMENSIONS



S-IV

DIAMETER	18 FT.
HEIGHT	40 FT.
WEIGHT	114,000 LBS. (FUELED)
ENGINE	A-3 (6)
PROPELLANT	LOX / LH
THRUST	90,000 LBS.

S-I

DIAMETER	21.4 FT.
HEIGHT	82 FT.
WEIGHT	1,016,000 LBS. (FUELED)
ENGINE	H-1 (8)
PROPELLANT	LOX / RP-1
THRUST	1,500,000 LBS.

SATURN I

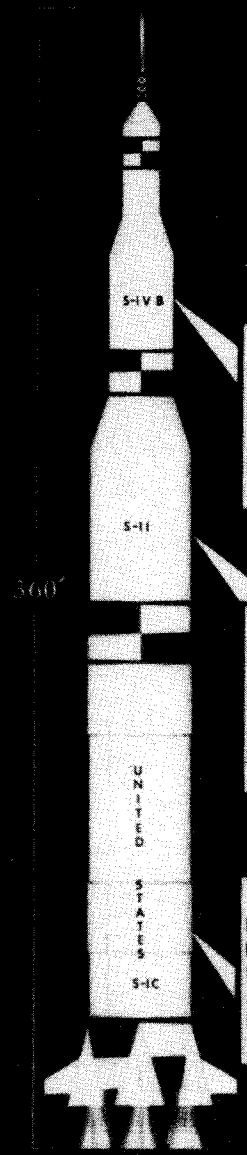
S-IVB

DIAMETER	21.5 FT.
HEIGHT	58 FT.
WEIGHT	243,200 LBS.
ENGINE	J-2 (1)
PROPELLANT	LOX / LH
THRUST	200,000 LBS.

S-IB

DIAMETER	21.4 FT.
HEIGHT	80.2 FT.
WEIGHT	1,002,000 LBS.
ENGINE	H-1 (8)
PROPELLANT	LOX / RP-1
THRUST	1,500,000 LBS.

SATURN IB



S-IVB

DIAMETER	21.5 FT.
HEIGHT	58 FT.
WEIGHT	261,000 LBS.
ENGINE	J-2 (1)
PROPELLANT	LOX / LH
THRUST	200,000 LBS.

S-II

DIAMETER	33 FT.
HEIGHT	82 FT.
WEIGHT	1,002,000 LBS.
ENGINE	J-2 (5)
PROPELLANT	LOX / LH
THRUST	1,000,000 LBS.

S-IC

DIAMETER	33 FT.
HEIGHT	138 FT.
WEIGHT	4,711,000 LBS.
ENGINE	F-1 (5)
PROPELLANT	LOX / RP-1
THRUST	7,500,000 LBS.

SATURN V

Between the smallest and largest is the third Saturn vehicle, the IB, which will consist essentially of the Saturn I booster (S-IB) and the Saturn V third stage (S-IVB). Using the 200,000 pound-thrust S-IVB increases Saturn I payload capability 50 percent while avoiding the cost of a new development program. The Saturn IB will place 17 tons of payload into low Earth orbit, compared with up to 11 tons for Saturn I. The Saturn IB will be used in early phases of the Apollo program, including manned missions in Earth orbit.

The Saturn V

The need for a vehicle much larger than Saturn I was established when the late President Kennedy set as a national goal a manned lunar landing before 1970. NASA, after several months of extensive studies, announced on January 10, 1962, that the Marshall Center had been assigned the task of developing the Saturn V--a goliath which would be about 360 feet tall, with Apollo payload.

The advanced rocket was to be in three stages, the first (booster) having 7.5 million pounds thrust--five times that of Saturn I. The rocket, to weigh more than six million pounds at liftoff, could put a payload of 120 tons into Earth orbit or send 45 tons to the Moon. This was the power needed to hurl the Apollo spacecraft to the Moon for a manned landing using the lunar orbital rendezvous technique.

S-IC

The Marshall Center and Boeing Co. are designing and developing the Saturn V booster, or S-IC stage. It will be 138 feet long and 33 feet in diameter. The cylindrical booster has separate propellant tanks with a capacity of about 4,400,000 pounds. Section lines from the forward liquid oxygen tank will pass through tunnels in the fuel tank to the engines. Dry weight of the stage will be about 280,000 pounds. The tanks will be cylindrical segments with dome-shaped end bulkheads. Both tanks will have baffles to control liquid sloshing at all levels.

The propulsion system will use five F-1 engines. The F-1, developed by the Rocketdyne Division of North American Aviation, has been static fired at full thrust (1.5 million pounds) for full flight duration (about 2½ minutes). Production engine delivery has begun.

Four engines are mounted on a 364-inch diameter ring with the pumps inward. One engine is rigidly mounted on the stage centerline. The four outboard engines, shrouded to protect them from external aerodynamic loadings, will gimbal for control purposes.

The liquid oxygen system will be pressurized by gaseous oxygen generated by engine-coupled heat exchanges, and the fuel system by helium in liquid form in pressurized containers.

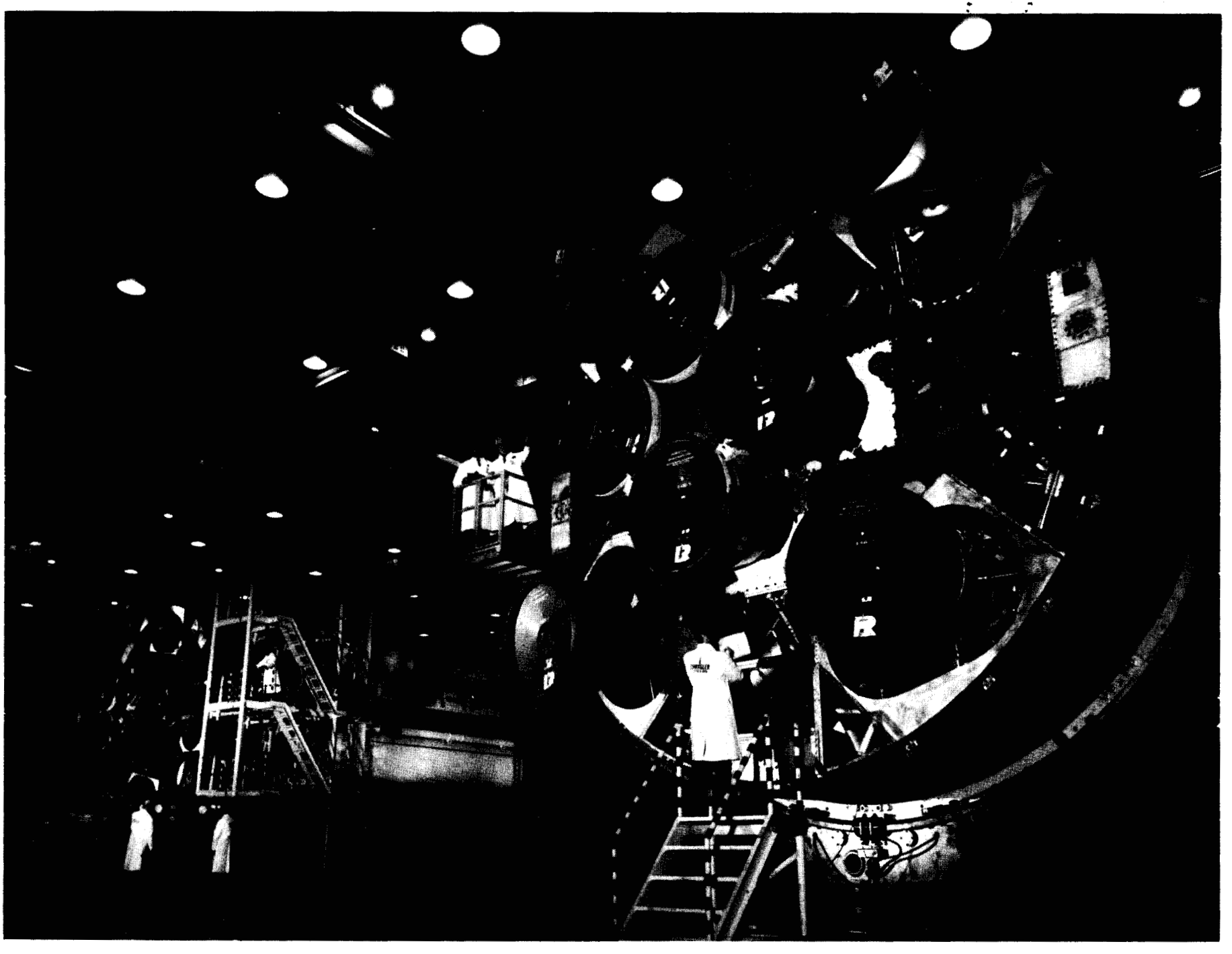
Boeing has a contract to produce eight flight units and two ground test units at the Michoud Operations in New Orleans. The Marshall Center will assemble two ground test units and two flight vehicles. MSFC and Boeing will test the boosters at Marshall and its Mississippi Test Operations.

S-II

The Space and Information Systems Division of North American Aviation, Inc. is developing the second (S-II) stage. It will be about 82 feet long and 33 feet in diameter with a propellant capacity of 930,000 pounds. The cylindrical stage will have an insulated common bulkhead separating the liquid oxygen tank and the forward liquid hydrogen tank.

The propulsion system will use five J-2 engines, also under development by Rocketdyne, which will give the stage a total thrust of 1,000,000 pounds. Four gimbaling engines will be placed in a square pattern with the fifth engine fixed rigidly in the center.

The vehicle instrument unit, located forward of the third stage, will provide the primary guidance and control signal for the stage. Stage design will incorporate provisions for automatic checkout.



The business end of a Saturn I. Its five engines generate 1.5 million pounds of thrust.

S-II static testing will be conducted at Rocketdyne's Santa Susana, Calif., facility and at the Mississippi Test Operations.

The contractor will furnish the S-II complete with interstage to the S-IC. The separation scheme includes a short coast prior to S-II engine ignition. Retrorockets on the S-IC will offset thrust decay, and ullage rockets of the S-II will assure proper S-II propellant seating prior to engine ignition.

S-IVB

The Douglas Aircraft Co. was given the prime development contract for the third stage (S-IVB) of the Saturn V due to Douglas experience with the S-IV stage.

The S-IVB will be about 21½ feet in diameter and about 58 feet long. The tankage can hold about 230,000 pounds of propellant which includes an allowance for boil-off during orbital coast.

The stage's J-2 engine will be gimbaled for pitch and yaw control. Auxiliary propulsion systems will provide attitude control during coast. The engine is cut off when the stage enters a "parking orbit" of the Earth. It is re-ignited at a precise instant to increase stage speed, break it from orbit and send it on its way to the Moon.

Provisions for automatic checkout will be incorporated in the basic stage design for manufacturing, test and launch checkout. This feature, when coupled with certain capabilities for the forward instrument unit, will provide for orbital monitoring of the stage conditions.

Instrument Unit

The instrument unit (IU) of the Saturn V is made up of six major systems, the structural, environmental, guidance-control, measuring-telemetry, radio frequency and electrical.

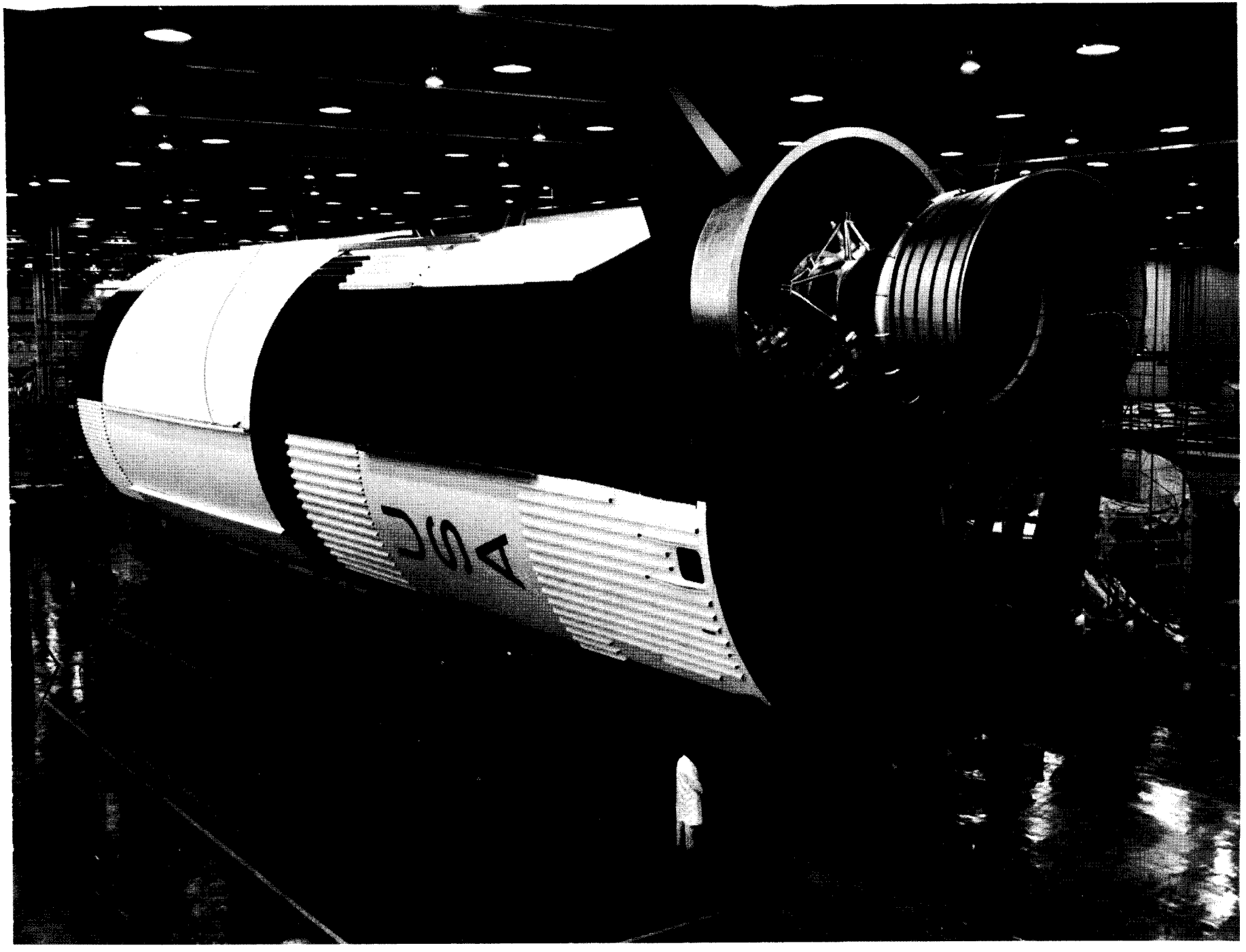
The IU employs advanced design techniques in circuitry and packaging, highly miniaturized components in the digital computer, gyros and acclerometers of extremely high precision in the stabilized platform, and redundant modular circuits to improve reliability.

Functions of the IU include guidance and control of the vehicle, command and sequencing of vehicle functions, insertion into orbit, injection of the S-IVB, IU and Apollo spacecraft into lunar transfer trajectory, stabilization during turnaround of the command-service module unit, and execution of manuevers to remove the S-IVB and IU from the spacecraft path.

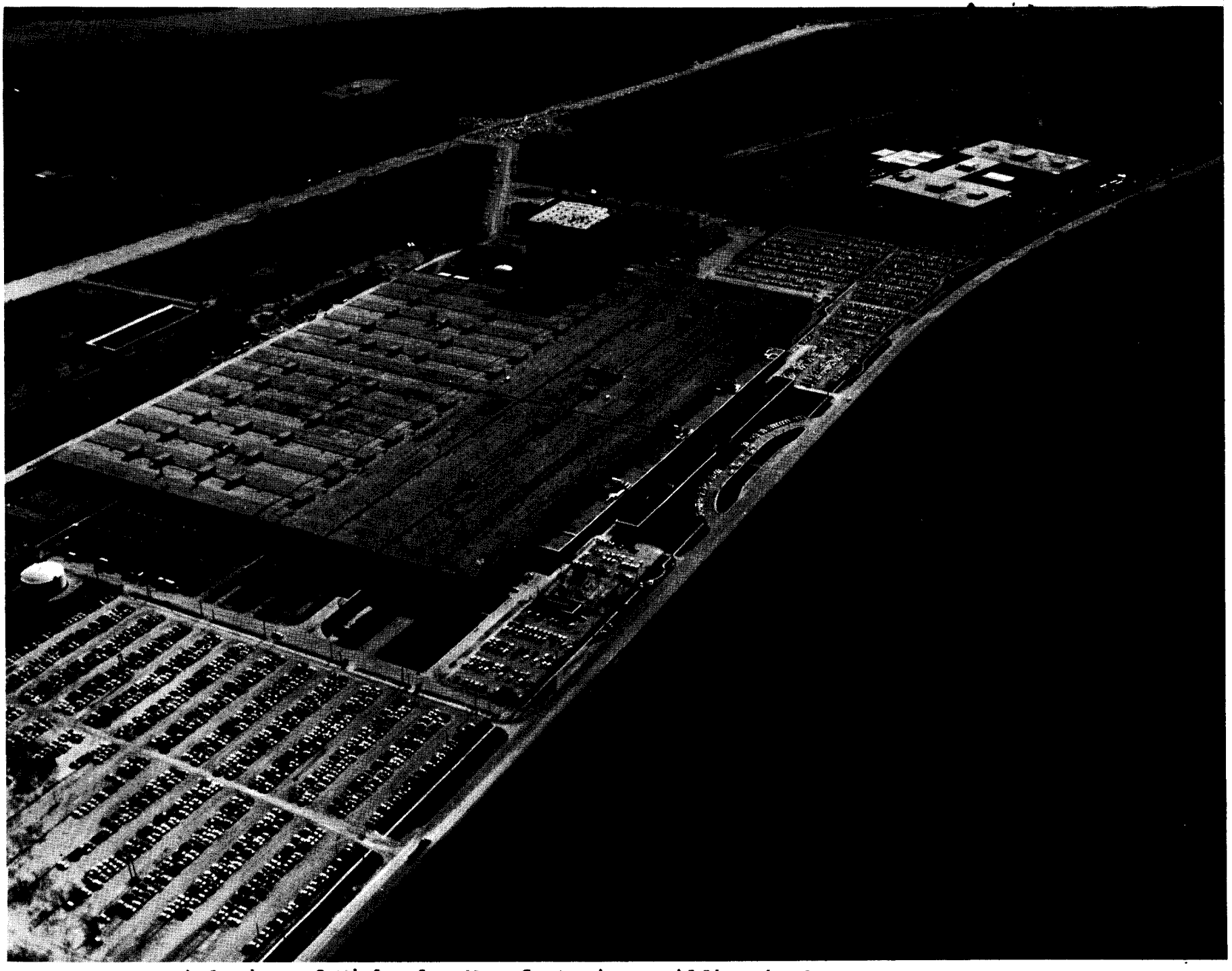
Transportation

The size of Saturn rockets presents unique transportation problems. Most of the stages are too large for conventional highway, rail or air movement. Special barges move the units produced at Huntsville to the launching site via the Tennessee, Ohio and Mississippi Rivers, the Gulf of Mexico and intracoastal waterways to Cape Kennedy on the east coast of Florida, a distance of more than 2,200 miles.

The same system will be used for moving the units produced at Michoud to the test site in Mississippi and to the Florida launching site. The stages produced on the west coast will be moved by water via the Panama Canal. The S-IV stage, single F-1 engines and other smaller items are transported by special modified aircraft.



A full-scale model of the Saturn V rocket booster that will launch Americans to the Moon.



An aerial view of Michoud. Manufacturing Building is large structure in center.

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Public Affairs Office
George C. Marshall Space Flight Center
National Aeronautics and Space Administration
Huntsville, Alabama

Phone: 876-1102, 876-1959
(Charles Kurtz - Fayetteville, Tenn. 433-4958)

May 18, 1965

IMMEDIATE RELEASE

Release No. 65-125

HUNTSVILLE, Ala. -- The NASA-Marshall Space Flight Center has awarded a contract to the Pittman Construction Co., New Orleans, La., for building a contractor service building at the Michoud Operations in New Orleans.

Pittman Construction won the contract with a bid of $1,964,879.

Support contractor personnel at the Saturn booster manufacturing plant will use the new NASA structure.

The "L" shaped building -- portions of it will be two story -- will house several functions including medical, reproduction, fire and photographic departments. There will also be a communications area and an automotive repair area.

The automotive repair shop and fire department will be housed in the structure's one-story portion. The other departments will be in the building's two-story section. There will be a total of about 74,000 square feet of floor area in the structure. Outside walls of the two story structure will be brick. The automotive shop will have metal siding.

Construction is expected to be completed in about a year.

Michoud Operations was opened by NASA more than three years ago. Boeing Co. and Chrysler Corp. build Saturn V and Saturn IB boosters there under the direction of the Marshall Center.

# # #

Michord

HEADQUARTERS WEEKLY BULLETIN

Vol. 1-65 No. 13 Date July 6, 1965

Issued under authority of NMI 6-1-2

TERMINATION OF PARKING ON THE GSA LOT AT 7TH & D STREETS, S. W.

The General Services Administration has advised NASA and other agencies using the GSA Parking Lot at 7th and D Streets, S. W., that building construction on the site will begin shortly.

The contract with Parking Management Incorporated, operator of the lot, terminates at close of business July 14, 1965--the last day of the current permit period. Arrangements have been made, however, to continue parking after this date on a weekly basis at the rate of $1.25 per week (for permit holders) until the contractor actually needs the site.

Notice of final closing of the lot will be posted at the lot entrance at least one week in advance of the closing date.

A study is being made to determine the availability of other parking facilities in the Southwest area. Headquarters personnel will be advised if and when such arrangements are made.

TRAINING IN THE PREPARATION OF NASA MANAGEMENT ISSUANCES SCHEDULED

A series of training sessions designed for clerical and secretarial personnel who prepare NASA management issuances will be conducted at NASA Headquarters. Division directors (or comparable authority) should designate those employees who are involved in the clerical preparation of management issuances. Instruction will be provided by Miss Eleanor G. Borella, Administrative Services Division; each class will last approximately one hour.

Schedule is as follows:

Date	Time	Location
July 14	9:00	U531
	10:30	U531
July 15	9:00	B2206
	10:30	B2206

Date	Time	Location
July 20	9:00	B2206
	10:30	B2206
July 22	(A make-up class; its time and location will depend on the number and location of employees involved.)	

Each class will be limited to 30 participants. Nominations should be submitted in writing to BH/Office of Employee Development, at least 3-work days prior to each class. For additional information, call code 128, extension 22361.

TITLE CHANGES AT MISSISSIPPI TEST, MICHOUD AND WHITE SANDS

The Administrator recently approved changes in the names of NASA entities as follows:

Old Designation	New Designation
Mississippi Test Operations	Mississippi Test Facility
Michoud Operations	Michoud Assembly Facility
MSC White Sands Operations	White Sands Test Facility

CORRECTION TO WEEKLY BULLETIN NO. 12--ESTABLISHMENT OF GSA SUB MOTOR POOL AT LOS ANGELES INTERNATIONAL AIRPORT

Official duty travelers desiring GSA vehicles must call GSA on:

a. FTS: Area Code 213, telephone 670-5460 or

b. Commercial line: Area Code 213, telephone 670-1266,

Vehicles may be picked up or returned to the GSA Motor Pool Office, Building #6 which is the Consolidated Carriers Building, Los Angeles International Airport, Room 216.

REQUESTS FOR PHOTOGRAPHIC SERVICES

Except for the Office of Public Information photographic requirements, all other Headquarters Office requirements for photographic reproduction should be submitted to Administrative Services Division (Code BAX).

GSI BARBERSHOP OPENS IN FOB 10A

A GSI barbership, at which services are provided by appointment only, is now open in FOB 10A, 800 Independence Avenue, S. W. Appointments may be made by calling Code 13, extension 34088 or 34151.

E
W

Public Affairs Office
George C. Marshall Space Flight Center
National Aeronautics and Space Administration
Huntsville, Alabama

Phone: 876-1102, 876-1959
(Joe Jones - residence 852-8847)

October 15, 1965

Immediate Release

Release No. 65-263

MSFC:

HUNTSVILLE, Ala. --Two construction contracts totaling $1,665,348 have been awarded by the NASA-Marshall Space Flight Center, Huntsville, Alabama, for repair of buildings damaged at its Michoud Assembly Facility in New Orleans by Hurricane Betsy.

Tri-State Roofing Co., Knoxville, Tenn., under a $534,817 contract will complete repair of roofing damage at the Saturn booster production site by Jan. 15, 1966.

J. A. Jones Construction Co., Charlotte, N. C., was awarded $1,130,531 contract to make all other necessary repairs, including structural, electrical, and glass damage. Jones is expected to complete this work by Feb. 11, 1966.

Both contractors began emergency repairs Sept. 13, three days following Hurricane Betsy's destructive sweep through the New Orleans area.

Damage to the Michoud installation, however, has not seriously affected the production schedules of the giant Saturn IB and Saturn V first stages to be used in the Apollo manned lunar landing program.

# # # #

Public Affairs Office
George C. Marshall Space Flight Center
National Aeronautics and Space Administration
Huntsville, Alabama

Phone: 876-1102. 876-1959
(Joe Jones - residence 852-8847)

December 21, 1965

IMMEDIATE RELEASE

Release No. 65-310

Also Released in New Orleans, La.

MSFC

NEW ORLEANS, La. --The National Aeronautics and Space Administration has selected the Range Systems Division of Ling-Temco-Vought, Inc., Dallas, Texas, for final negotiations to provide computer support services for the Michoud Assembly Facility, New Orleans, La.

A cost-plus-award-fee contract will be negotiated for a one-year period with provisions for three consecutive one-year renewals. Cost for the first year is estimated to exceed $1.5 million. The services will be performed at the main Mi houd plant and at its Computation Office in Slidell, La. They include operation and maintenance of some 20 digital and analog computers, a data transmission system, a data reduction system and related electronic equipment.

These services also will support the Mississippi Test Facility in Hancock County, Miss. The work will require approximately 200 personnel.

Michoud, a facility of the Marshall Space Flight Center, Huntsville, Ala., is a production and assembly site for first stages of the Saturn IB and Saturn V launch vehicles to be used in the Apollo program. The Mississippi Test Facility, also under Marshall Center, is the site for ground testing first and second stages of the Saturn V vehicle.

LTV was one of three companies which submitted proposals to the Marshall Center.

NEWS NASA
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546
TELS. WO 2-4155
WO 3-6925

FOR RELEASE: IMMEDIATE
DECEMBER 21, 1965

RELEASE NO: 65-386

LTV TO PROVIDE COMPUTER SERVICES AT MICHOUD

MSFC

The National Aeronautics and Space Administration has selected the Range Systems Div., Dallas, of Ling-Temco-Vought for final contract negotiations to provide computer support services for the Michoud Assembly Facility, New Orleans.

A cost-plus-award-fee contract will be negotiated for a one-year period with provisions for three consecutive one-year renewals. Cost for the first year is expected to exceed $1.5 million.

The services will be performed at the main Michoud plant and at the computation office near Slidell, La. They include operation and maintenance of some 20 digital and analog computers, a data transmission system, a data reduction system and related electronic equipment.

These services also will support the Mississippi Test Facility in Hancock County, Miss. The work will require approximately 200 personnel.

-more-

12/21/65

Michoud, a facility of NASA's Marshall Space Flight Center, Huntsville, Ala., is a production and assembly site for first stages of the Saturn 1B and Saturn V launch vehicles to be used for the Apollo program. The Mississippi Test Facility, also under the Marshall Center, is the site for ground testing first and second stages of the Saturn V vehicle.

LTV was one of three companies which submitted proposals to the Marshall Center.

-End-

Public Affairs Office
George C. Marshall Space Flight Center
National Aeronautics and Space Administration
Huntsville, Alabama

Phone: 876-1102, 876-1959
(Joe Jones - residence 852-8847)

December 8, 1966

IMMEDIATE RELEASE

Release No. 66-292

Also Released in New Orleans, Louisiana

NEW ORLEANS, La. -- The National Aeronautics and Space Administration has exercised the first of three one-year renewal options with the Range Systems Division of Ling-Temco-Vought to provide computer support services for the NASA-Michoud Assembly Facility.

The new $2,758,179 extension of Ling-Temco-Vought's (LTV) basic cost-plus-award-fee contract was awarded by Michoud's parent organization, the George C. Marshall Space Flight Center, Huntsville, Ala. The contract, which will continue in force until January 8, 1968, increases the total value of LTV's contract to $5,192,941.

The Dallas, Texas, based firm was originally selected in December, 1965, to provide computer services at the Michoud installation in New Orleans and at its Computer Operations Office in nearby Slidell, La.

The services include operation and maintenance of some 20 digital and analog computers, a data transmission system, a data reduction system and related electronics equipment.

LTV, currently employing about 230 personnel, also provides support services for NASA's Mississippi Test Facility, Bay St. Louis, Miss.

MORE

Michoud is the assembly site for the Uprated Saturn I and Saturn V first stages, designed for use in the Apollo manned lunar landing program. The Mississippi Test Facility, also a branch of the Marshall Center, is the site for ground-testing first and second stages of the Saturn V space vehicle.

# # #

Public Affairs Office
George C. Marshall Space Flight Center
National Aeronautics and Space Administration
Huntsville, Alabama

Phone: 876-1102, 876-1959
(Joe Jones - residence 852-8847)

January 10, 1967

IMMEDIATE RELEASE

Release No. 67-6

MSFC

HUNTSVILLE, Ala. -- The National Aeronautics and Space Administration has exercised a one-year renewal option valued at $10,451,092 with the firm of Mason-Rust for continued provision of support services at NASA's Michoud Assembly Facility in New Orleans.

The extension of Mason-Rust's basic cost-plus-award-fee contract was awarded here by Michoud's parent organization, the NASA-George C. Marshall Space Flight Center. It brings the firm's accumulative contract figure at Michoud since March 1, 1965, to $32,986,428.

This extension will continue in force through December 31, 1967.

Since its initial selection by NASA in December, 1961, Mason-Rust has furnished common services to both contractor and government elements operating at the main Michoud complex in New Orleans and at its Computer Operations Office in nearby Slidell, La.

Michoud is the assembly site of the Uprated Saturn I and Saturn V first stages, designed for use in the Apollo manned lunar landing program.

Support services under this contract include transportation and port operations, security and safety, fire protection, photography, medical, food, supply, messenger and mail, communications, custodial, plant maintenance and repair, reproduction and documentation.

MORE

Mason-Rust, now employing 836 persons, is a joint venture of the Rust Engineering Co., Pittsburgh, Pa., and the Mason and Hangar-Silas-Mason Co., Lexington, Ky.

# # #

Public Affairs Office
George C. Marshall Space Flight Center
National Aeronautics and Space Administration
Marshall Space Flight Center, Alabama

Phone: 876-1102, 876-1959
(Joe Jones - residence 852-8847)

December 22, 1967

IMMEDIATE RELEASE

Release 67-246

Also released in New Orleans

MARSHALL SPACE FLIGHT CENTER, Ala. -- The National Aeronautics and Space Administration has exercised a one-year renewal option valued at $8,990,826 with the firm of Mason-Rust for continued provision of services at NASA-Michoud Assembly Facility in New Orleans. The extension of Mason-Rust's basic cost-plus-award-fee contract was awarded by Michoud's parent organization, the NASA-Marshall Space Flight Center here. It brings the firm's accumulative contract figure at Michoud since March 1, 1965 to $39,073,652.

This extension will continue in force through December 31, 1968.

Since its initial selection by NASA in 1961, Mason-Rust has furnished common services to contractor elements operating at the main Michoud complex in New Orleans and at its Computer Operations Office in nearby Slidell, La.

Michoud is the assembly site of the Uprated Saturn I and Saturn V first stages designed for use in the Apollo manned lunar landing program.

MORE

Services under this contract include transportation and port operations, safety and security, fire protection, photography, medical, food, supply, messenger and mail, communications, custodial, plant maintenance and repair, reproduction and documentation.

Mason-Rust is a joint venture of the Rust Engineering Co., Pittsburgh, Pa., and the Mason and Hangar-Silas Mason Co., Lexington, Ky.

# # #

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington, D. C. 20546
Phone: (202) 755-8370

William W. Pomeroy
(Phone: 202/755-3114)

FOR RELEASE:
IMMEDIATE
July 26, 1972

RELEASE NO: 72-153

SHUTTLE CONTRACTOR SELECTION

The National Aeronautics and Space Administration today selected the Space Division of North American Rockwell Corporation of Downey, Calif., for negotiation of a contract to begin development of the Space Shuttle System.

As prime contractor, North American Rockwell Corporation will be responsible for design, development, and production of the orbiter vehicle and for integration of all elements of the Space Shuttle System.

- more -

July 26, 1972

The contract will be awarded on a cost reimbursement basis plus fixed and award fees. The contractor's proposal estimates the cost of orbiter development and shuttle integration at $2.6 billion over a period of about six years. The contractor's estimate of the cost of the first increment covering a period of approximately two years is $540 million.

Other major elements of the Space Shuttle System will include the Space Shuttle Main Engine, a 470,000-pound-thrust hydrogen-oxygen engine already under contract to the Rocketdyne Division of North American Rockwell Corporation; a large external hydrogen and oxygen tank; and twin solid rocket boosters.

The external tank and the solid rocket boosters are planned to be procured by NASA when Space Shuttle Systems engineering by the prime contractor has progressed sufficiently to enable NASA to solicit competitive proposals for these system elements. The planned site for assembly of the tanks is the government-owned assembly facility at New Orleans, Louisiana, where Saturn rockets used for the Apollo program were assembled.

(Michoud Assembly Facility)

- more -

Selection was made by NASA Administrator James C. Fletcher following an intensive evaluation by NASA of proposals submitted by four major aerospace corporations: Grumman Aerospace Corporation; Lockheed Missiles and Space Co., Inc.; McDonnell-Douglas Corporation; and North American Rockwell Corporation. All four firms had participated in extensive system definition studies which were completed in February of this year. Proposals were received from them in mid-May, and analysis and evaluation of the proposals was carried out over a two-month period by an evaluation board and supporting teams totalling 416 people drawn from eight NASA Centers and from the U.S. Air Force.

Overall program management responsibility for the Space Shuttle System within NASA has been assigned by the Office of Manned Space Flight to the Manned Spacecraft Center, Houston, Texas.

Project offices will be at the Manned Spacecraft Center for the orbiter vehicle; at the Marshall Space Flight Center, Huntsville, Ala., for the shuttle main engine, the external tank, and the solid rocket boosters; and at the Kennedy Space Center, Fla., for the launch, landing, and turn-around operations.

Employment generated by the orbiter development and shuttle integration portion of the shuttle project will build up to a maximum of roughly 15,000 by 1975 and 1976, and will gradually decrease thereafter. It is not possible at this time to define the geographical distribution of this employment because a very substantial portion of the work will be carried out under subcontract to firms as yet not selected by the prime contractor. It is, however, a reasonable prediction that the Far West will perform somewhat less than half of the work, with the remainder broadly distributed geographically among the various regions of the country.

The Air Force has been actively involved in the Space Shuttle definition study phase and will maintain an active interest during the design and development period as a prospective major user of the Space Shuttle.

The Space Shuttle will be developed over the next six years. Horizontal test flights are planned to begin in 1976, and manned orbital test flights are scheduled in 1978. The

complete Shuttle system is to be operational by 1980.

The Space Shuttle will be the first reusable space vehicle. The orbiter stage will be a delta-winged airplane-like vehicle capable of landing on conventional runways. It will have a cargo compartment measuring about 18 meters (60 feet) in length and 4.5 meters (15 feet) in diameter, and will be able to place 29,500 kilograms (65,000 pounds) in a 185-kilometer (100-nautical-mile) due East orbit.

The orbiter will be boosted into space through the simultaneous operation of the solid-propellant booster rockets and the orbiter stage high-pressure liquid oxygen-liquid hydrogen main engines. The booster rockets will detach at an altitude of about 40 kilometers (25 miles) and descend into the ocean to be recovered and reused. The orbiter, under its own power, will continue into low Earth orbit.

The Space Shuttle will be able to place satellites in orbit; return satellites from orbit; permit in-orbit repair and servicing of satellites; deliver propulsive stages and

satellites to low Earth orbit, and conduct short-duration science and applications missions with self-contained experiments in low Earth orbit.

The Space Shuttle will be employed as an operational system by both NASA and the Department of Defense. Primary operational sites for the Space Shuttle will be the Kennedy Space Center in Florida and Vandenberg Air Force Base in California.

- end -

NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
Washington, D. C. 20546

FOR RELEASE:

Upon Receipt

Dave Garrett
Headquarters, Washington, D.C.
(Phone: 202/755-3114)

Joe Jones
Marshall Space Flight Center, Ala.
(Phone: 205/453-0034)

RELEASE NO: 73-64

NASA ASKS PROPOSALS FOR SHUTTLE EXTERNAL TANK

The National Aeronautics and Space Administration released to industry today a "Request for Proposals" (RFP) for design, development and production of the Space Shuttle external tank.

Companies invited to bid were McDonnell Douglas Astronautics Co., The Boeing Company, Chrysler Corp. and Martin Marietta Aerospace.

This is the third major procurement for NASA's Space Shuttle. The two initial contracts, for the Orbiter-Systems-Integration and for the main engine, went to Rockwell International Corp.

-more-

April 2, 1973

The external tank, carrying liquid oxygen and liquid hydrogen, will be 27 feet in diameter and 158 feet long. It will carry 1.5 million pounds of propellant.

Tank assembly will be at the Marshall Space Flight Center's Michoud Assembly Facility at New Orleans. The RFP was released from the Marshall Center at Huntsville, Ala., the NASA center responsible for management of the contract.

~~The Space Shuttle~~ will consist of a manned reusuable Orbiter mounted piggyback at launch on the large expendable external tank. Two recoverable solid rocket notors will also be attached to the tank.

The Orbiter will resemble a delta-winged airplane about the size of a DC-9 jetliner.

At launch, the solid rocket motors and the Orbiter's three main engines will carry the vehicle to an altitude of about 40 kilometers (25 statute miles). There the solid motors will be jettisoned for recovery in the ocean and reuse.

The external tank will continue to supply propellants to the Orbiter engines until just before reaching orbit. When the tank is dropped, the Orbiter will switch to the orbital maneuvering engines fed from internal fuel tanks, and the stage will continue into orbit.

After completing the mission -- normally about seven days -- the crew will pilot the Orbiter through reentry and land it like an airplane. It can then be refurbished for other flights.

Current plans are for the external tank to be discarded shortly before entering orbit. This would eliminate the need for retrorockets and associated equipment needed for "deorbit" capability, thus resulting in less weight and lower cost.

If the tank is released from the Orbiter at about 150 feet per second slower than orbital velocity, it will follow a ballistic trajectory and fall into a remote ocean area.

The external tank procurement will entail the design and development activities and the manufacture of three test articles and six flight articles, the last to be delivered in 1979.

-end-

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Marshall Space Flight Center,
Ala. 35812

Curtis Hunt, 205/453-0034
Residence, 205/852-1763

FOR RELEASE:

Upon Receipt
Release No. 75-12

MODIFICATIONS CONTINUE AT MICHOUD ASSEMBLY FACILITY

MARSHALL SPACE FLIGHT CENTER, Ala. -- The capability to produce External Tanks (ET) for the Space Shuttle moves nearer as modifications of and additions to the NASA-Michoud Assembly Facility at New Orleans progress.

Two projects are in the final construction phase, a third will be completed this fall, and contracts for two more have been awarded. Five other projects are in the design phase.

Nearing completion are tank weld subassembly and mechanical subassembly facilities. Components of the liquid oxygen and liquid hydrogen tanks are to be welded in the first facility and mechanical components assembled in the latter.

In progress now are extensive modifications to the cranes and trusses in the main plant. Cranes were removed for rework and modification. The reworked cranes will be reinstalled and new ones added. The trusses are being strengthened to take care of the additional crane load. This work is scheduled for completion in October.

Work on providing an area for welding the propellant tanks is due to begin this month.

-more-

January 20, 1975

A contract is expected to be awarded next month to construct a pneumatic test facility. This facility will be used for pneumatic (pressurized nitrogen) tests of the liquid hydrogen tanks. These tests are required to verify all welded joints for the hydrogen tanks.

Still in the design phase are modifications of an area in the main plant for preparing and applying materials for the Shuttle's thermal protection system.

Also still in the design phase are extensive modifications to the Vertical Assembly Building to provide: A hydrostatic (water under pressure) test position for the liquid oxygen tanks; three positions for the application of thermal protection material; a tank cleaning position; and a stacking and joining position for the propellant tanks.

A number of small tasks are also either underway or scheduled to be completed this year, such as foundations for tooling fixtures, modifications to a major tank component cleaning area, minor modifications to the plant and rehabilitation of the chemical waste well.

# # #

NASA News

National Aeronautics and
Space Administration

25th Anniversary
1958-1983

George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812
AC 205 453-0034

Lyn Cywanowicz
Marshall Space Flight Center, Ala.
(205/453-0034)

For Release:
IMMEDIATE

RELEASE NO: 83P-46
NEGATIVE NO: 3-35314

SHUTTLE TANKS IN FINAL ASSEMBLY

Shown here are the Space Shuttle external tanks that will fly on missions 11, 12, and 13. This is the first time that as many as three tanks have been in final assembly at the same time, a prelude to future increases in yearly production goals.

The tanks are built by the Michoud Division of Martin Marietta Aerospace at NASA's Michoud Assembly Facility, near New Orleans under the direction of the Marshall Space Flight Center in Huntsville, Ala.

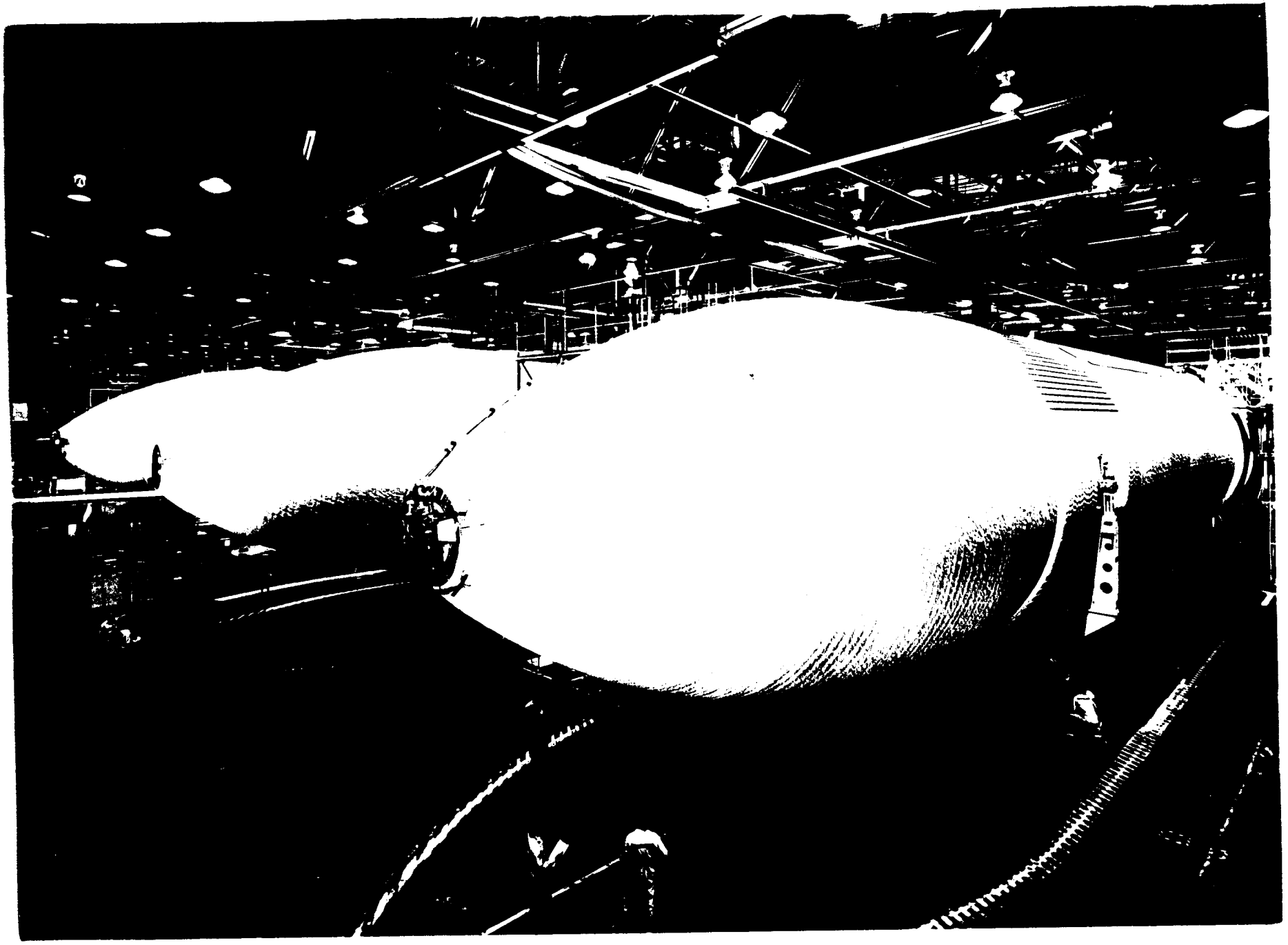
External tanks, 154.2 feet long, and 27.5 feet in diameter, carry a combined total of over 526,000 gallons of liquid hydrogen and oxygen that fuel the Space Shuttle's three main engines.

-30-

June 30, 1983

NASA National Aeronautics and Space Administration

George C. Marshall Space Flight Center
Huntsville, Alabama



mictoud
Centers info
See inside
@ 9/86

MEDIA GUIDE AND

PUBLIC AFFAIRS CONTACTS

FOREWORD

This Media Guide and Public Affairs Contacts booklet is intended to assist media representatives in their coverage of NASA activities. It includes information about the varied NASA centers, their primary responsibilities and the public affairs representatives who will provide assistance on specific subjects.

Since the loss of the Space Shuttle Challenger, many new reporters have been assigned to the NASA beat. These difficult months have provided an education to all of us of the complexities of manned space flight. But NASA is much more than manned flight. It is my hope that this Guide will help direct you to the exciting NASA centers, programs and people who have projected the United States into technological leadership in aeronautics and space exploration.

Shirley M. Green
Director of Public Affairs

MICHOUD ASSEMBLY FACILITY

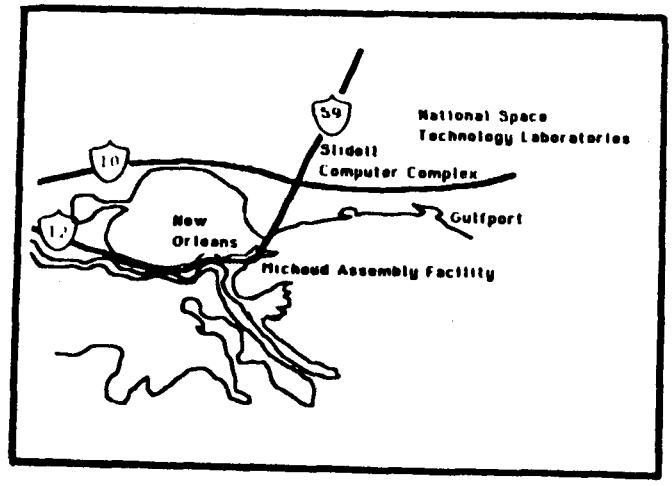
P.O. Box 29300
New Orleans, LA 70189

The Michoud Assembly Facility is located in Orleans Parish, La., about 15 miles east of downtown New Orleans. The site is on the Gulf Intra-Coastal Waterway and has deep water access via the Mississippi Gulf outlet.

The facility occupies approximately 833 acres of land. On this site there are 33 buildings with an area of about 3.5 million square feet. The largest building within the complex is the main manufacturing building, originally built in 1942.

The primary mission of Michoud is the systems engineering, engineering design, manufacture, fabrication, assembly and related work for the Space Shuttle external tank.

Marshall Space Flight Center exercises overall management control of the facility. A prime contractor, Martin Marietta, provides Space Shuttle production capability. Dr. Mathias P. Siebel is manager of Michoud.



NOTE: No Public Affairs Office exists at Michoud Assembly Facility. Public Affairs functions for Michoud are handled by the Director of Public Affairs at Marshall Space Flight Center. Liaison between Michoud and MSFC in public affairs matters is handled by:

NAME & TITLE	OFFICE PHONE	FTS	HOME PHONE
Mathias P. Siebel Manager (SA39)	AC 504 255-2601	685-2601	AC 504 889-0974