Space News ROUNDUP!

VOL. 4 NO. 4 MANNED SPACECRAFT CENTER, HOUSTON, TEXAS DECEMBER 9, 1964

GT-2, LJ/BP-23 Flights Scheduled This Week

Unmanned Gemini Will Test Reentry Heating, Systems

An unmanned Gemini spacecraft (GT-2) is scheduled for launch from Cape Kennedy this week atop a modified Titan II on a suborbital flight that will ram it back through the atmosphere at 16,600 miles per hour to test the spacecraft under maximum reentry heating conditions.

In addition, the spacecraft will carry all Gemini systems required to qualify it and the launch vehicle for two-man orbital flight.

The flight, scheduled for no earlier than today, will last about 20 minutes with the spacecraft reaching an altitude of about 106 miles and traveling approximately 2,150 statute miles downrange from Cape Kennedy.

U.S. Naval forces will be deployed along the flight path and will recover the spacecraft about 800 miles east of San Juan, Puerto Rico.

GT-2 is a crucial mission. If all goes well, NASA can proceed with confidence toward launching the first manned Gemini early in 1965. If the test shows major deficiencies in the spacecraft or booster, it could set the program back four to six months for incorporation and testing of design changes and conceivably reconfiguring another spacecraft for an unmanned flight.

The GT-2 mission is designed to flight-qualify the total spacecraft as an integrated system for manned space flight. A major item is the afterbody heat protection. Flow patterns over the spacecraft during reentry cannot be fully simulated in ground testing. The ballistic trajectory for this flight was selected to provide the maximum reentry heating rate for this spacecraft.

This will be the second flight test of the two-man Gemini spacecraft. The first was conducted April 8, 1964, and demonstrated the structural compatibility of the spacecraft and the launch vehicle from liftoff through orbital insertion, launch vehicle and spacecraft heating conditions during launch, and qualified certain spacecraft systems, among other objectives.

The unmanned GT-2 spacecraft will be launched from Complex 19 on an azimuth of 105 degrees. Spacecraft separation

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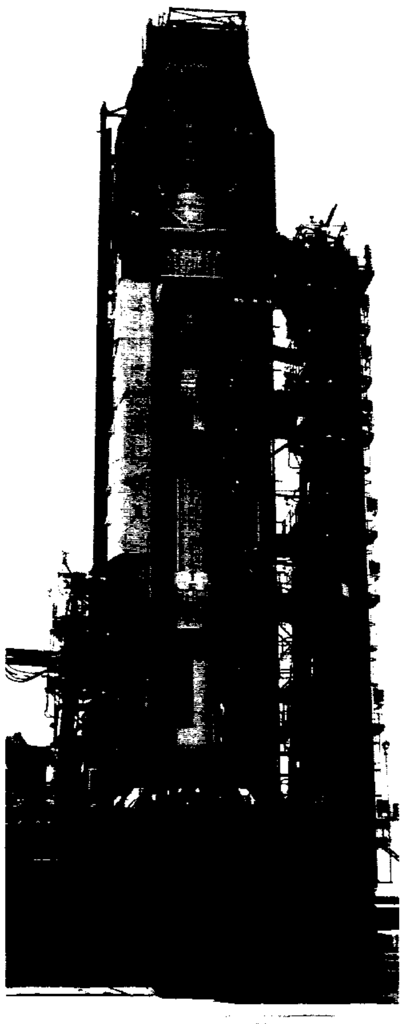


SUBORBITAL BIRD—The Titan II with Gemini spacecraft 2 at the top stands 109 feet tall on Pad 19 at Cape Kennedy.

Apollo-Little Joe II Launch To Test Escape System

A flight test of the Apollo-Little Joe II configuration in another of a series of tests at the White Sands Missile Range in New Mexico is scheduled for this week with the launch to have been no earlier than Tuesday.

The major mission objectives of the Apollo boilerplate-23 flight are to demonstrate satisfactory launch escape vehicle performance utilizing canards and boost-protective cover, and to verify the abort capability in the maximum dynamic-pressure (q) region.

The canard subsystem, boost-protective cover, dual-drogue parachutes with reefing, and an attitude control subsystem in the launch vehicle, are introduced into the White Sands Missile Range flight test series for the first time during this mission.

Project management of the program is the responsibility of Manned Spacecraft Center, under the overall direction of the Office of Manned Space Flight, NASA Headquarters.

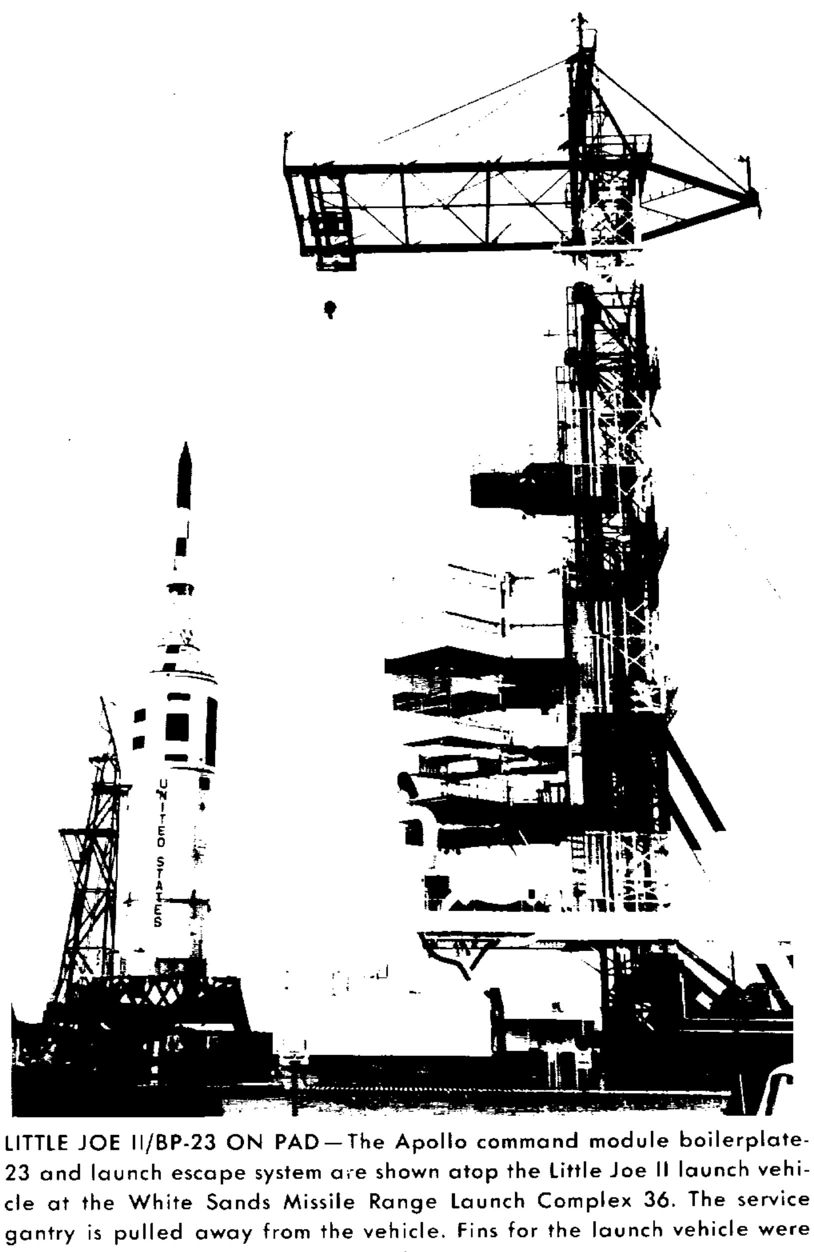
Major hardware components to be used in the test will be a Little Joe II launch vehicle, boilerplate-23 Apollo command and service modules, with a production launch escape subsystem.

In addition to the major mission objectives, other test objectives include determinations of the command module pressure loads, including possible plume impingement in the maximum dynamic-pressure region; and the demonstration of satisfactory performance of the launch vehicle attitude-control subsystem.

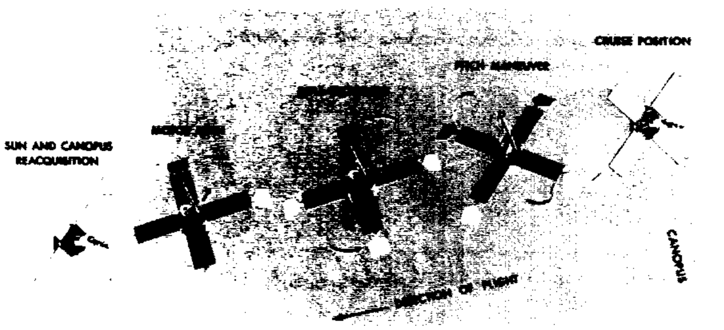
The test vehicle will be launched from White Sands Missile Range (4,000 feet above sea level). It will be oriented in a northerly direction at an angle of

(Continued on Page 3)

SPACECRAFT MATING—Engineers from MSC-Florida Operations inspect connections between Gemini spacecraft-2 and the launch vehicle adapter section in the White Room of Launch Complex 19 at Cape Kennedy, prior to mechanical mating of the spacecraft and launch vehicle.



LITTLE JOE II/BP-23 ON PAD—The Apollo command module boilerplate-23 and launch escape system are shown atop the Little Joe II launch vehicle at the White Sands Missile Range Launch Complex 36. The service gantry is pulled away from the vehicle. Fins for the launch vehicle were not in place when this photo was taken.



AN ARTISTS CONCEPT OF MARINER'S MIDCOURSE MANEUVER.

Mariner 4 Off To Mars, Trip To Take 228 Days

With a navigational "fix" on the star Canopus, the 575 pound, 9.5 feet tall Mariner 4 spacecraft began a 325-million mile flight that will take it to within 8,600 miles of the planet Mars next July.

Mariner 4 which was launched from Cape Kennedy, Saturday, November 28, is scheduled to send back to earth television pictures of Mars, some seven months from now.

The launching of Mariner 3 on November 5, ended in a failure which project officials concluded to have been caused by the shroud or fairing not being completely jettisoned as scheduled some five and one-half minutes after launch. A shroud made of a different type material was used on the last launch to prevent a repeat failure of this type.

Mariner 4 began its mission when an Atlas-Agena rocket hurled it into an "aiming orbit" around Earth. After reaching a spot over the Indian Ocean, the Agena, acting as a flying launch platform, re-fired its engine and kicked the spacecraft away from the grasp of Earth's gravity toward Mars.

Jet Propulsion Laboratory scientists who built Mariner 4 and are controlling its flight by radio, said they can correct any error up to a million miles.

A mid-course correction was to have been made last week by a small on board rocket to drive the spacecraft closer to Mars.

As mariners for centuries have used the North Star as a guidepost, Mariner 4 is using the giant star Canopus, second brightest star in the heavens and brightest in the southern sky.

Mission objectives of the flight are to provide engineering experience on the operation of a spacecraft during a long-duration flight away from the sun and to perform scientific measurements in interplanetary space between the orbits of Earth and Mars and in the vicinity of Mars.

Pictures are to be taken as the spacecraft flys within 8,600 miles of the Mars surface.

COST REDUCTION CORNER

Saving 'Buck A Day' Would Net Millions

Ever realize what your saving of a "buck a day" on the job would amount to in a year? In 20 years?

If you saved the Government a dollar a day for a year, your savings contribution to taxpayers would total around $250. If you sustained that effort for 20 years, your individual savings would total around $5,000. If every employee followed your example through the years, the combined effort would produce a whopping savings of over $12 billion for Uncle Sam.

This exercise in arithmetic was prompted by an article in a recent issue of *DESC Electron*, publication of the Defense Electronic Supply Center at Dayton, which challenged Center supervisors and employees to seek ways to save a "buck a day."

Here are a few thought-starters offered for their consideration.

Get to work on time and start work on arrival.

Get to meetings on time.

Avoid long-winded telephone calls or personal discussions.

Shorten correspondence to say only what is necessary.

Work safely—avoid any accident.

Take care of your health — stay on the job.

Keep lunch periods and coffee breaks within established limits.

Help a co-worker whenever you can, especially when he's in a bind.

Limit unofficial visits with fellow workers to a bare minimum.

Do top-flight job the first time and avoid rework.

Exceed what is expected — give bonus performance.

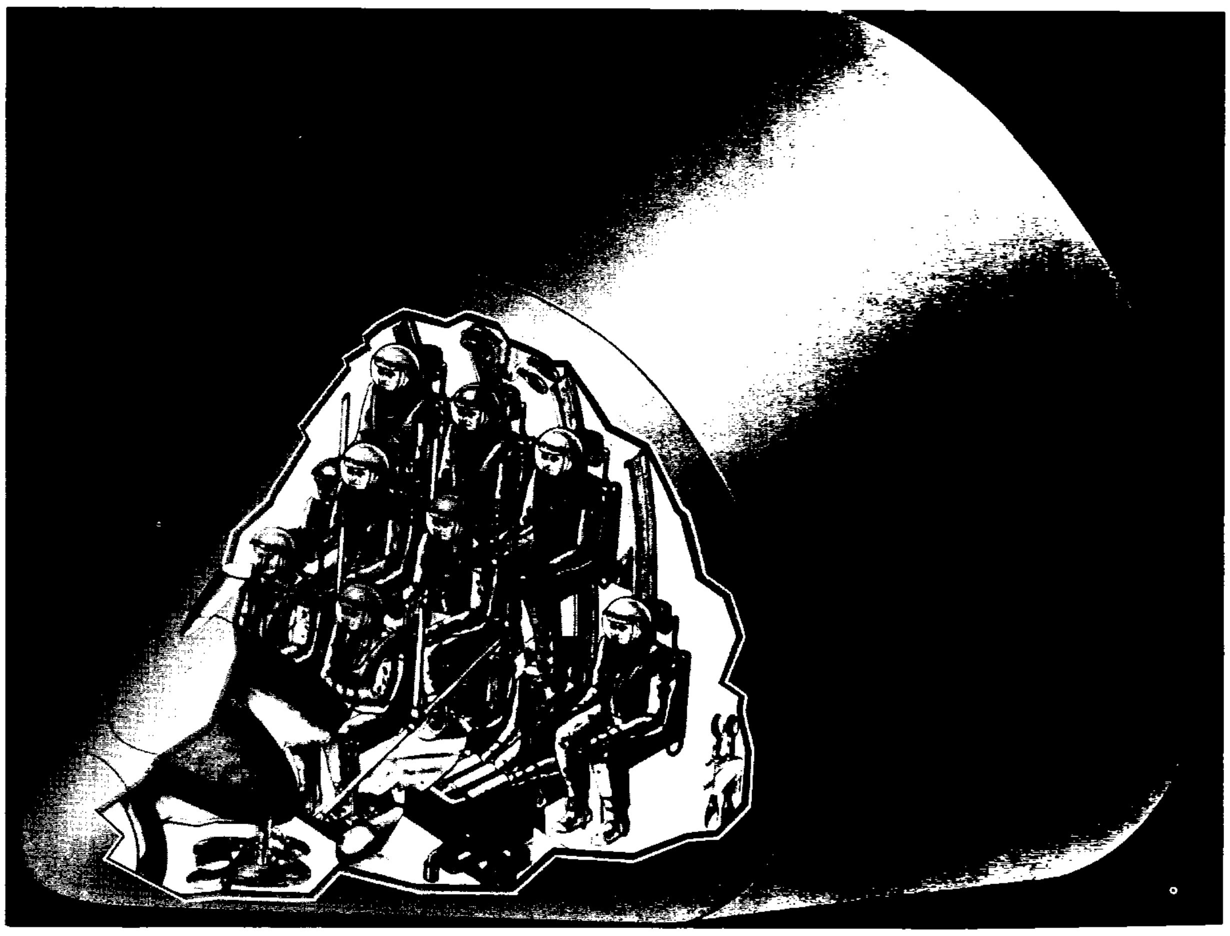
Beat deadlines and reduce costly followup.

Request and use only essential supplies.

Check all work habits for savings.

Every employee doubtless can think of scores of other possibilities for saving a buck a day. Every employee could save at least a dollar a day by a slight improvement in performance alone, and he could save more by suggesting ways to do a job more efficiently and economically.

By accepting this challenge, what's in it for you? Plenty! You increase your job worth. By improving your job performance, you strengthen your skills and enhance your promotion potential. You develop a new sense of genuine pride in your work, of doing a top job for all America, of contributing to the welfare of every American. And by doing a top job, you may qualify for quality-rate increases in pay and in cash awards.



SCHEDULED' SPACELINE—This cone-shaped Apollo-type ballistic spacecraft, carrying 12 astronauts and 8 tons of cargo, could be operated on a regular earth-to-space station schedule within five years after a program go-ahead is given, according to Lockheed-California Company engineers in a study performed for NASA. The reusable logistics spacecraft would make a parachute landing on return to earth. A minimum of five vehicles with spare parts would be required over a five-year operational period. Booster vehicle would be the Saturn I-B, now under development. A resupply round-trip mission to a space station could be completed in five hours.

Twelve-Man Space 'Commuter Ferry' Possible, NASA-Sponsored Study Shows

Apollo-type "commuter" craft for delivering a dozen astronauts and eight tons of cargo to a space station on a timetable schedule could be developed in less than five years, Lockheed-California Company engineers reported recently.

The reusable ballistic logistics spacecraft could complete an earth-to-space station-and-return mission in five hours, it was noted in the study sponsored by the National Aeronautics and Space Administration. Normally, however, the logistics spacecraft would be stowed inside the 260-mile (nautical) orbiting space station for up to six months.

A minimum of five logistics spacecraft vehicles plus spare parts would be required over a five-year operational period. This would be based on a schedule calling for a logistics launch every 90 days to resupply and exchange crews of the orbiting space station. The launch vehicle would be the Saturn I-B presently under development.

The logistics vehicle study is one of the many advanced Lockheed man-in-space programs covering space transports, rocket engines, orbital laboratories, lunar flights and bases, interplanetary travel, and research into solar radiation and human factors.

No technological breakthrough would be necessary for the development of the logistics spacecraft, said the Lockheed engineers in the report to NASA's Manned Spacecraft Center. There would be a maximum utilization of NASA's Mercury, Gemini, and Apollo (manned orbit and moon landing) technology and equipment.

This ballistic logistics spacecraft is a conceptual design. Studies of this type are sponsored by NASA for the purpose of long range planning. No authorization has been given for the development of this type of vehicle.

The logistics spacecraft — 25 feet long, 22 feet in diameter at its base, and with a launch weight of about 18 tons — would be fired into orbit from Cape Kennedy by a giant 10-story tall Saturn I-B rocket booster.

Reaching about a 105 nautical mile altitude in 11 minutes, the logistics spacecraft would either intercept the station's orbit and lock on to the target with radar or remain in a "parking" orbit until the pre-planned time.

Transfer maneuver from the parking orbit to that of the 260-mile (nautical) high space station orbit would take about an hour.

After personnel and cargo are unloaded, the logistics spacecraft could be prepared for the return trip to earth with a 30-minute notice, if necessary.

On its return trip, at 17,500 mph the logistics spacecraft — minus its nine-foot-long cargo module — would go into approximately one full orbit around the earth after debarking from the space station. During this period, all systems will be checked before retro fire. Three hours would be allowed for the descent operation.

Following re-entry into the atmosphere, clusters of two-16-foot drogue parachutes and three 90-foot diameter main parachutes would permit a "soft" landing on earth at speeds reduced to two to four miles per hour at impact.

Its heat shield would be jettisoned before landing to expose the height sensors which actuate the slowdown retro rockets.

To cushion the landing, 10 inches of crushable material — balsa and honeycomb metal — would line the bottom of the logistics spacecraft.

Normal landing could be either in Florida or south Texas. In case of an emergency, the logistics spacecraft crew could select one of 500 possible ground landing sites along the Project Mercury track. In the ocean, the logistics spacecraft could float for a week or more if necessary.

The spacecraft's "cabin" pressure shell would be mainly titanium. The conical heat shield would be made of Rene 41 nickel alloy. Aluminum honeycomb and magnesium would be used for the cargo module.

Main propulsion and reaction control systems would be liquid-fueled. Solid propellants would be employed for the retro motors and to jettison the 41-foot tall escape tower atop the logistics spacecraft following successful launch.

Technical Symposium's December Meeting Postponed 'Til January

The regular monthly MSC Technical Symposium which is held the last Monday of each month, will not meet during December it was announced by Warren Gillespie Jr., meeting manager.

January 25, 1965, the last Monday in the month is the date for the next scheduled meeting. The meetings are held from 6:15 to 8:15 p.m., in the MSC Auditorium and admission to these meetings requires a security clearance at the confidential level.

GT-2

(Continued from Page 1)

will be followed by a turn-around and a maneuver to retroattitude. The retrorockets, though not needed to perform this mission, will be sequence fired 62 seconds after spacecraft separation.

GT-2 will not be launched before one hour after sunrise nor after four hours before sunset. A minimum of three daylight hours is desirable for spacecraft recovery after landing.

Three 16mm black and white motion picture cameras are mounted on the crew simulator pallets to monitor the panel instruments during the GT-2 mission.

The fuel cell, located in the equipment section, will be flown to establish prelaunch activation and check-out procedures and to confirm its ability to function properly after launch.

Two ejection seat assemblies have been reworked for mounting of the two crewman simulators. Although operating elements of the ejection system will be flown, these seats will not be armed for ejection. Both seats are clamped to the seat rails to minimize vibration damage to the crewman simulators.

The main parachute for the landing is an 84-foot-diameter ringsail parachute designed to provide stable descent at a vertical velocity of 30 feet per second at sea level.

The parachute deploys and supports the spacecraft vertically from a single point for 22 seconds. Then the single point suspension is released, which permits the spacecraft to reposition to a two-point bridle suspension. This orients the spacecraft in the proper landing attitude, with the nose 35 degrees above the horizon.

Prime recovery ship is the aircraft carrier, USS Intrepid. Navy swimmers will be taken to the spacecraft area by helicopters from the Intrepid to install a flotation collar around the spacecraft. This will provide additional buoyancy until the spacecraft can be lifted aboard the Intrepid by a crane.

The program is managed by the Manned Spacecraft Center's Gemini Program Office, headed by Charles W. Mathews. Dr. George E. Mueller, NASA associate administrator for Manned Space Flight, as acting Gemini program director.

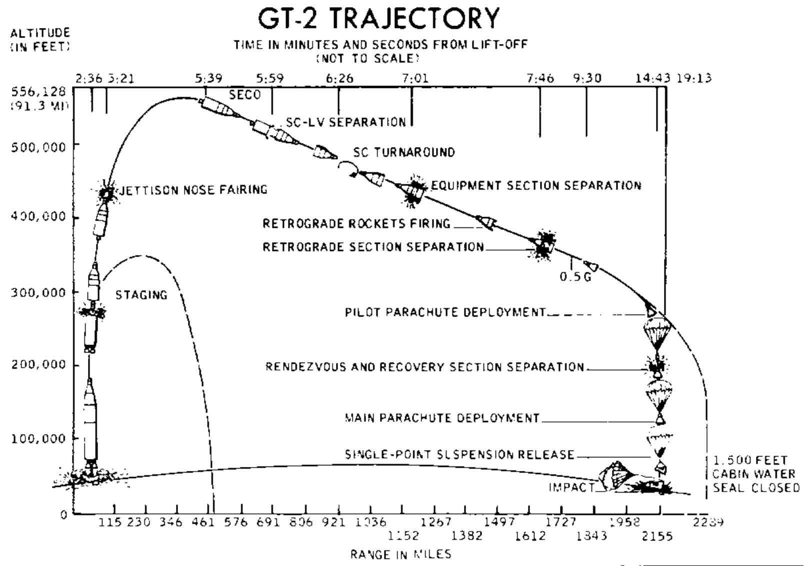
Overall responsibility for conducting the GT-2 mission rests with Christopher C. Kraft Jr., MSC assistant director for Flight Operations, who is operations director for the mission.

The USAF Space Systems Division and the 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.

A wide range of Department of Defense support for this mission, is provided and includes tracking, recovery ships and launch services.

Prime contractor for the manufacture of 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.

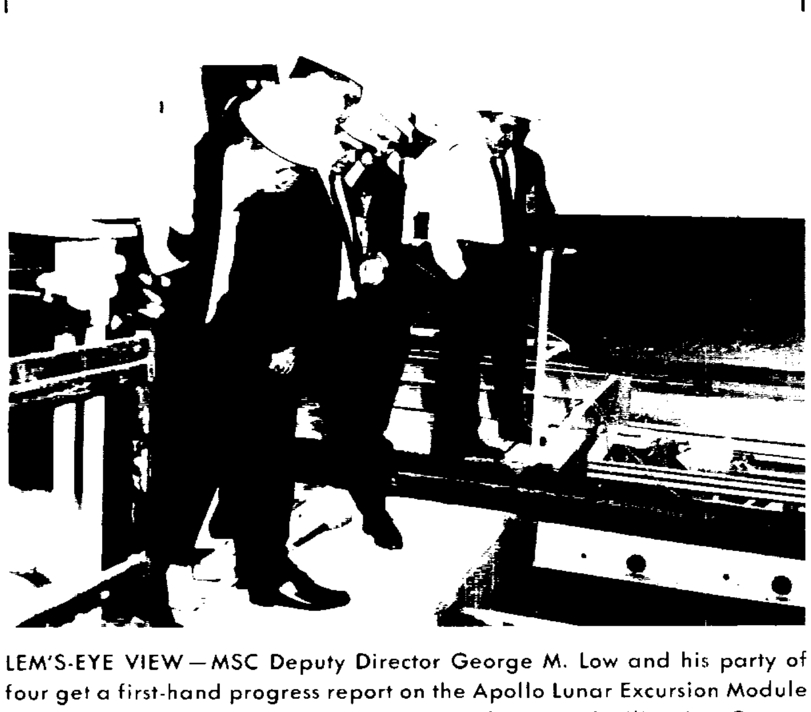
GT-2 TRAJECTORY



Texas Governor Center Visitor

ADDRESSES CONFERENCE—Gov. John Connally (right), and Dr. Robert R. Gilruth (center), director, Manned Spacecraft Center, listen as Richard S. Johnston,chief, Crew Systems Division, explains the workings of a space suit to the Texas governor during a tour of the Center facilities. Governor Connally was here to address the Conference for Summer Session Administrators on November 23.

MSC Officials Visit Test Facility



LEM'S-EYE VIEW—MSC Deputy Director George M. Low and his party of four get a first-hand progress report on the Apollo Lunar Excursion Module test stands at the Propulsion Systems Development Facility, Las Cruces, N.M. Providing commentary on the static test stands are White Sands Operations Manager Martin L. Raines and WSO Propulsion Engineering Office Chief B. R. Gantz. Members of the group are, from left, William H. Simmons, E. M. Fields, J. G. Thibodaux, Raines, Wesley L. Hjornevik, Low and Gantz.

BP-23

(Continued from Page 1)

approximately 84 degrees with respect to the horizontal. The signal to launch, transmitted by land-line from the blockhouse, will ignite the two Algol and four Recruit solid rocket motors simultaneously.

The test vehicle will follow a controlled trajectory to the test point. Approximately two seconds prior to abort, on a radio command, the launch vehicle attitude-control subsystem will produce a pitch maneuver to attain an angle of attack to produce desired launch-escape vehicle dynamics.

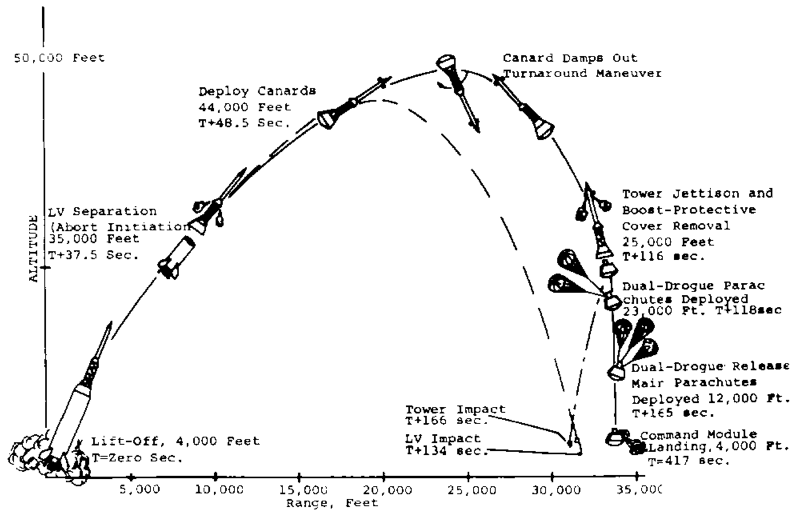
The abort will be initiated by a launch vehicle timer when the radio command for the pitch-up maneuver is received. The abort is scheduled to occur about 37 seconds after liftoff. The abort signal initiates the separation of the command module from the service module, ignition of the pitch-control and launch escape rocket motors, and activation of the mission sequencer 11-second time delay.

Eleven seconds after abort initiation, the canard surfaces will be deployed causing launch-escape vehicle turnaround and stabilization with the command module aft heat shield forward. The apogee of the launch-escape vehicle will be about 46,000 feet above the range, 65 seconds after liftoff.

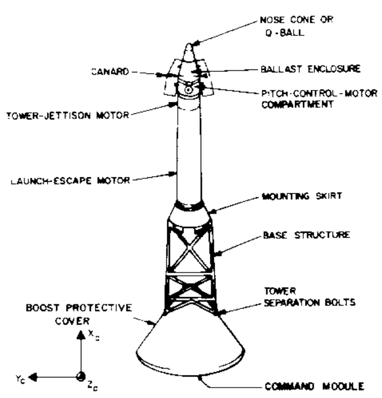
The launch-escape subsystem, boost-protective cover, and forward heat shield will be jettisoned as a unit by the tower jettison rocket motor, initiated by a baroswitch at about 21,000 feet above the range.

Dual-drogue parachutes will be deployed in a reefed condition two seconds later and will be disreefed six seconds after deployment.

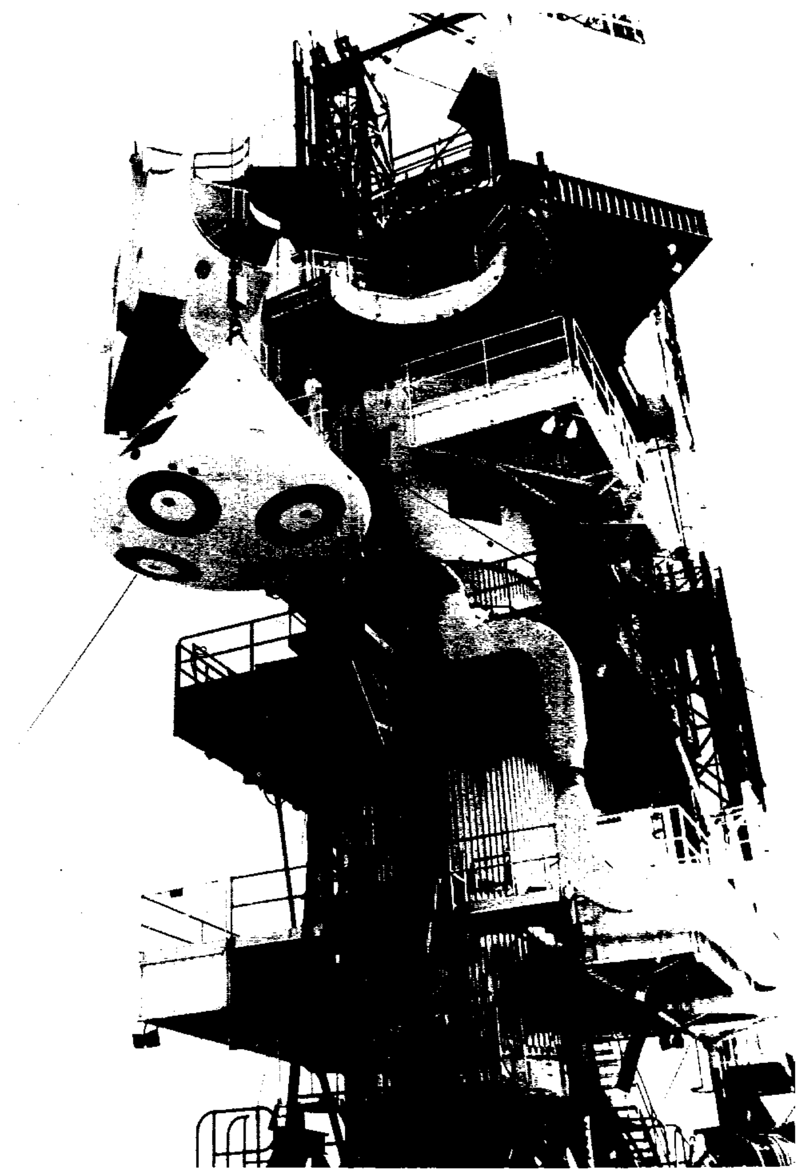
At 8,000 feet above the range, the dual-drogue parachutes will be released and the main parachutes will be deployed in a reefed condition for a period of six seconds at which time the main parachutes will be disreefed. Command module impact is scheduled for about seven minutes after liftoff.



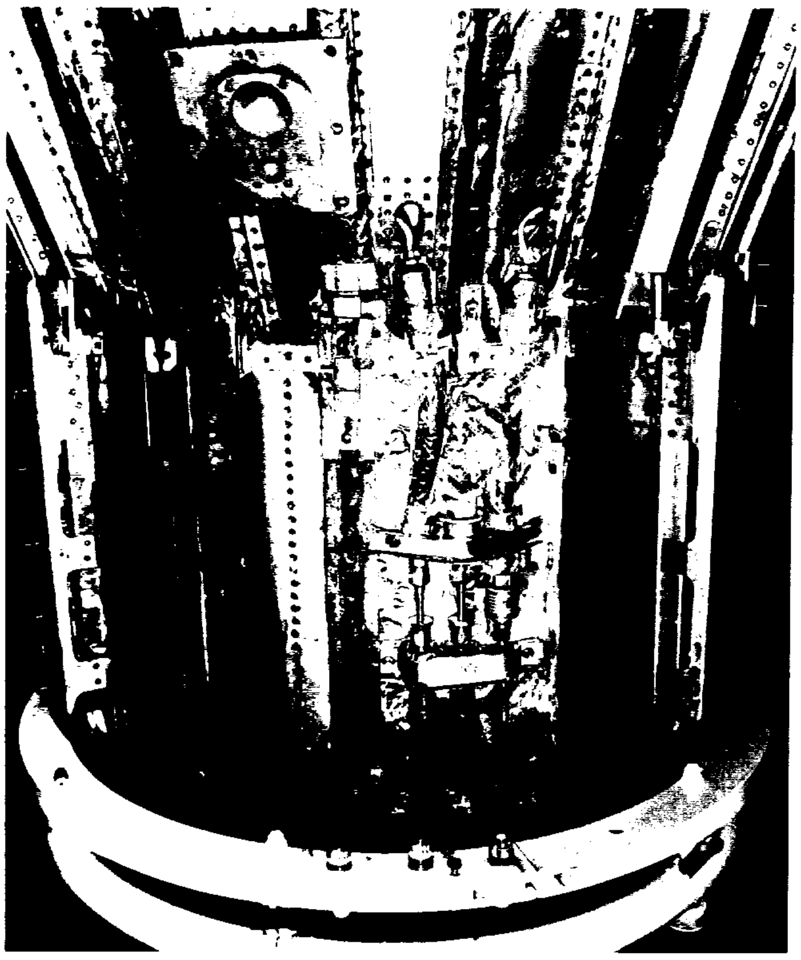
FLIGHT PLAN FOR BP-23 TEST AT WHITE SANDS



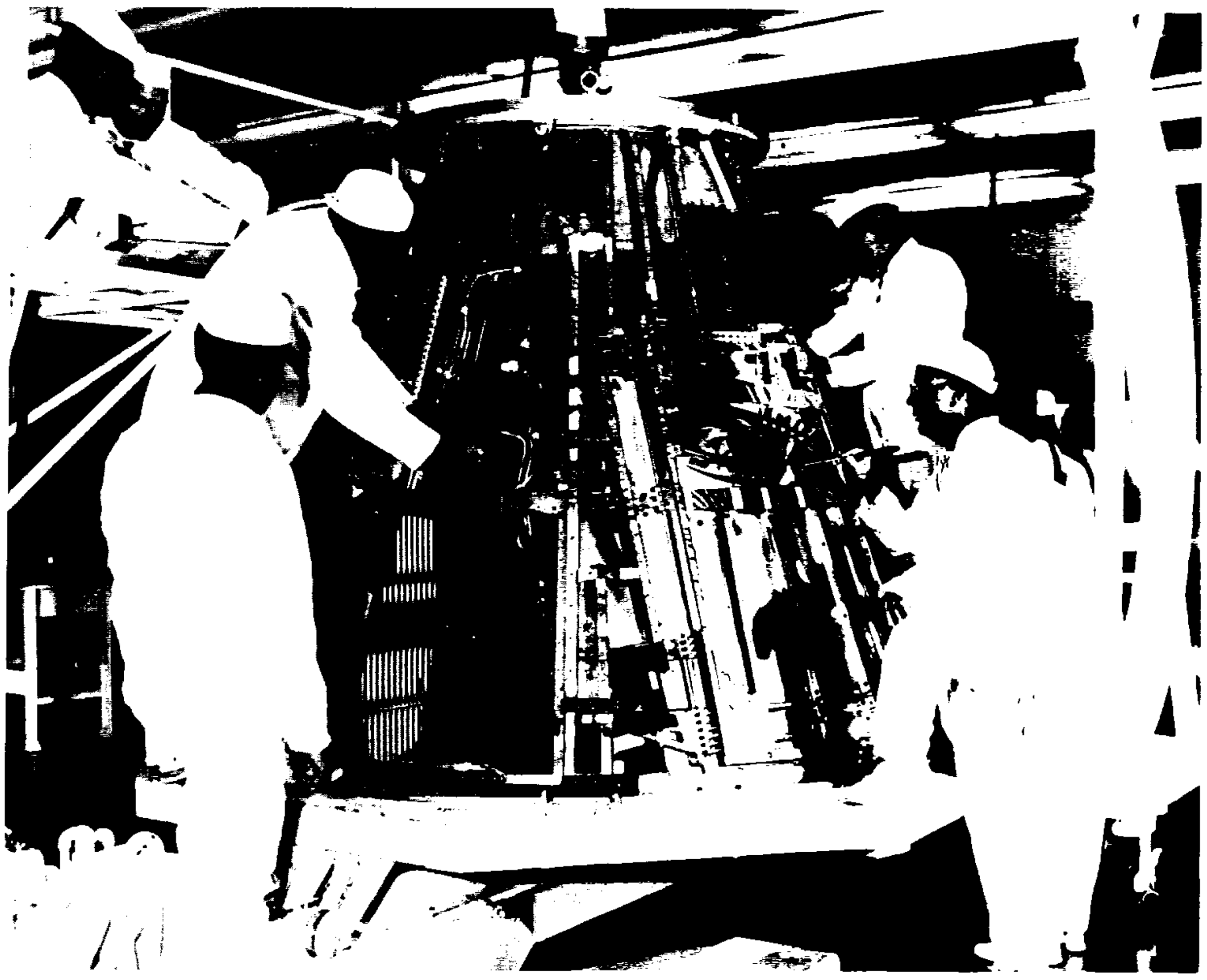
COMMAND MODULE-LAUNCH ESCAPE VEHICLE COMPONENTS.



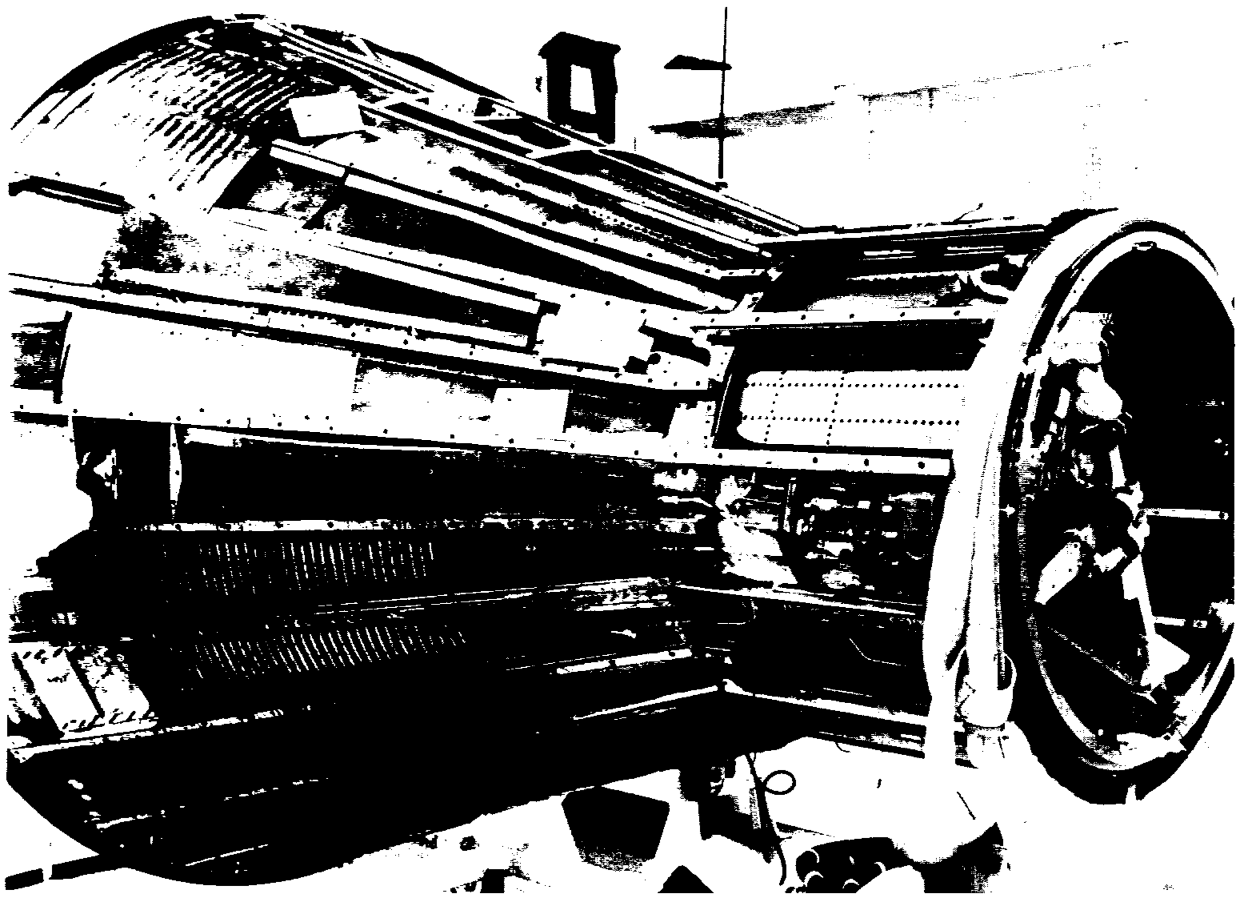
COMMAND MODULE MATING—Boilerplate 23 Apollo command module is shown being hoisted into place for mating with the Little Joe II launch vehicle at Launch Complex 36, White Sands Missile Range, N. M.



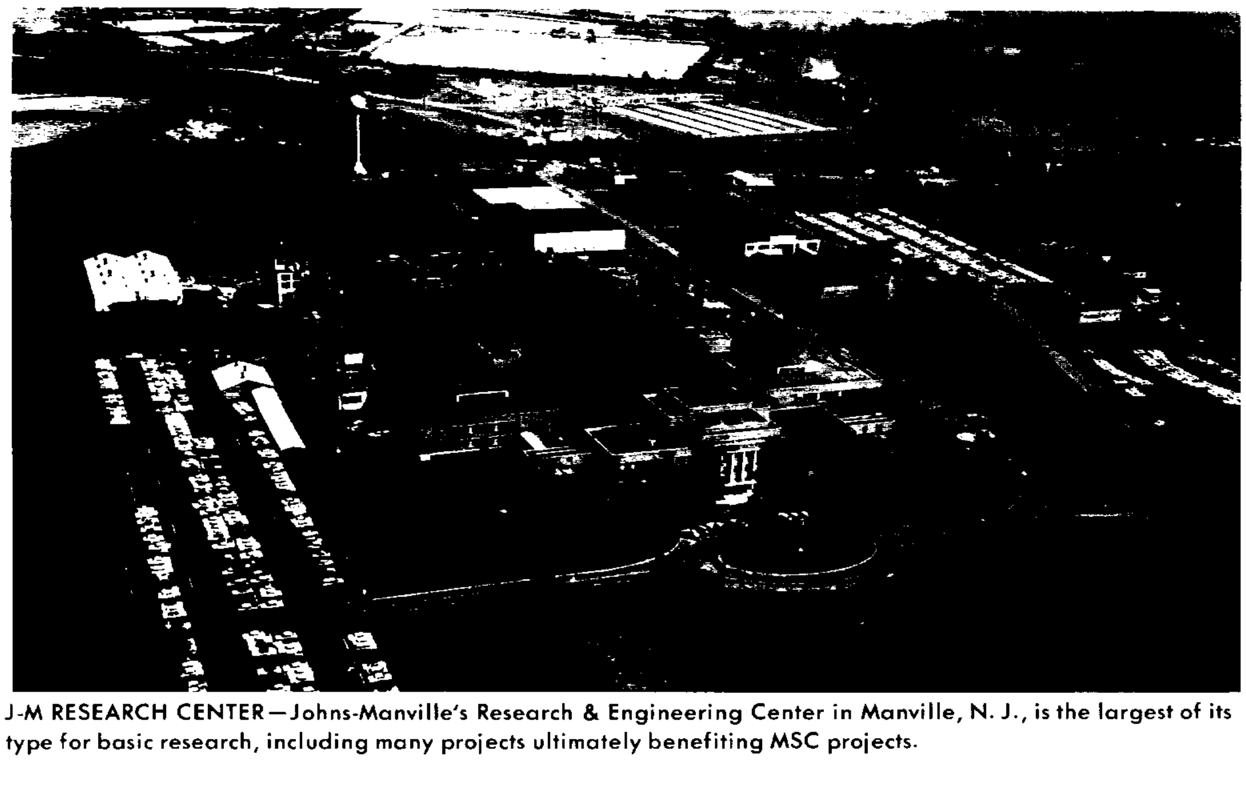
INSULATION AFTER FLIGHT—Photo of reaction control system in place on Mercury spacecraft following flight shows that insulation was in no way changed by the temperature extremes experienced.



INSULATING GEMINI—Fabrication of Gemini spacecraft is shown at McDonnell Aircraft. J-M's Min-K, foil encased, is seen installed along outer edges of ribs, and around window.



MERCURY INSULATION—Mercury spacecraft in construction at McDonnell shows two J-M insulations. Min-K, metal-foil encased, is placed in channels along the tops of ribs, while the Thermoflex, fiber glass encased, is placed between the ribs.



J-M RESEARCH CENTER—Johns-Manville's Research & Engineering Center in Manville, N. J., is the largest of its type for basic research, including many projects ultimately benefiting MSC projects.

Spacecraft Insulation

Johns-Manville, one of the oldest names in the business of thermal insulations has been closely connected with the aviation and aerospace industries from their earliest days through the present era of such sophisticated manned spacecraft as Gemini and Apollo.

Protection of astronauts from the environment of outer space has posed a challenge to the engineers and researchers at the J-M Research and Engineering Center at Manville, N.J., who have a solid foundation in such endeavors in their development of many thermal insulations designed to restrict the passage of heat.

The Johns-Manville business is carried on by 11 operating divisions with more than 22,000 employees manufacturing and distributing some 500 lines of products including those for the control of heat, cold, sound, and motion, and protection against fire, weather and wear.

EDWARD F. BRIGGS
Vice President J-M Sales Corp.

One of these is the development and manufacture of a broad line of products used in the aviation and aerospace industries, most of which are marketed by the recently formed Aerospace Products Department headed up by E. F. Briggs. This Department, part of the Industrial Insulations Division, prides itself on offering the most exotic line of materials produced by J-M.

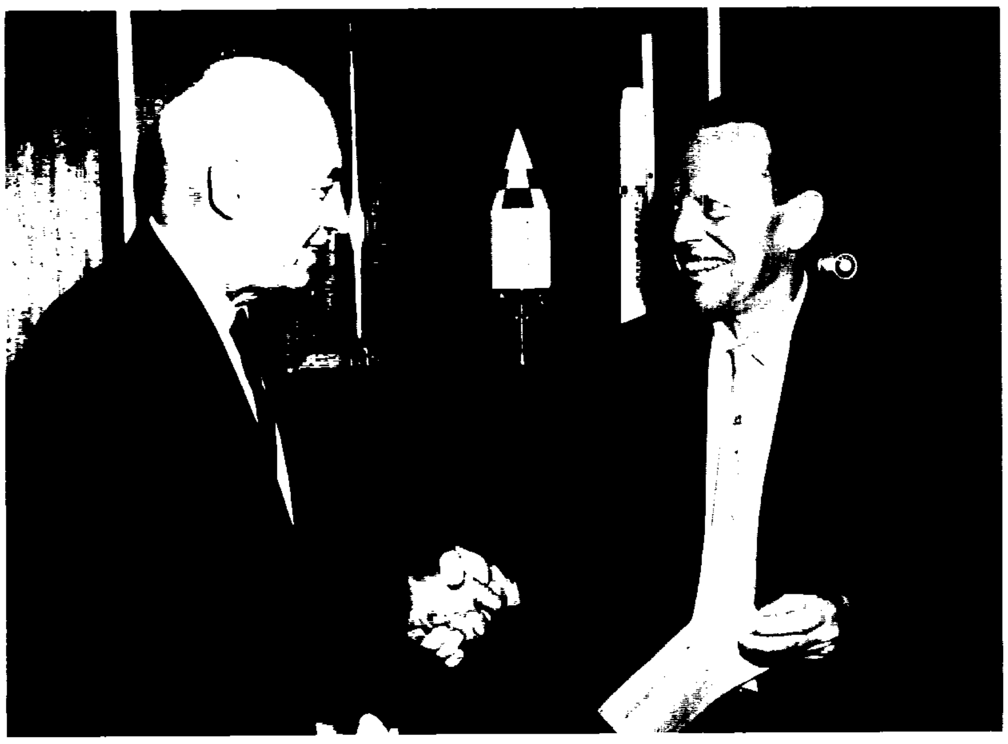
The success and obvious capabilities of these products are evidenced by the fact that, in addition to innumerable applications in the field of non-manned missiles and rockets, they have been, and are being specified for use aboard all the manned spacecraft currently under design or construction. This includes Mercury, Gemini, the Apollo command module and the Lunar Excursion Module. In addition, J-M insulations were aboard NASA Project Fire, and Air Force Project Asset.

Particularly well known to the industry are two thermal insulations, developed at the Johns-Manville Research Center and originally utilized in the Project Mercury spacecraft, which are now being used by McDonnell in the Gemini spacecraft. One of these—Min-K—actually has a thermal conductivity lower than that of still air, traditionally considered the lowest possible, according to its inventor, Dr. Sidney Speil.

The second is Thermoflex, a blanket like material composed of ceramic fibers produced from

EDITOR'S NOTE: This is the thirty-sixth in a series of articles designed to acquaint MSC personnel with the Center's industrial family, the contractors who make MSC spacecraft, their launch vehicles and associated equipment. The material on these two pages was furnished by Cunningham and Walsh Inc., for Johns-Manville.

MSC Awards Program Honors Employees Service, Achievements



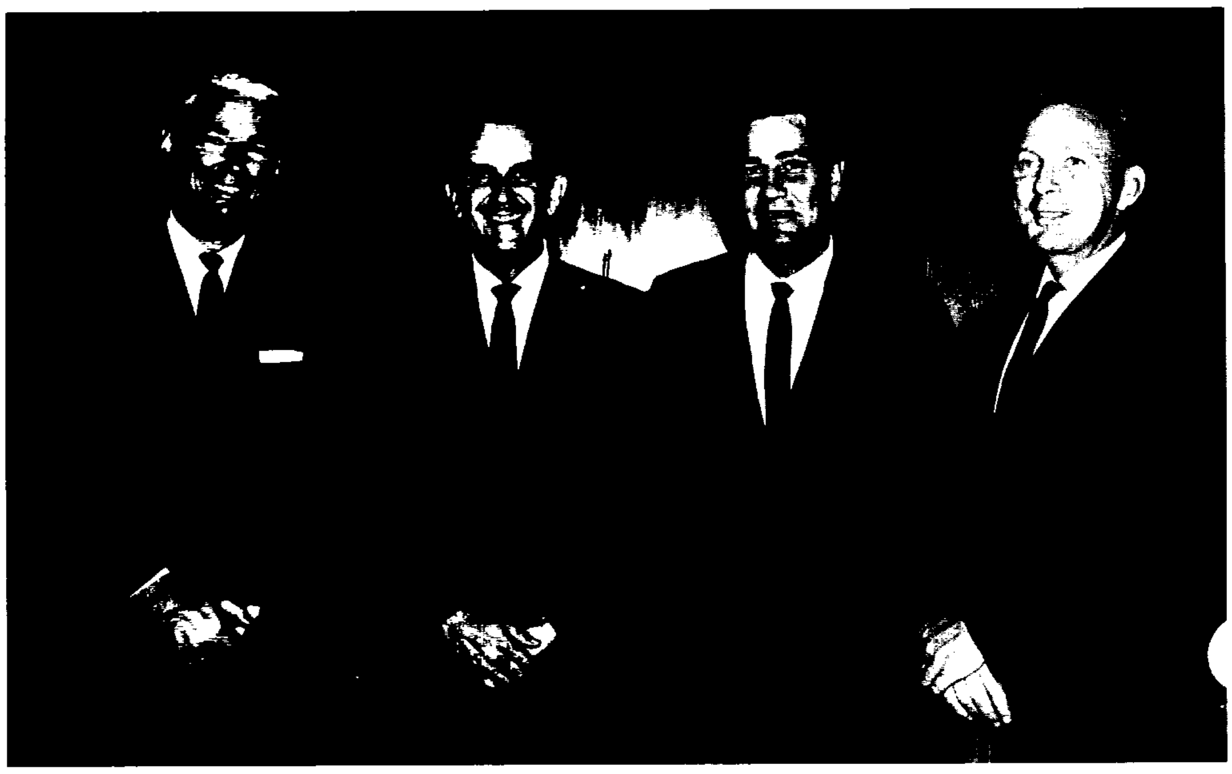
THIRTY-YEAR AWARD—For 30-years of service to the government, Frederick John Bailey Jr. (right), chief, Reliability and Quality Assurance Office, was recently presented a Service Award by Dr. Robert R. Gilruth, director, Manned Spacecraft Center.

INVENTION AWARD—Warren Gillespie (right), technical assistant in the Office of the Assistant Director for Engineering and Development, receives an award for his invention "Alleviation of Divergence During Rocket Launch." Aleck C. Bond, manager of Systems Test and Evaluation, makes the presentation.

TWENTY-YEAR AWARDS—Aleck C. Bond (center) manager, Systems Test and Evaluation, presents 20-year service awards to (left) Leroy Proctor, inspection supervisor, Instrumentation and Electronic Systems Division and George E. Griffith (right), branch chief, Structures and Mechanics Division.

PERFORMANCE AWARD—Dr. R. W. Lanzkron (right), chief, Ground Systems Engineering Division for Apollo, receives a Sustained Superior Performance Award from Dr. Joseph F. Shea, manager of Apollo Spacecraft Program Office.

PERFORMANCE AWARD—Dolores B. O'Hara, staff nurse, Center Medical Program Office, receives a check for the Sustained Superior Performance Award. Presenting the award is Dr. Charles A. Berry, chief, Center Medical Programs Office.



SSP AWARDS—Sustained Superior Performance Awards were recently presented to three members of NASA's Manned Spacecraft Center—Florida Operations. The awards were presented by G. Merritt Preston (2d from right), manager MSC—Florida Operations. Recipients were (l. to r.) John Williams, MSC-FO assistant manager for Gemini; Jake Moser, MSC-FO assistant manager for Apollo; and Paul Donnelly, chief test conductor.

Test Your Security I. Q.

1. Each NASA-MSC employee will be required to have the new NASA ID Badge and new type decal by January 31, 1965. A. True; B. False.

2. The new badge denotes an individual level of clearance: A. By border color-codes; B. By border color-codes and stripes; C. By stripes.

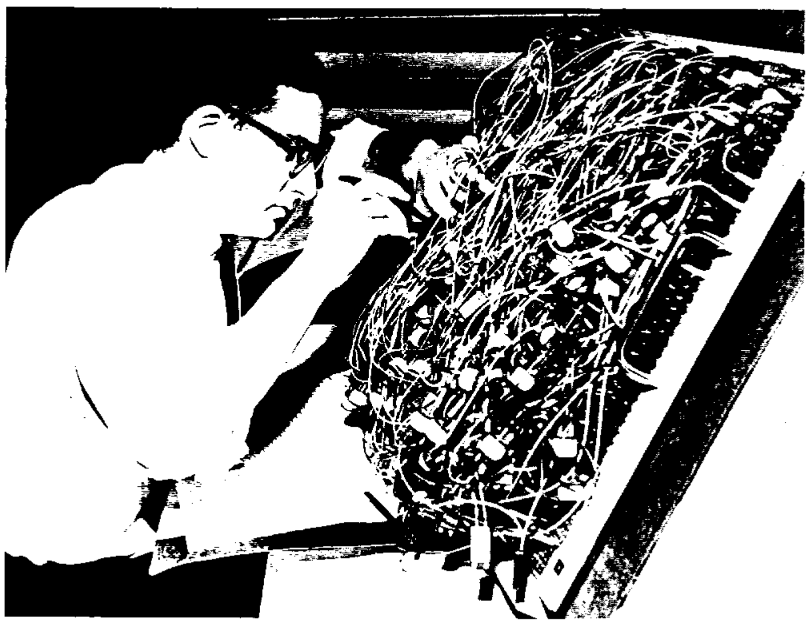
3. Under the new NASA-ID Badge Program a secret clearance is indicated by: A. A solid white stripe; B. A solid black background with a white stripe; C. A red border with two vertical white stripes.

4. The new NASA-ID Badge will be recognized on a reciprocal basis at all NASA facilities. A. True; B. False.

5. Alphabetical code letters on the new badge indicate: A. Unlimited access to restricted areas; B. Entry authorization to restricted areas under specified conditions; C. Access to restricted areas during missions.

Answers on page 5-A

MSC at work...



DAVID ARNOLDY, co-op student, from Kansas State University, revises the patch panel programmer for LEM, lunar landing simulator. He is in the Simulation Branch of the Guidance and Control Division.

JUNE P. SHOOSMITH, secretary to Philip Hamburger, assistant for congressional relations, is shown scheduling appointments of congressional visitors to the Manned Spacecraft Center.

NORMA WYSCARVER, Mathematical Physics Branch, Mission Planning and Analysis Division, types a monthly progress report for a member of the division.

Bridge Club Winners Announced

Gil Conforti and Art Manson came in first at the November 24 MSC Duplicate Bridge Club game, and Evelyn Huvar and Barbara Robinson were second.

On Friday, November 27, Max Cone and Rita O'Boyle, MSC Duplicate Bridge Club Members, placed sixth in the National Charity Game held at the Rice Hotel in Houston.

The Club meets at 7:15 p.m., each Tuesday at the Ellington NCO Club.

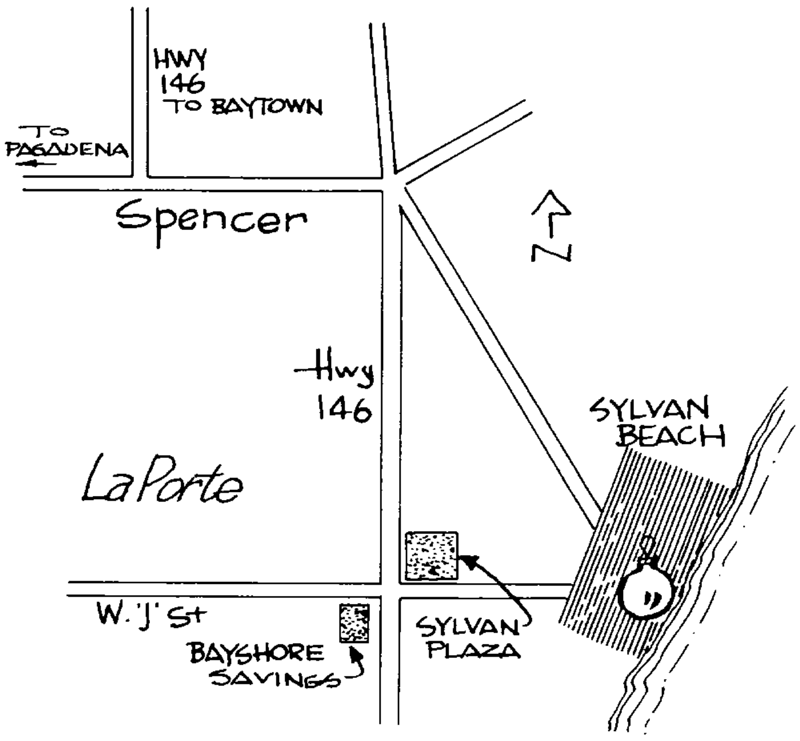
MSC Christmas Dance 8 P.M. Friday

The Annual MSC Christmas Dance will be held from 8 p.m. to midnight this Friday at the Sylvan Beach Pavilion in LaPorte and tickets were still available at Roundup copy deadline time.

In the event tickets are not all sold in advance, the remaining tickets will be sold at the door. But employees are advised by dance ticket sales representatives, to be sure by buying tickets early.

The dance will feature music by Nick Navarro's orchestra and the $2.50 per person price tag includes admission and set-ups. Dress is semi-formal. *(See map on this page for directions to the dance.)*

Last minute tickets may be purchased from any Employee Activities Association Representative, from building receptionists, and at lunch time from roving sales representatives in the MSC Cafeteria. Ticket sales will end Thursday at the close of the working day.



Bell Ringer Chorus To Entertain Children At Christmas Party

A bell ringer chorus playing Christmas carols, Santa Claus and clowns will be included in the entertainment for MSC's employees' children at the Children's Christmas Party this Saturday from 3:30 to 5:30 p.m. in the MSC Cafeteria.

Children age three thru 12 are invited and each is requested to bring a gift for their own age and sex, costing a maximum of one dollar. The age and sex should be noted on the outside of the package to give Santa a little help in making the distribution.

Refreshments will be served by the MSC Employees Activities Association.

MSC Chess Club Memberships Open

The MSC Chess Club has issued an invitation to all chess players, and would be players, to attend the regular Wednesday meetings at 6:30 p.m., at the Ellington NCO Club.

Additional information on the club may be had by calling M. E. Weidmann at Ext. 3903.

ANSWERS TO SECURITY QUIZ

1. A; 2. B; 3. C; 4. A; 5. B.

MSC BOWLING ROUNDUP

MSC MIXED LEAGUE
Standings as of Nov. 30

TEAM	WON	LOST
Celestials	35	13
Eight Balls	30	18
Alley Cats	30	18
Virginians	29	19
Dusters	27	21
Falcons	23	25
Shakers	22	26
Chugg-a-Lugs	21	27
Play Mates	21	27
Hawks	19	29
Gutter Nuts	19	29
Goof Balls	14	34

High Game Women: Barnes 225, Taylor 174, Morris 169.

High Game Men: Morris 230, Schmidt, Zwolinski 221, Sargent 220.

High Series Women: Barnes 541, Gassett 450, Morris 428.

High Series Men: Spivey 574, Morris 570, Sargent 564.

High Team Game: Celestials 847, Eight Balls 823, Dusters 803.

High Team Series: Eight Balls 2321, Celestials 2315, Alley Cats 2227.

MIMOSA MEN'S LEAGUE
Standings as of Nov. 19

TEAM	WON	LOST
Fabricators	31	17
Pseudonauts	28	20
Turkeys	26	22
Green Giants	25	23
Whirlwinds	24	24
Alley Oops	24	24
Roadrunners	23	25
Spastics	22	26
Sizzlers	20	28
Technics	17	31

High Game: Hecht 244, Schwartz 242, Amason 233.

High Series: Lee 645, Folwell 604, Sandars 586.

High Team Game: Fabricaors 990, Green Giants 928, Alley Oops 919.

High Team Series: Fabricators 2631, Pseudonauts 2631, Green Giants 2591.

NASA 5 O'CLOCK MON.
Standings as of Nov. 30

TEAM	WON	LOST
Suppliers	28	16
Foul Five	26	18
Hot Shots	22	22
Computers	22	22
Sombreros	20	24
Alley Gators	14	30

High Game: H. Erickson 224, C. Eckert 219, H. Walker 218.

High Series: W. Stransky 563, H. Walker 557, G. Shrum 539.

High Team Game: Computers 880, Suppliers 845, Foul Five 832.

High Team Series: Hot Shots 2326, Computers 2321, Foul Five 2304.

MSC COUPLES LEAGUE
Standings as of Dec. 1

TEAM	WON	LOST
Wha Hoppen?	39	13
Hi-Ho's	31	21
Schplitz	30	22
Pin Splitters	29	23
EZ-Go	26½	25½
Sandbaggers	26½	25½
Crickets	25	27
Alley Cats	22	30
Bowlernauts	21½	30½
Thinkers	21	31
Goofballs	20½	31½
BLTZF	20	32

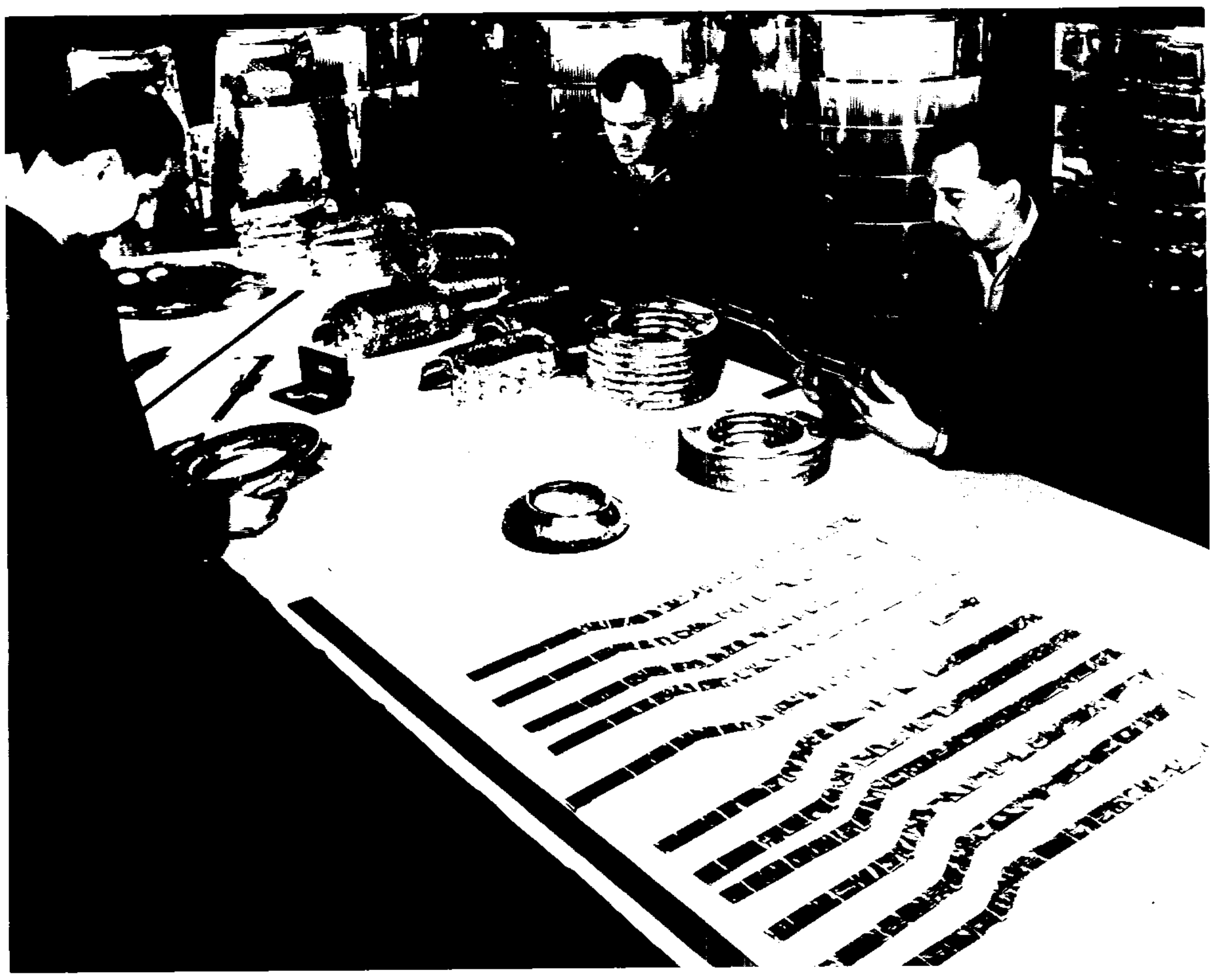
High Game Women: D. Donatto 223, G. Jones 217.

High Game Men: L. Townsend 236, J. Garino 235.

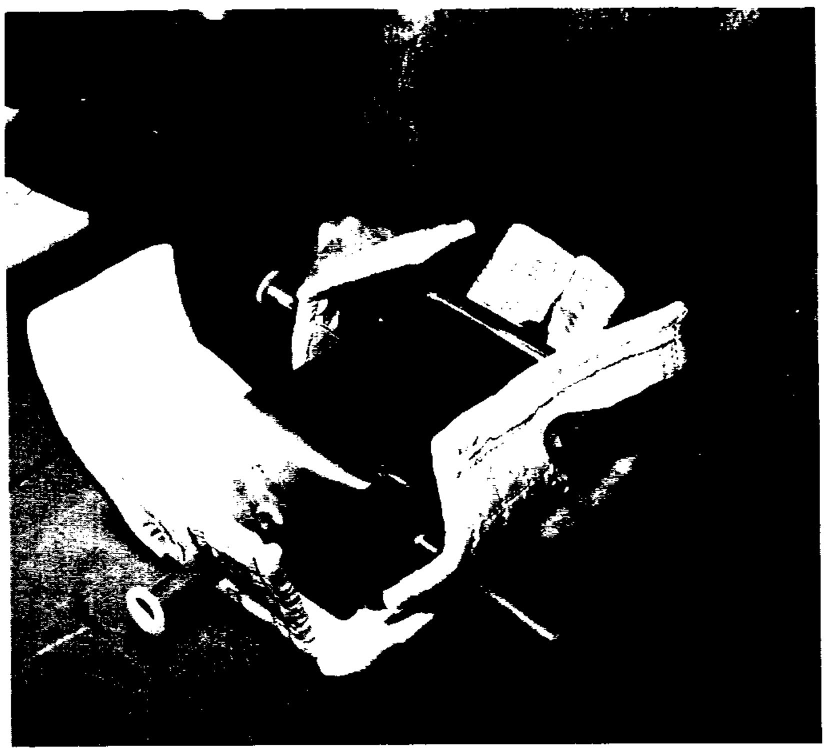
High Series Women: J. Foster 538, 514, S. Garino 506.

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

DOUGLAS ROBINSON, co-op student from Kansas State University, is shown installing the uprighting bag on an Apollo boilerplate. He is in the Operational Evaluation and Test Branch of the Landing and Recovery Division.



INSPECTION—Typical Min-K fabrications for manned spacecraft installation are inspected at Johns-Manville plant in Manville, N. J., prior to shipment.



APOLLO INSULATION—Flexible Min-K is wrapped around an Apollo part at the J-M plant. Use of the flexible material, as opposed to the rigid shown in other photos, cuts down tooling cost and production time, with insignificant loss in insulation.

Provided By Johns-Manville

arc-furnace melts at temperatures higher than used in producing any other fibers. This material, because of its fluffy structure, offers high resistance to the passage of noise as well as heat.

CLINTON B. BURNETT
President Johns-Manville Corp.

Shielding astronauts from the high noise levels experienced during launch was deemed necessary by spacecraft designers.

Both thermal insulations supplied by J-M's Aerospace Group can withstand long-term exposure to temperatures far above those encountered in the spacecraft applications. Specific temperatures on spacecraft skins can vary at different locations from a possible high of 2,000 degrees F. during the most severe reentry to a low of minus 100 degrees F. during orbit.

Design parameters of spacecraft call for extremely lightweight thermal insulations. Exceeding these weight requirements slightly lessens the possibility of a successful launch. With the weight of the astronaut and needed environmental, control, and recovery equipment, little tolerance remains for structural and thermal protection. Both Johns-Manville insulations fill this need.

Min-K usually placed along structural ribs and over storage tanks and tubing, has a thermal conductivity of 0.27 at a mean temperature of 1,000 degrees F., which is reduced by 0.07 Btu/in./hr./sq. ft. degrees F. at an equivalent altitude of 60,000 feet. Thus, the molded Min-K insulation can be used in extremely thin sections and still give the needed thermal protection with little weight.

Thermoflex is normally placed between the inner and outer shells of a spacecraft, where it offers thermal protection to the astronaut navigating compartment and also attenuates high noise levels during launch.

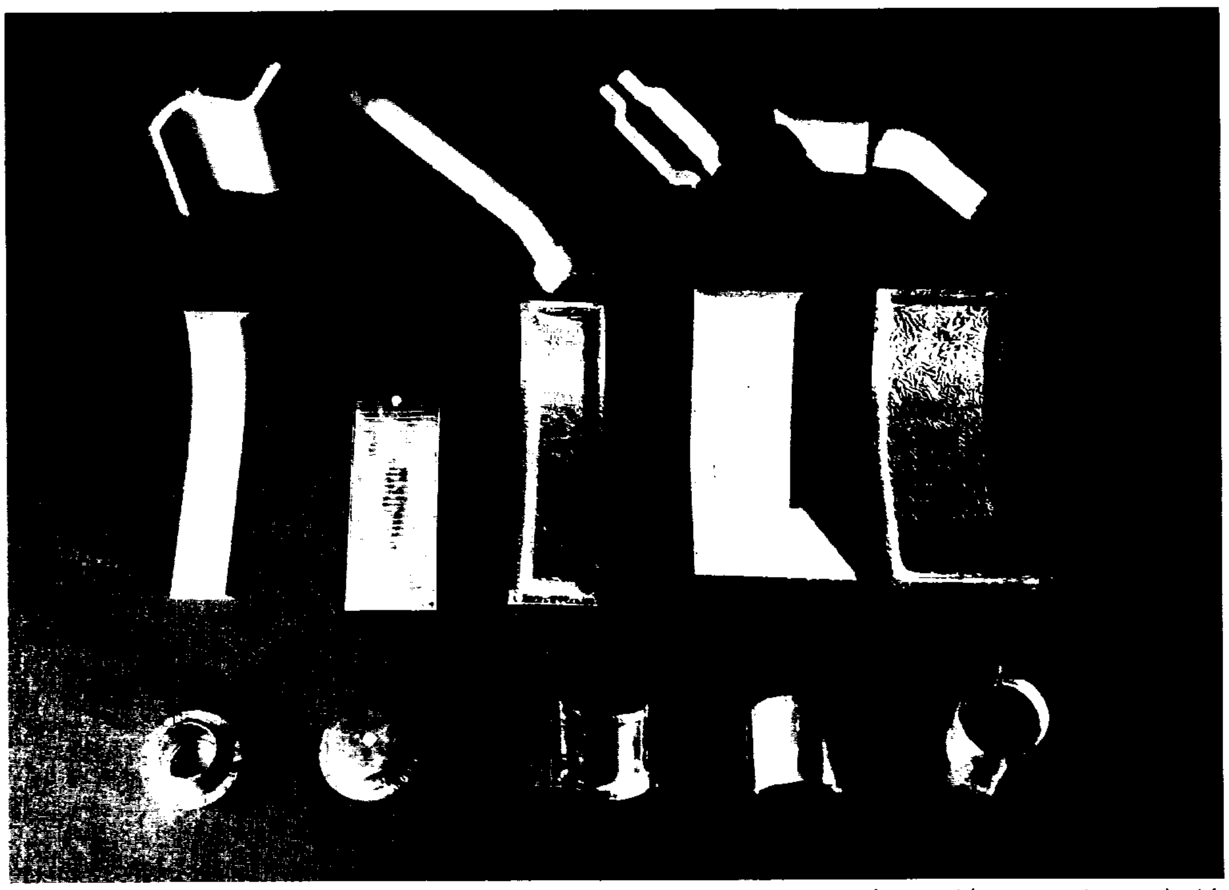
In addition, Thermoflex has been used to protect retrorockets, as well as recovery equipment.

In the case of Apollo, a third J-M insulation will be utilized to add further protection of the command module during reentry to that provided by the ablative heat shield. A report on the construction of the craft, contained in *Aviation Week* magazine indicated that "a layer of J-M Micro-Quartz insulation material will be bonded to the inside of the heat shield to complete its manufacture." J-M materials will also be utilized in the Apollo command module to insulate the windows supplied by Corning Glass from the surrounding metal frame in the form of Min-Klad, an insulation system that combines thermal protection with structural strength.

J-M products are also used in numerous other phases of the space program. On the Saturn program, for instance, ducts and tubes are protected by metal clad Micro-Fibers Felt and Micro-Quartz. Flexible Min-K is being used by Grumman in the LEM test facilities, and both Flexible Min-K and Micro-Fibers Felt protect fuel cells in Apollo and LEM.

Not all the Johns-Manville products directly or indirectly used in MSC activities get off the ground. For example, J-M Transite asbestos-cement pipe is being used in large quantities to supply water and carry off waste at the new Merritt Island launch complex now under construction. And a cement additive produced by J-M was mixed in the concrete used for the foundation of Merritt Island's Vertical Assembly Building, the world's largest building. Finally, a unique Johns-Manville tape, called Blastape, is used to wrap umbilical cables on launching towers. The tape, composed of asbestos and Inconel, protects cables from heat and erosion during launches.

INSULATION DEMONSTRATION—Dr. Sidney Speil, inventor of J-M's unique Min-K insulation used on Mercury, Gemini, and Apollo, is shown during a nationwide TV interview from the Cape, illustrating the heat protection capabilities of Min-K as used on Mercury. NBC's Merrill Mueller assists.



MIN-K INSULATION FOR GEMINI—Typical Min-K insulation components are shown without covering and with Inconel metal foil protection. These are similar to components being produced for the Gemini craft by J-M.

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
Chief, News Services Branch . . . . Ben Gillespie
Editor . . . . Milton E. Reim
Staff Photographer . . . . A. "Pat" Patnesky

On The Lighter Side

Dr. Shea Crowned Champion

LAUREL WREATH TO THE WINNER—Maxime A. Faget, assistant director for Engineering and Development, prepares to place a makeshift laurel wreath on the head of Dr. Joseph Shea, manager, Apollo Spacecraft Program Office, for prowess he demonstrated in a one-mile foot race by the two on Thanksgiving day. The race, four laps around the one-fourth mile track at the La Porte, Tex., High School, was the result of a friendly challenge. While no Olympic records were broken, Shea ran the mile in 6:23 and Faget in 6:38. (Editor's Note: Who knows, maybe this could be the beginning of a MSC track team and a possible physical fitness program for all Center employees who spend most of their hours behind a desk.)

Welcome Aboard

During the last reporting period, a total of 86 persons joined the Manned Spacecraft Center. Of these, two were assigned to St. Louis, Mo., 17 to MSC-Florida Operations, three to White Sands Operations, and the remaining 64 here in Houston.

Legal Office: William T. Barr.

Center Medical Operations Office: Roy Laird.

Public Affairs Office: David A. Wills.

Office Services Division: Iva J. Massey.

Technical Information Division: William Chmylak.

Logistics Division: David B. Homer, and Francis D. Sparrow.

Procurement and Contracts Division: William T. Batman, and Franklin D. Nolin.

Personnel Division: Lola J. Campbell, Cherry A. Cloud, Gloria L. Crowston, and Barbara F. Cryer.

Resources Management Division: Samuel P. Gibson, Walter A. Graham, Roger G. Henderson, William E. Jobe, and Lucille M. Johnson.

Security Division: William A. Larsen.

Engineering Division: Quentin G. Robb.

Facilities Division: Eula A. Perrault.

Aircraft Operations Office: John D. Collins.

Flight Crew Support Division: David L. Eichblatt, Frances S. LaBrie, Walter J. Piszczek, and Francis W. Ravet.

Information Systems Division: Dona K. Criss, Calvin F. Herman, Peter N. Poulos, William R. Reed, Bobby K. Vermillion, and John C. Peck.

Crew Systems Division: Richard J. Gillen.

Computation and Analysis Division: Coy E. Parker.

Instrumentation and Electronic Systems Division: James C. Dallas, and Larry R. Sutton.

Guidance and Control Division: Beverly D. Bell, Charles S. Finch, and William H. Peters.

Propulsion and Power Division: Mack C. Buchanan, John P. Franklin, Alice C. Reed, and James A. Wood.

Structures and Mechanics Division: David R. Camp, Ronald E. Durkee, Mickey L. Minyard, Luther D. Palmer, Vinicio Riccardelli, and Ivan K. Spiker.

Advanced Spacecraft Technology Division: William R. Daugherty, and Herbert A. Sook.

Flight Control Division: Pantaleon Moreno, Paul D. Nering, James M. Payne, Leo G. Reitan, Carl B. Shelley, Henry B. Stephenson Jr., and Talivaldis K. Sulmeisters.

Landing and Recovery Division: Sheridan J. Berthiaume.

Mission Planning and Analysis Division: Doris J. Roberts.

Gemini Program Office: Richard D. Bratton, and Wayne A. Eaton; Boyd S. Koffman, and Robert G. Thiroff, (St. Louis, Mo.)

Apollo Spacecraft Program Office: Frank W. Harding III, and Edward S. Johnson.

MSC-Florida Operations (Merritt Island, Fla.): Tex H. Baldwin, Rhoda M. Barham, Russell E. Dorrell, Ronald H. Freeman, Margaret Guistino, Allan R. Goldenberg, Harold B. Hansen, Charles B. Holder, Abraham R. Johnston Jr., Edward M. Mahoney, Frank J. Merlino, James E. Pugh Jr., John W. Rucker Jr., Benjamin W. Stevens Jr., Paul D. Toft, Tommie Lee Wheeler, and Roy L. Whitson.

MSC-White Sands Operations (Las Cruces, N. M.): Donald R. Visness, Isaac Diaz, and Orfila M. Ramirez.

Space News Of Five Years Ago

Dec. 15, 1959—NASA released detailed comparison of United States and U.S.S.R. space sciences programs prepared by Dr. Homer E. Newell, which pointed up the importance of leadtime in vehicle technology.

Mid-December, 1959 — NASA team completed study design of upper stages of Saturn launch vehicle.

Dec. 19, 1959 — The chairman, Atomic Energy Commission, in a letter to the administrator of NASA, proposed a flight test objective be established for the nuclear rocket program and proposed a technical program and division of agency responsibilities to achieve those objectives.

Dec. 20, 1959—Dr. Melvin Calvin reported that molecules in meteorites resembled basic constituents of genetic material found on earth.

Dec. 22, 1959 — The Redstone launch vehicle for the first Mercury-Redstone mission (MR-1) was installed on the interim test stand at the Army Ballistic Missile Agency for static firing.

SPACE QUOTES

MAN AND MACHINE BOTH VITAL, SHOULD COMPLEMENT EACH OTHER. Dr. Eugene Konecci, NASA director of Biotechnology and Human Research, paper delivered before International Astronautical Congress, Sept. 8, 1964.

"Within the last few decades, there has been provocative discussion dealing with man versus machine control. The rapid progress in aeronautics and astronautics makes it clear that it is *not* man *or* machine but rather the most effective combination of man and machine which give us the most efficient systems . . .

"There is a tendency to categorize human and machine elements in terms of 'what man can do best' and 'what machines can do best.' Since this kind of generalization is not very profitable in terms of specific problems facing the design engineer, it should be repeated that men and machines are not competitors.

"Within limits of what is available and, more important, cost-effectiveness considerations, the system designer should consider the characteristics of both men and machines relative to the specific system problem facing him. The two classes of components should be wed in such a way that the respective strengths of each complement the weakness of the other."

MSC PERSONALITY

Owen Maynard Of Apollo's SED Helped Pick Up MA-1 Pieces

The job of supervising the reconstruction of a Mercury spacecraft from pieces that had been scattered over the Atlantic Ocean's floor off Cape Kennedy, was just one of the jobs performed by Owen E. Maynard in the early days of the Mercury program.

Maynard, as chief of the Systems Engineering Division, Apollo Spacecraft Program Office, is now applying his efforts to the Apollo program.

He joined the Space Task Group, forerunner of the Manned Spacecraft Center, in April of 1959 along with a group of engineers from AVRO Aircraft in Canada.

His first job with STG was in the Flight Systems Division to do advanced project work on space stations, and spacecraft for lunar and planetary missions. He also assisted project engineers on the Big Joe portion of the Mercury program.

In the early part of 1960 Maynard was assigned to head the engineering effort for conversion of Spacecraft-Four for the Mercury-Atlas-One (MA-1) flight.

On July 29, 1960, MA-1 was launched from Cape Kennedy (then Cape Canaveral) but the flight was terminated 59 seconds after launch because of a launch vehicle and adapter structural failure.

Maynard was then assigned the responsibility for reconstruction of the spacecraft and investigation of the cause of the failure. He also participated actively in the search and recovery operation for the spacecraft and launch vehicle parts in about 30 feet of water off the Florida coast.

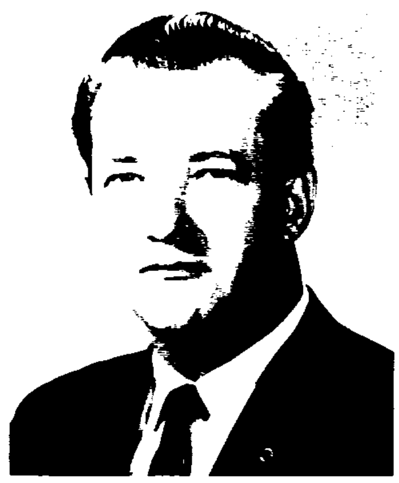
Results of the investigation contributed to the successful flight of the Mercury-Atlas on MA-2.

Following this he was appointed head of the Systems Integration Branch with the responsibility for the conceptual design of advanced spacecraft.

In January of 1962 he became head of the Spacecraft Integration Branch with the responsibility for the conceptual design of spacecraft systems which included the Apollo command module, lunar excursion module (LEM), space stations and planetary spacecraft for advanced missions.

He assumed the duties of the LEM Engineering Office in February 1963 where he had the responsibility for all systems and ground support equipment.

After serving as assistant chief of the Systems Engineering Division from December 1963 to February 1964, he assumed his present duties as chief of the division. In this position he serves as the key technical manager for all important program decisions in the development of overall systems, and concepts for the Apollo Spacecraft Program.



OWEN E. MAYNARD

He is responsible for apportionment of weight and electric power between modules and subsystems, systems and subsystems specifications, and the interface between major system and subsystem elements.

In addition to his other duties, he was a member of the team that evaluated the proposals for the contracts on the LEM and the Apollo command and service module. He is also a member of the space suit board for Apollo and Gemini.

This past October he chaired mock-up review boards at both North American in Downey, Calif., and Grumman Aircraft at Bethpage, N.Y., on the Apollo Command module and the LEM respectively.

Maynard was born in Sarnia, Ontario, Canada and after serving in the Canadian Air Force during WWII as a pilot of Mosquitos (a twin engine plywood night fighter bomber), he attended the University of Toronto and was graduated with a BS degree in aeronautical engineering in 1951.

Prior to joining NASA he was the senior stress engineer for structures and mechanical systems at AVRO Aircraft in Canada.

Maynard has authored several technical papers on space stations, Mercury, and Apollo, and was recently given an invention award for his work on a Radial Module Space Station.

He is a member of the Institute of Aero Sciences, and the American Institute of Aeronautics and Astronautics.

His wife is the former Helen Richardson of New Toronto, Canada, and the couple has three children: Ross 13, Merrill 9, and Beth 8. The family resides in Friendswood, Tex.

Maynard said that swimming is his favorite participation sport, and next is sailing, but finding time to pursue the sport is difficult.

GEMINI-2 X-RAY—Radiography specialist Johnny Johnson of MSC-Florida Operations, explains to NASA engineers his interpretation of radiograph of the retrorockets of Gemini-Titan spacecraft-2 for possible voids in the propellants and liner separation. Radiograph is being viewed using a high intensity illuminator.

X-Rays Of Spacecraft's Anatomy Aids Detection Of Hidden Flaws

When the word x-ray enters a conversation, most people think of a picture probe for a bad tooth, a suspicious shadow on a lung, or any part of the anatomy that might shield some dreaded disease.

To Bethel R. (Johnny) Johnson, Manned Spacecraft Center — Florida Operations, nondestructive testing (NDT) specialist, the subject is viewed in an entirely different light. Johnson depicts in his mind the anatomy of Gemini and Apollo spacecraft.

His job is to ferret out hidden spacecraft flaws and defects that would otherwise go undetected by more conventional means. To accomplish this, Johnson uses such methods as penetrating radiation (x-ray, and nuclear radioactive isotopes), ultrasonics, eddy currents, magnetic particles, fluorescent and dye penetrants and infra-red.

Johnson works out of the MSC-Florida Operations Quality Control Section at the Merritt Island Launch Area (MILA). As a quality control specialist, he monitors analysis and nondestructive testing of materials and components used in manned spacecraft and associated ground equipment. Johnson resolves technical problems and renders professional advice to NASA and contractor personnel on unusual test techniques and procedures designed to improve quality control and inspection standards and methods.

Johnson explains that, "a good example of the value of NDT in the spacecraft activities at the Cape occurred recently during the pre-launch operations of the ApolloBoiler-plate 15. There was some degree of doubt in the soundness of the Launch Escape System (LES) tower bolts. Our Malfunction Analysis Branch was called upon to subject the bolts to an ultrasonic method of nondestructive testing. We determined that the bolts were okay for flight and — as you know — the flight was good all the way — especially the LES bolt separation sequence."

According to Johnson, industrial radiography is also being used to good advantage. "The PAA NDT Laboratory portable X-ray facilities and personnel were employed to determine the liquid level and bladder configuration of the oxidizer and fuel tanks of the Gemini GT-2 spacecraft," Johnson said. "Without x-ray, considerable time and money would have been spent to determine these facts. The estimated savings here was seven or eight thousand dollars," he said.

A sophisticated x-ray TV image intensification system is also used by Johnson to perform spacecraft systems dimensional checks and to locate minute parts, such as transistors and diodes.

Johnson says, "nondestructive testing is the best way of determining the internal soundness and integrity of materials without having to destroy any of the materials. This saves many hundreds of thousands of dollars."

Johnson also declared, "I suppose we could say that film radiography is the most popular of the many NDT methods, since, as the old saying goes, 'a picture is worth a thousand words.'

"Also — and this is a normal reaction — people are fascinated at being able to see through a mass of metal or a 'glob' of propellant, especially if they can see a defect!"

Johnson summed up his faith in nondestructive testing by stating: "In my opinion, the future of NDT here at MILA is tremendous. I can foresee the day in the near future when NASA and its contractors will be using NDT, especially radiography, as an everyday operational check of the Gemini and Apollo spacecraft."

Marshall Launch Support Group Will Soon Begin Move To Cape

Moving of a John F. Kennedy Space Center launch support technical group which had been temporarily assigned to the Marshall Space Flight Center, Huntsville, Ala., to Cape Kennedy will begin soon, it was announced by NASA Hq., November 27.

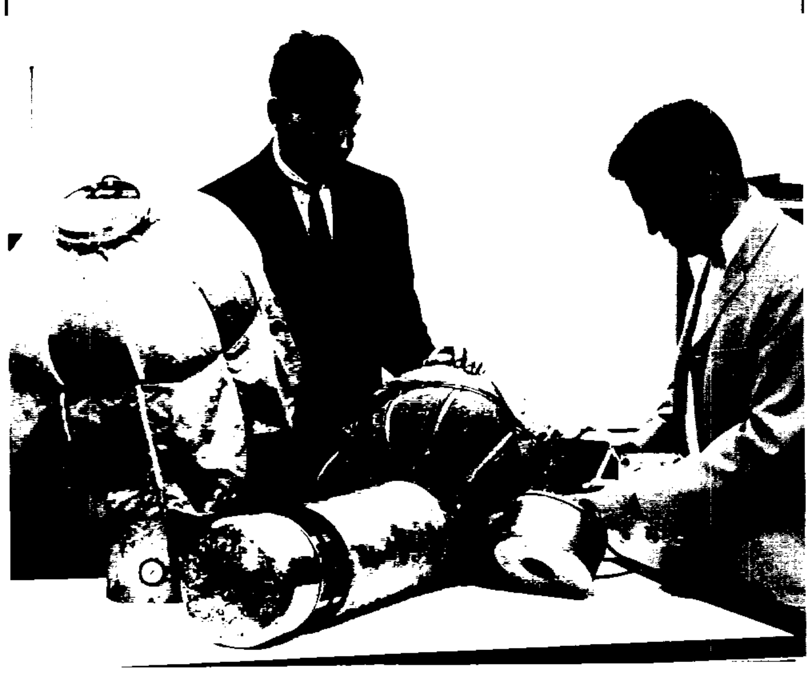
Dr. George E. Mueller, NASA associate administrator for Manned Space Flight, said about 100 of the 140 personnel in the KSC Launch Support Equipment Engineering Division would move from Marshall to KSC between now and August 1965.

"A point has been reached where much of the original design of launch support equipment has been completed and the equipment will be installed in Apollo launch and checkout facilities on Merritt Island," said Dr. Mueller. "As planned more than two years ago when the KSC was established as a NASA center, the launch support equipment group will move with the equipment in order to supervise and direct its installation and checkout at the Kennedy Space Center."

The 40 persons remaining at Marshall will support testing and modification of Saturn V launch support equipment still under development or fabrication.

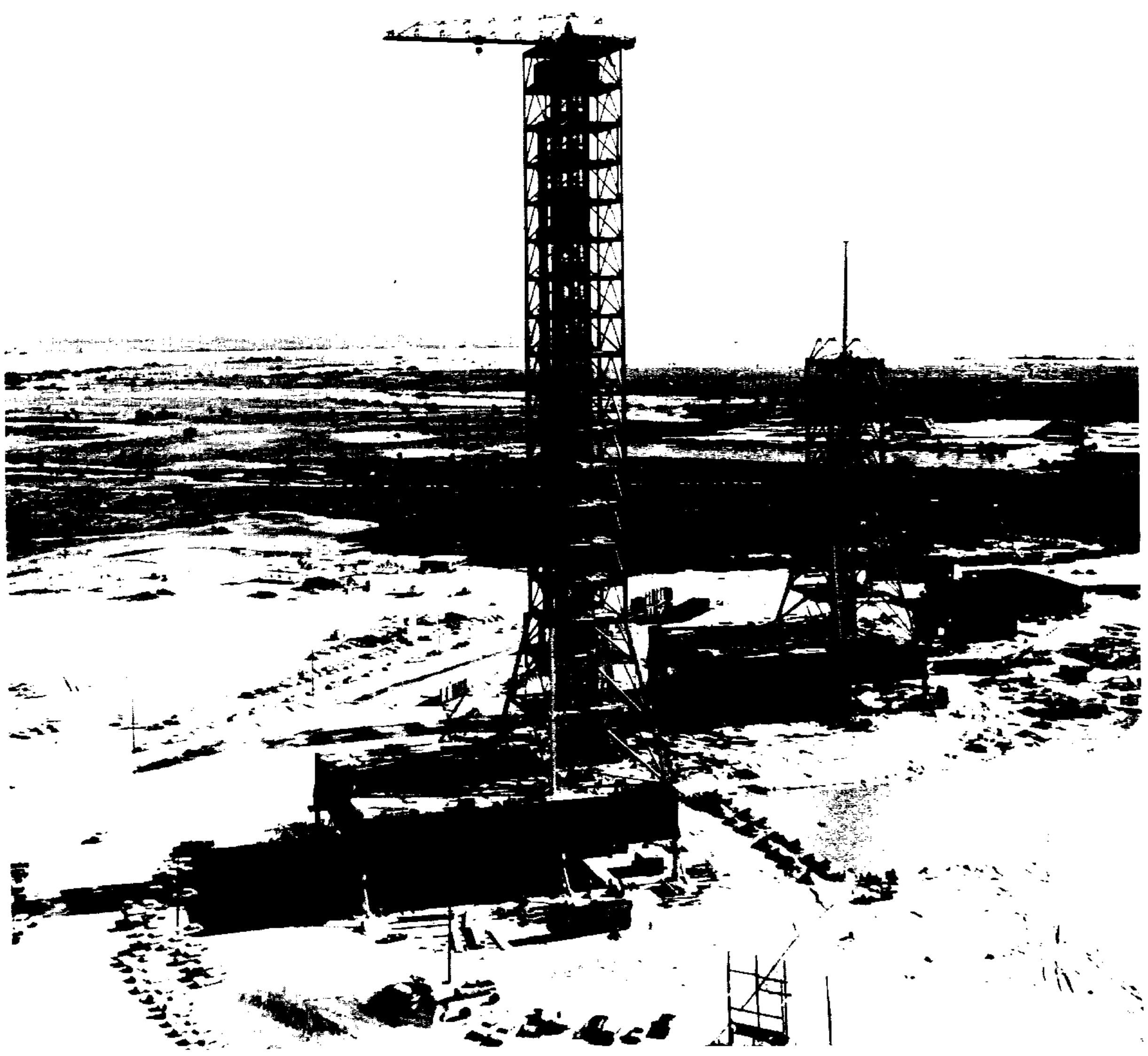
T. A. Poppel is head of the Kennedy Space Center Launch Support Equipment Engineering Division. The equipment for which his division is responsible includes the 440-foot mobile launch platform and the crawler-transporters to be used in Saturn V launches.

Two SA-7 Cameras Found



ROCKET CAMERAS RECOVERED—Two barnacle-encrusted camera capsules, shown above being inspected by Marshall employees, were recovered after seven weeks adrift in the Atlantic. Color film from the two camera capsules was in perfect condition. The cameras photographed the vital rocket functions during the launch of a Saturn-Apollo (SA-7) flight on September 18 from Cape Kennedy. Hurricane Ethel caused the search for eight capsules carried on the flight to be abandoned. The "paraballoons" on top of the capsules aided deceleration and kept them afloat.

Saturn V Launch Umbilical Towers Take Shape



LAUNCH TOWERS—The giant size launch umbilical towers (LUT) which will be used to transport the Saturn V vehicle to the launch pad from the Vertical Assembly Building for the Apollo moon shot from Launch Complex 39 on Florida's Merritt Island, are shown in a recent photo. The 440-foot mobile launch platform in the foreground and the one starting up in the background will be transported by a giant crawler-transporter which is billed as the largest land vehicle in the world. The transporter, LUT, and Saturn V combined, will weigh about 14-million pounds.

MSC Officials Get Apollo Control Panel Briefing

APOLLO CONTROL PANEL—Dr. Robert R. Gilruth, director of the Manned Spacecraft Center, examines the control panel of the guidance and navigation system of the Apollo spacecraft along with Dr. Joseph F. Shea, manager, Apollo Spacecraft Program Office. Dr. Gilruth visited General Motors AC Spark Plug Division at Milwaukee recently, and was briefed on the progress of the G and N plan. Others in the photo are (l. to r.) Hugh Brady, AC Apollo Program manager; Thomas Markley, chief, MSC Apollo Program Control Division; Harold Mueller, AC superintendent of Manufacturing; and Dr. Robert C. Duncan, chief of MSC Guidance and Control Division.

MSC's Electron Microprobe Analyzer—

Instrument Shows, Tells All About Rocks

An instrument that can analyze rock samples smaller than a grain of sand began operation in the geological laboratory at the Manned Spacecraft Center recently.

The electron microprobe analyzer can produce a television picture of thin samples of rock one micron or a millionth of a millimeter on a side. At the same time, it can make a chemical analysis of the rock without dissolving or destroying it.

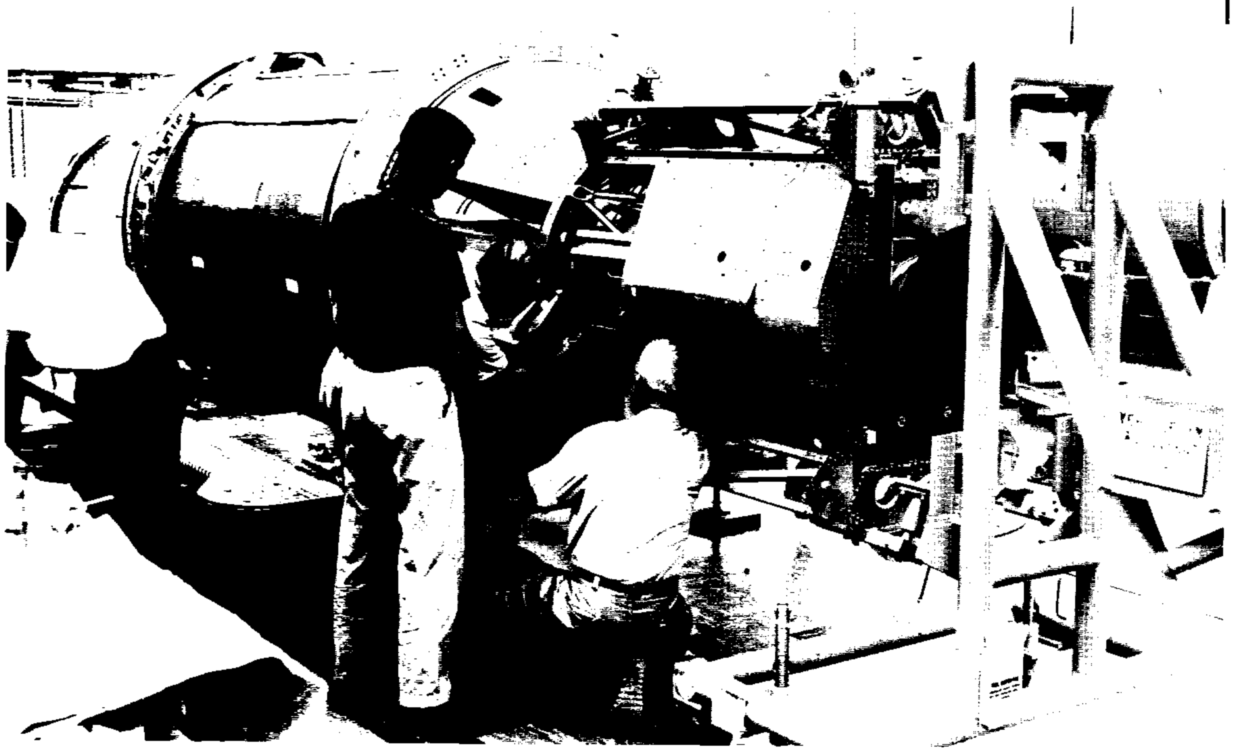
Meteorites, tektites, and other rocks which may be similar to those found on the surface of the moon, will be analyzed by the microprobe. Using the probe, MSC geologists and astronauts will be able to determine the chemical composition, origin, and history of a rock.

It will also be used to study the possible contamination of lunar rock by the exhaust of the descent engine of the Lunar Excursion Module which will carry two astronauts to a first landing on the lunar surface.

A combination of electron microscope and X-ray spectrograph, the probe has a magnification of 2400 X. It supplies an image of the rock sample to two TV tubes. Geologists can then examine the sample and photograph it with an attached Polaroid camera.

One of the primary uses of geology laboratory equipment is in training astronauts. Many of the instruments in the laboratory have been proposed as scientific equipment which astronauts would carry in more compact versions to the surface of the moon.

Agena Vehicle For First Space Rendezvous



GEMINI MANNED RENDEZVOUS FLIGHT HARDWARE—Gemini Agena, shown here, will be one-half of man's first joining together of two vehicles on space orbit. The Agena will supply the major part of the rocket power and maneuvering capability for the Gemini man-in-space program. It will join with the Gemini spacecraft, containing two astronauts. After hookup of the two vehicles, the combined craft will conduct various space maneuvers. This Air Force Agena, built by Lockheed Missiles and Space Co. here, is the actual vehicle which will attempt to make the first space rendezvous. The new engine, capable of starting and stopping many times in space, is already installed, as is the control system, capable of handling 96 commands from the astronauts or ground stations.

Space News ROUNDUP

SECOND FRONT PAGE

Army Helicopter To Airlift Oversize Space-Age Cargo

How do you transport a cargo that is too tall and wide for a railroad or truck, and too big for any cargo aircraft?

Last week a U. S. Army helicopter began tests in Tulsa, Okla., to determine the best way to handle a space-age cargo that fits this description.

The cargo is a mock-up of the adapter section—or casing—which will house the Lunar Excursion Module (LEM) aboard NASA's giant Saturn V launch vehicle during the first phase of America's manned flights to the moon. It is manufactured by North American Aviation, Inc., in Tulsa, for NASA.

Part of the Apollo spacecraft, the metal adapter section is 28 feet long, with a diameter of 13 feet at one end, and nearly 22 feet at the other. With its helicopter transportation gear, it weighs about 4,700 pounds.

The load will be lifted by an Army CH-47A (Chinook) helicopter using a 25-foot cable. Because the adapter section is cone-shaped like an airfoil, it will trail below and behind the rotorcraft, narrow end forward, providing its own lift.

Two helicopter crews, provided by the Army's Transportation Corps, and a ground crew from North American, will train for two days at Tulsa International Airport with the outsize cargo. They will fly between 1,000 and 2,000 feet at speeds between 90 and 105 miles an hour.

If first-phase testing is successful, the Chinook will tow the LEM adapter mock-up to Cape Kennedy, Fla.

The first production model LEM adapter section is scheduled to be transported by the Army from Tulsa to NASA's Marshall Space Flight Center, Huntsville, Ala., for ground testing in early 1965.

177 Quality Increases Given MSC Employees, 933 In All Of NASA

NASA Headquarters announced recently that in fiscal year 1964, 933 employees of this agency had received recognition for exceeding expected work standards.

This recognition came in the form of a Quality Salary Increase which advances an employee one step within his grade. At the Manned Spacecraft Center, 177 employees received Quality Increases during FY 1964.

Saturn's 'Eight-Wheel' Brakes

SATURN'S ROCKET BRAKES—A technician (lower left) works beneath solid propulsion retrorockets—two of eight that provide the "brakes" for the Saturn/Apollo moon rocket booster (S-IC stage). Two of the rockets are installed in each of the shrouds which surround the outboard F-1 engines at the base of the huge rocket. Inset photo shows location of the retrorockets. The eight units, mounted with nozzles upward, provide a total of 736,000 pounds of thrust for .64 seconds to aid in separation of the S-IC and S-II stages and avoid a collision of the two units.