Space News ROUNDUP!

VOL. 4 NO. 5 MANNED SPACECRAFT CENTER, HOUSTON, TEXAS DECEMBER 23, 1964

Season's Greetings

As the year 1964 is about to be consigned to history, I would like to extend my warmest wishes for the coming Holiday season to the more than 4,000 employees of the Manned Spacecraft Center and their families.

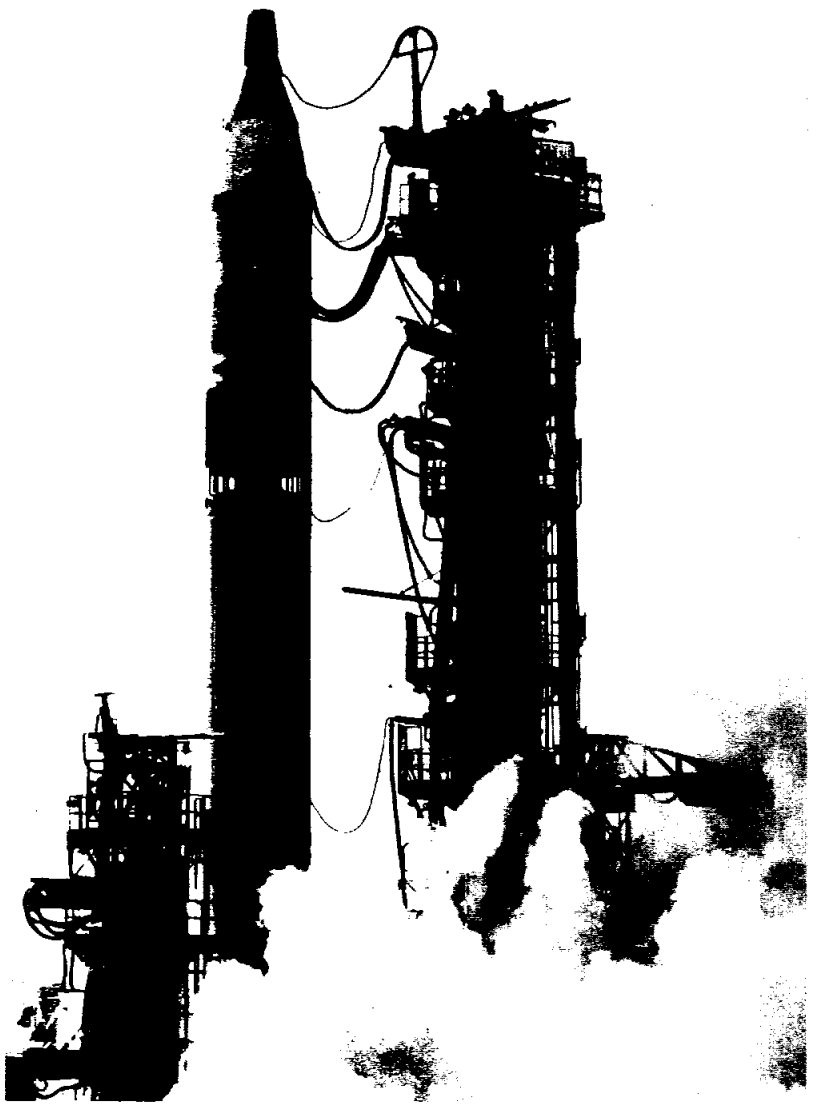
The past year has witnessed the near completion and the occupancy of our beautiful Center, along with test flights that have helped to verify the launch vehicles and spacecraft for the Gemini and Apollo programs. We have made significant accomplishments in both these programs and look forward to even greater progress in the coming year.

To each member of the team go my personal thanks for contributions made in the past. With your continued support and dedication to the achievement of our objectives, we will make far greater advancements in 1965.

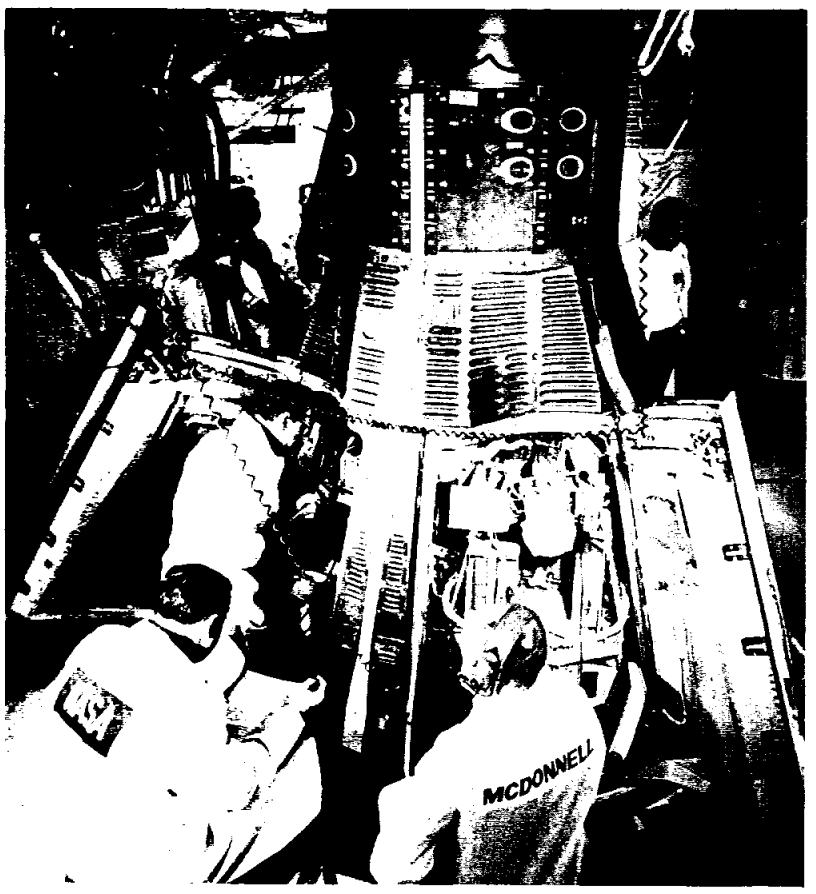
Robert R. Gilruth

ROBERT R. GILRUTH
Director

Titan Shut Down Postpones GT-2 Flight 'Til Early 1965



IGNITION/CUTOFF—The Gemini Titan-2 is shown on Pad 19 at Cape Kennedy at 11:41 a.m., December 9, just instants after the engines cutoff due to a malfunction in the booster's hydraulic system. Cutoff was just slightly over one second after ignition.



FINAL CHECK—Engineers in the white room are shown as they made final checks of the Gemini spacecraft systems on the morning of the scheduled launch of the GT-2 mission. All systems were go.

The launch of the unmanned Gemini spacecraft, December 9, at Cape Kennedy was postponed until early next year when the Titan II booster engines shut down slightly more than one second after ignition.

A loss of hydraulic pressure developed affecting the primary control system, when the flange on a servo valve cracked in two places. This in turn caused the Titan engines to automatically shut down.

Engineers are investigating the possibility of replacing the eight servo valves on the Titan's primary guidance system, using a heavier and stronger forging.

The servo valve with an actuator is operated with hydraulic fluid under 3,000 psi pressure and controls the gimballing of the thrust chambers.

The shut down caused only minimal damage to the booster.

Christopher C. Kraft Jr., GT-2 operations director, said shortly after the postponement, "although today's events resulted in a delay, they will undoubtedly prove helpful in qualification of the booster and spacecraft's systems for manned Gemini flights."

The flight was to have been a suborbital flight lasting some 20 minutes and reaching an altitude of 106 miles and traveling approximately 2,150 miles downrange from Cape Kennedy.

Object of the flight, which will remain the same on the rescheduled flight, will be to test the spacecraft under maximum reentry heating conditions by ramming the Gemini spacecraft back through the atmosphere at over 16,000 miles per hour. At the same time onboard systems will be tested during the flight which will qualify the spacecraft and launch vehicle for the two-man orbital flight.

The postponement of the Gemini-Titan Two was preceded early on the morning of December 9 by a two hour delay in starting the countdown for the flight. There was no connection between the postponement and the difficulty encountered at that time.

Cause of the two-hour delay was the flow meter on the propellant line leading to the second stage of the launch vehicle when it went out of calibration. The situation was corrected by using the flow meter for the first stage propellant lines.

This delay was encountered before the launch countdown was scheduled to begin at 2 a.m., thus moving the launch time from 9 a.m. to 11 a.m. The actual time of ignition was 11:41 a.m. EST, as a result of short holds during the countdown.

FINAL LOCK-UP—An engineer performs the final lock-up of the Gemini spacecraft two in the white room on Pad 19, using a torque wrench to secure the hatch on the morning of the scheduled launch.

SIMULATED RECOVERY—Recovery forces from the U.S. Navy and Air Force located in the downrange recovery area for the GT-2 mission searched out and recovered a Gemini boilerplate in exercises on December 5 in preparation for the real exercise. Here three members of an underwater demolition team from the U.S. Naval Amphibious Base at Little Creek, Va., are shown as the spacecraft with flotation collar attached, is readied for lifting it aboard the aircraft carrier Intrepid. Waves were running eight to 12 feet high during the exercise.

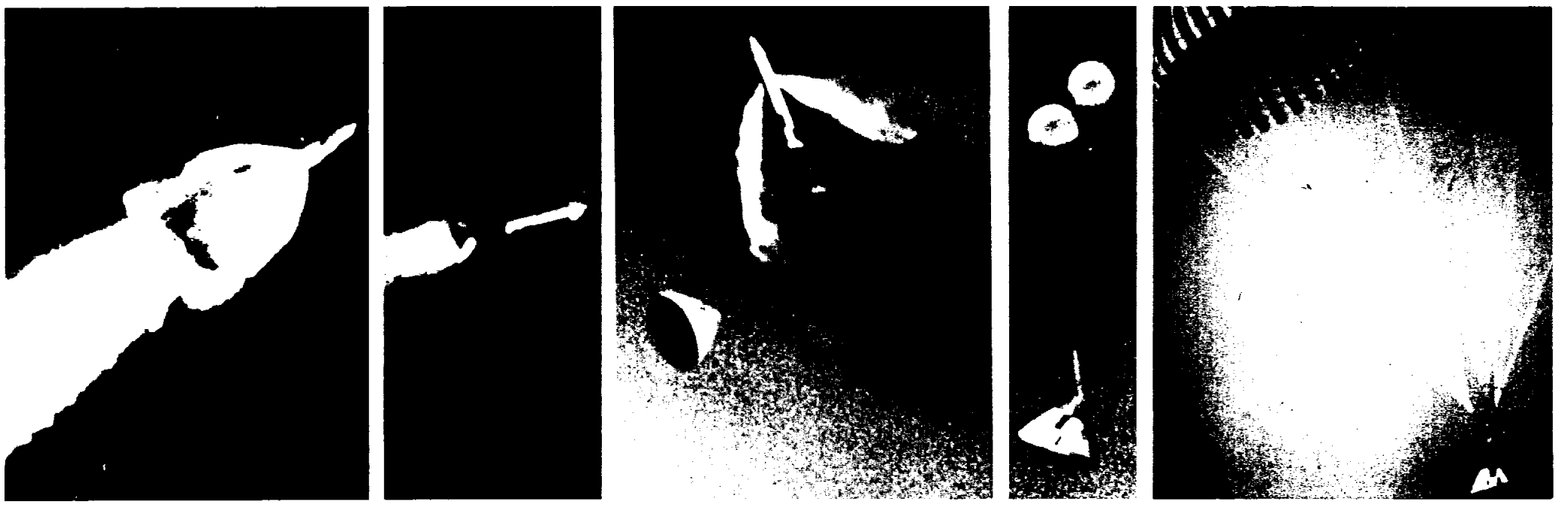
Cape Kennedy Has Busy Week

The week of December 7 was one of the busiest launch periods ever experienced by Cape Kennedy.

On December 8, the Air Force successfully launched their Project ASSET research re-entry glider on a night flight downrange. A Thor booster propelled the 1200 pound research vehicle downrange some 840 miles.

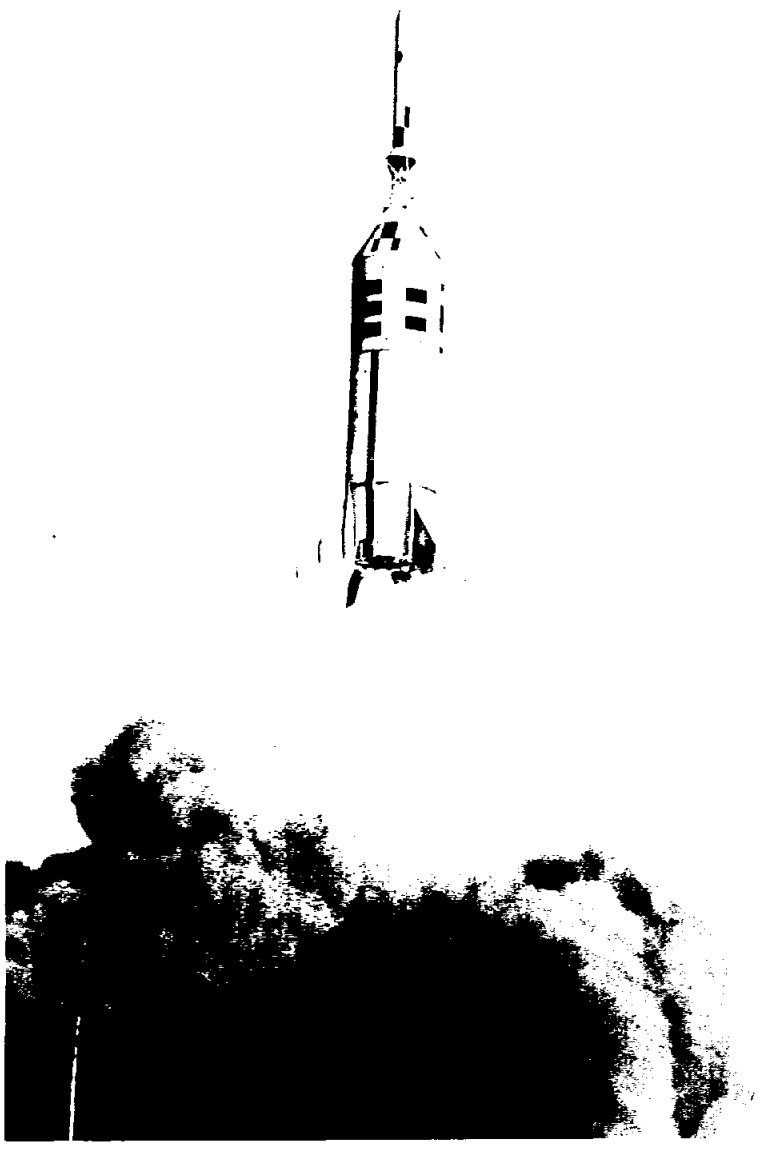
An attempted Gemini-Titan launch took place on December 9, and on December 10, an Air Force Titan-3A rocket placed a 3750 pound satellite into earth orbit.

Then on December 11 an Atlas-Centaur placed a 2100 pound test satellite into earth orbit. This is the vehicle that is scheduled to land a Surveyor spacecraft on the moon next year.



SEQUENCE OF EVENTS DURING BP-23 FLIGHT—The above sequence of events took place as the Little Joe II launch vehicle boosted the Apollo boilerplate 23 and launch escape system over 40,000 feet above the White Sands Missile Range in New Mexico. The photos (left to right) show: (1) separation of the Apollo BP-23 and launch escape system from the Little Joe II launch vehicle; (2) canards extended at turnaround; (3) escape tower jettison; (4) dual drogue parachutes deployed; and (5) main parachutes deployed.

Apollo Launch Escape System Performs As Programed



LJ-II/BP-23 LIFTOFF—At one-half second after 8 a.m., MST, on December 8, the Little Joe II vehicle launched the Apollo boilerplate-23 command and service modules, and launch escape system on a successful flight above the White Sands Missile Range in New Mexico.

The Apollo launch escape system passed another important test on December 8, at White Sands Missile Range in New Mexico, as it performed its necessary function under severe conditions.

Object of the flight of the Little Joe II vehicle and the Apollo boilerplate 23, topped by the escape system, was to demonstrate the satisfactory performance of the escape system during a catastrophic launch vehicle failure at the altitude the spacecraft is under maximum aerodynamic pressures.

The BP-23 flight was launched from Complex 36 at White Sands at 8 a.m. MST, with not a single hold being encountered during the countdown.

At 33.6 seconds after liftoff the pitch-up maneuver was radioed to the launch vehicle, the abort was initiated at T plus 36 seconds with the separation of the command module from the boilerplate service module and ignition of the launch escape and pitch control motors occurring simultaneously as planned.

The canards on the forward end of the jettison motor, deployed at 46.6 seconds after liftoff and effected the turn-around maneuver to turn the command module to the blunt-end-forward position to minimize command module descent oscillations.

At T plus 121.2 seconds the launch escape subsystem boost protective cover and the forward heat shield were successfully jettisoned by the jettison motor.

SAFE LANDING—The Apollo command module with the chutes still attached is shown a short time after landing, as recovery crews check the spacecraft prior to loading it onto a truck to transport it to the MSC-White Sands Operations which is located adjacent to White Sands Missile Range.

On this flight, dual drogue parachutes were used and they deployed at T plus 123.3 seconds. At T plus 160.4 seconds, at an altitude of about 11,000 feet the drogue chutes were released and three pilot chutes deployed. These, in turn, extracted the three main parachutes which successfully lowered the command module to the ground at T plus 443.4 seconds.

Previous successful tests of the Apollo launch escape system were conducted at the WSMR on Nov. 7, 1963, a pad abort simulation test; and May 13, 1964, a high dynamic pressure test.

The test on December 8, used a Little Joe II launch vehicle which produced approximately 340,000 pounds of thrust.

In this test the LES utilized canards—a pair of wings or fins—located near the top of the tower jettison motor, they caused the spacecraft to turn around and stabilize with the blunt end forward.

Another spacecraft subsystem flight tested for the first time was the boost protective cover which consisted of a shell contoured to fit the sloping section of the command module. It is designed to protect the docking mechanism from excessive heating during first stage boost and to protect the command module windows from soot and erosion caused by the launch escape motor. It also protects the thermal control paint on the ablative material. The boost protective cover was jettisoned with the LES.

Also, during this test, two spacecraft drogue parachutes were used instead of one as in

To Be Used By Astronauts, Technicians—

Apollo Systems Trainers Delivered

A series of trainers for teaching the nation's astronauts the intricacies of the Apollo lunar mission spacecraft were delivered to the NASA Manned Spacecraft Center early this month.

Called "Apollo Systems Trainers," the devices were designed and built by the Los Angeles Division of North American Aviation at a cost of $953,024 under terms of the basic Apollo spacecraft contract.

Three of five sections of the trainers were delivered in the first group and the remaining two sections will be delivered after Christmas. The three delivered sections are for the electrical power, stabilization control, and environmental control systems. Still to be delivered are the propulsion and sequential systems units.

Each section consists of two or more animated lighted-line schematic display panels which illustrate the circuitry in each system for normal operation and how malfunctions can be bypassed through redundant circuits.

Not only will Apollo flight crews receive training on the Systems Trainers, but technicians and maintenance personnel will also be trained for actual spacecraft hardware operation and check-out. Moreover, the trainers will provide information on all spacecraft systems changes and how they affect operation, maintenance and check-out by support groups.

Two Holidays Coming Up!

The next two Fridays are legal holidays, Christmas and New Years respectively, and all offices here at the Manned Spacecraft Center will be closed.

Employees will be excused from duty without charge to leave or loss of pay except those having duties considered essential for operations.

Center employees required to work on the holiday are to be notified as far in advance as possible by supervisors.

Rocketdyne Engines Provided

ALTITUDE TEST FACILITY—Lunar Excursion Module (LEM) engine being developed by Rocketdyne, a division of North American Aviation, Inc. is ground tested in this facility at Nevada Field Laboratory. One of largest vacuum test structures in U.S., facility is capable of simulating pressures encountered at altitude of 150,000 ft. Facility stretches 260 feet across high plateau overlooking Nevada desert.

A slender, white missile rose slowly upward and disappeared into a cloud-spotted nighttime sky.

Seemingly endless minutes later, a nation and the world responded in January, 1958, to the awaited news that America's first satellite, Explorer I, had been placed in orbit.

Less than four years later, even that event was to be overshadowed by the flight of Astronaut Alan B. Shepard Jr., streaking downrange from Cape Kennedy in the first of the Mercury spacecraft.

A participant in both of those flights was Rocketdyne, a division of North American Aviation, Inc. Its A-7 rocket engines, which launched the two flights, have since been joined by other Rocketdyne engines in providing liftoff thrust for more than 225 U. S. space launchings, including those of Mercury-Atlas.

Today, the division is at work on additional propulsion systems for manned flight at both ends of the thrust spectrum, ranging from the nation's most powerful, the 1,500,000 pounds-thrust F-1, to 25 pounds-thrust engines—and smaller.

Centered at Canoga Park, Calif., Rocketdyne is designing, developing and manufacturing engines and components for the Saturn family of launch vehicles, for both battlefield and air-launched missiles and for the experimental program leading to a flyable nuclear rocket engine.

Anticipating specialized requirements for propulsion in the low-thrust range, Rocketdyne formed its Spacecraft Engine division in March, 1961. Located in a separate plant at Van Nuys, Calif., SED's 2100 employees are designing and developing three systems for Manned Spacecraft Center primes—attitude control systems for the Gemini and Apollo spacecraft and a deep-throttling descent engine for the Lunar Excursion Module.

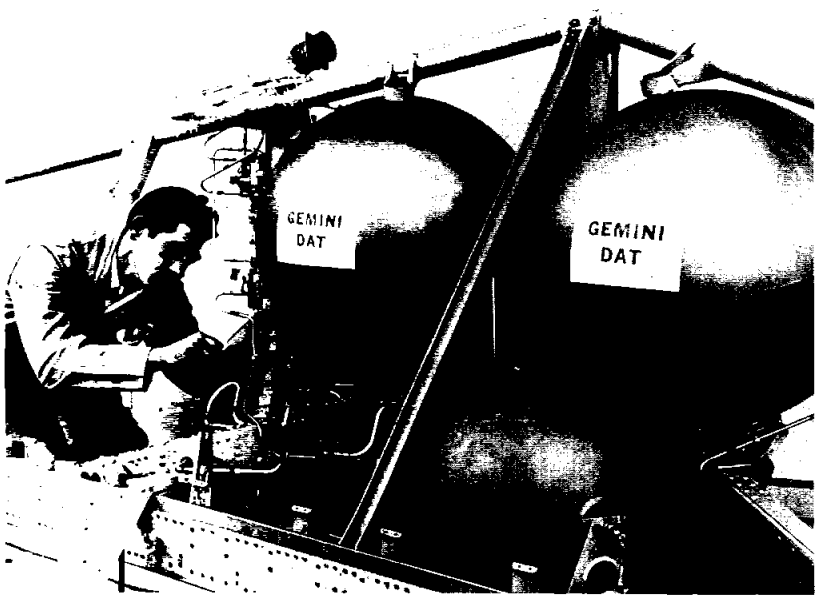
For Gemini, two propulsion systems are being designed, developed and produced under subcontract to the McDonnell Aircraft Corporation.

One is the OAMS (orbital attitude and maneuvering system), installed in the adapter between the spacecraft and the launch vehicle. It is composed of positive-expulsion propellant tanks, a pressurizing system and 16 engines ranging in thrust from 25 to 100 pounds.

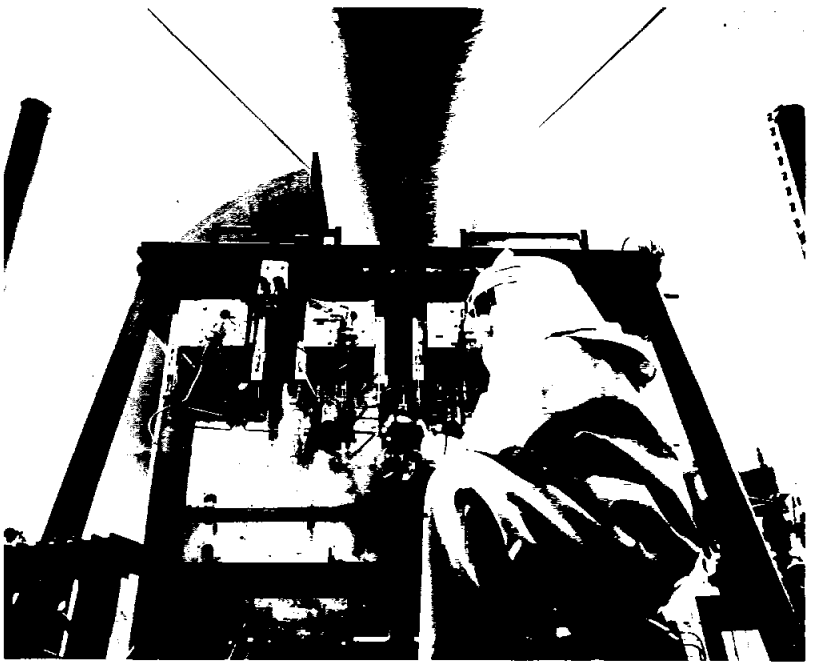
The second is the RCS (reentry control system), two of which are installed in the spacecraft itself. Each system operates independently and consists of eight 25 pounds-thrust engines and their associated equipment (positive-expulsion propellant tanks and pressurizing system). One set acts as a back-up system to the other.

For the Apollo Command Module, Rocketdyne is producing 91-pound-thrust rocket engines, which are used in two sets

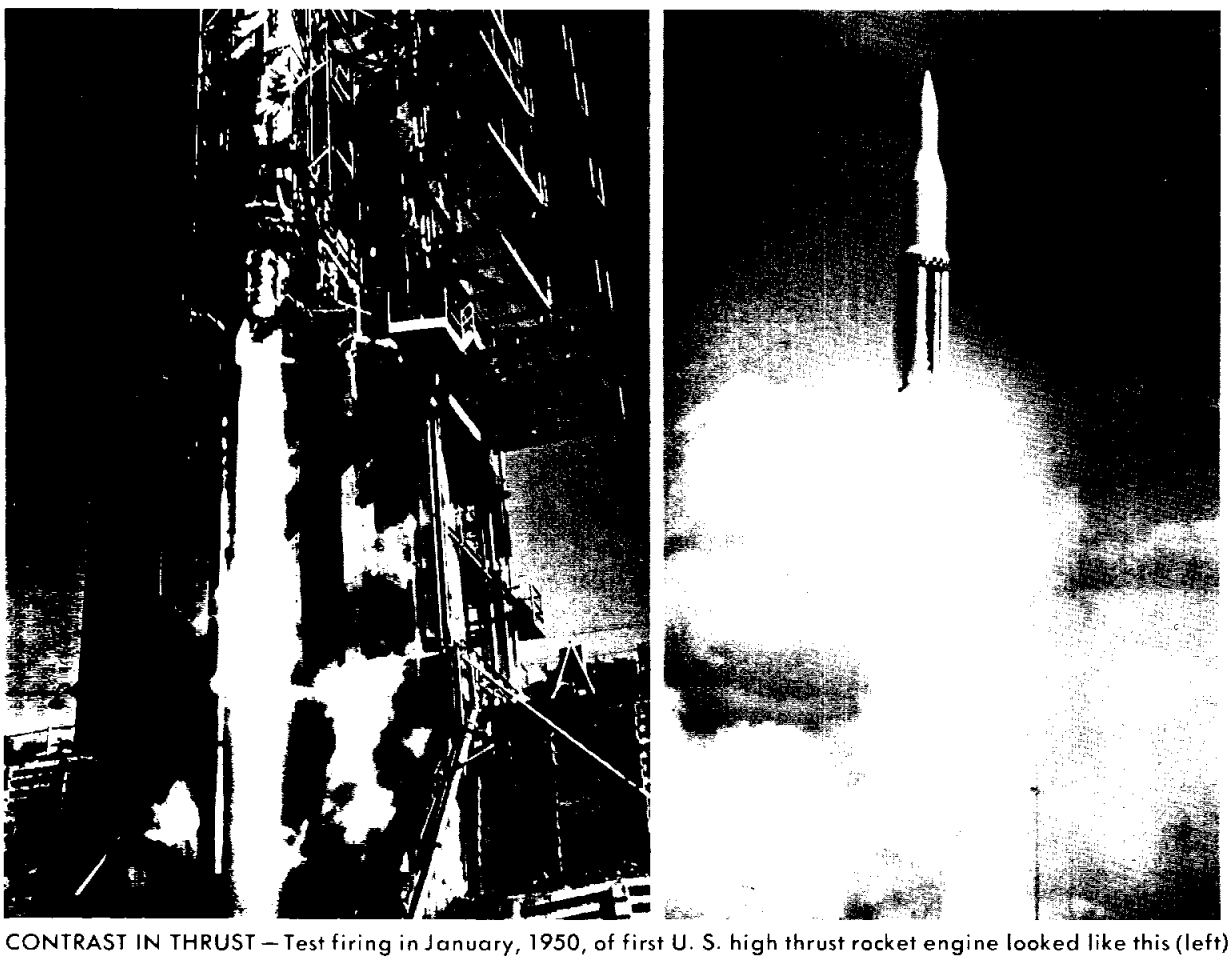
SAMUEL K. HOFFMAN
President
Rocketdyne



GEMINI OAMS—Positive expulsion tanks that are part of orbital attitude and maneuver propulsion system for Gemini are prepared for shipment to Manned Spacecraft Center where vibration test series was completed earlier this year. System is installed in spacecraft adapter, and includes 16 engines ranging in thrust from 25 to 100 pounds.



GEMINI ENGINE TESTING—Small spacecraft engines used in systems for attitude control and maneuvering of NASA Gemini spacecraft during orbital flight and re-entry are tested in this altitude simulation facility near Reno at Nevada Field Laboratory of Rocketdyne, a division of North American Aviation, Inc. Test engineers sample propellant for purity prior to test firing.



CONTRAST IN THRUST—Test firing in January, 1950, of first U. S. high thrust rocket engine looked like this (left) at Santa Susana Field Laboratory of Rocketdyne, a division of North American Aviation, Inc. Engine produced 75,000 pounds of thrust, later launched first U. S. satellite and first manned Mercury spacecraft. Sharp contrast with early engine is drawn by flight of huge Saturn I vehicle (right) being thrust upward by eight Rocketdyne H-1 engines developing 1,500,000 pounds of thrust.

ROCKETDYNE HEADQUARTERS—Headquarters and main plant of Rocketc Park, Calif. Other plants are located at Van Nuys, Calif., for design, d engines; at Neosho, Mo., in support of liquid rocket engine production, ar ment and production of solid propellant rockets.

MSC ANNUAL CHRISTMAS DANCE—This panoramic view of the dance floor at the annual Christmas Dance for Manned Spacecraft Center employees was typical of the enjoyable evening.

EAA OFFICERS—Members of the executive board of the MSC Employees Activities Association were introduced to the Christmas dance crowd by Phil Hamburger at the microphone and George Low (right center), deputy director, MSC, presented the outgoing board members with gifts. Shown (l. to r.) are Claude Ingels, treasurer; Mervin Hughes, chairman of Arts and Crafts; Phoncille DeVore, chairman of the Promotion Committee; Abner Askew, vice president; Mary Sylvia, chairman of Social Committee; Hamburger; Low; and outgoing board members David Bell, chairman of Building, Grounds, and Safety Committee; Joe McMann, chairman of Children's Committee (and he's a bachelor); Ragan Edmiston, chairman of Activities Committee; and Al Ligrani, president.

Capacity Crowd Attends Annual Christmas Dance

Nearly 800 people were in attendance at the Sylvan Beach Pavilion in LaPorte for the Annual MSC Christmas Dance the evening of December 11.

The affair was a sellout with tickets all being sold a week before the dance. Music was furnished by Nick Navarro's orchestra and the dance floor didn't lack for dancers the whole evening.

Among the MSC employees attending and having an enjoyable time were George M. Low, Paul E. Purser, Wesley L. Hjornevik, J. W. Ould and their wives. Special guests included Judge Bill West from LaPorte, and R. H. Voigt from the NASA Regional Audit Office.

Door prizes were presented during the evening to three lucky ticket holders. The prizes were a Virginia ham, a basket of imported foods and liqueurs, and a basket of cheeses and assorted bottles of liquor.

The dance was sponsored by the MSC Employees Activities Association with the coordination of all the details being handled by Mary Sylvia.

During one of the intermissions in the evening, the officers of the EAA were recognized and gifts were presented to the outgoing officers by George M. Low, deputy director of MSC.

Safety Office Urges MSC Employees To Heed Holiday Season Hazards

Employees of the Manned Spacecraft Center are reminded by the Safety Officer here at the Center, that the coming holiday, being the most joyous season during the entire year, can also be the most tragic if we are heedless of the many potential dangers and hazards.

You are advised by the Safety Office when in your automobile to abide by the "Golden Rule" and practice good "defensive driving" habits, and don't drive while drinking holiday cheer. To be extra careful when handling firearms, and don't suffer from overexposure to the elements.

Know and abide by fire safety rules. Do not use flamable decorations, place natural trees in water away from heat, do not block exits, check tree lights thoroughly, do not use electric lights on metal trees, turn off lights before retiring or leaving home, don't allow smoking near the tree or amid wrappings, and keep matches, lighters, candles, medicines, etc. out of the reach of small children.

Have a fire emergency plan for evacuation and notification of the fire department, and above all have an enjoyable holiday season and a happy return to work in 1965.

Photo Club Holds First Field Trip

The Photo Club at MSC held its first field trip on the night of November 30 for a picture taking session in downtown Houston.

The results were judged at the December 17 meeting. Other field trips are being planned. The club meets the first and third Thursdays of each month. Persons interested in joining the club may contact Brian Morris at Ext. 5302, or Ken Cashion at Ext. 7673.

Bridge Club Holds Master Point Game, Winners Announced

On Tuesday, December 15, the MSC Duplicate Bridge Club held the first of its Charity Master Point Games sanctioned by the American Contract Bridge League.

Ten and a half tables were in play. First place North-South went to Edith and Richard Reid, and second to Paul Swanzy and Ray Lynch. First place East-West winners were Caroline Fitzgerald and Muncy McKinney; second, Max Cone and John Stanfield.

Results of previous games: December 1 Master Point winners North-South were Tom Moore and Leona Kempainen; East-West, Howard Ates and Richard Baldwin. Second place winners North-South were Marilyn and Larry Gallagher and East-West, Tom Holt and Merle Schwartz.

Winners of the December 8 rating point game were Paul Swanzy and Ray Lynch, first, and Barbara Robinson and Evelyn Huvar, second.

Games are held every Tuesday at 7:30 p.m. at the Non-Commissioned Officers Club at Ellington. Shortly after the first of the year, the Club will announce its schedule of master point games and special events for 1965.

MSC BOWLING ROUNDUP

MSC MIXED LEAGUE
Standings as of Dec. 14

TEAM	WON	LOST
Celestials	42	14
Virginians	34	22
Alley Cats	34	22
Eight Balls	30	26
Dusters	30	26
Falcons	26	30
Play Mates	26	30
Chugg-a-Luggs	25	31
Shakers	25	31
Gutter Nuts	25	31
Hawks	24	32
Goofballs	19	37
Big O's	21	27
Easy Four	21	27
Seven-Ups	20½	27½
Hurricanes	14	34

High Game Women: Barnes 225, Taylor, Morris 174, Gassett 165.

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

High Series Women: Morris 452, Barnes 541, Gassett 450.

High Series Men: Sargent 580, Spivey 574, Morris 570.

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

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

NASA 5 O'CLOCK MON.
Standings as of Dec. 14

TEAM	WON	LOST
Suppliers	35	17
Foul Five	32	20
Computers	26	26
Sombreros	24	28
Hot Shots	23	29
Alley Gators	16	36

High Game: W. Kutalek 244, M. Cohn 230, H. Erickson 224.

High Series: E. R. Walker 591, H. Walker 569, W. Stransky 563.

High Team Game: Computers 880, Foul Five 862, Suppliers 845.

High Team Series: Hot Shots 2326, Computers 2321, Foul Five 2306.

NASA MIXED LEAGUE
Cocoa Beach, Fla.
Standings as of Dec. 3

TEAM	WON	LOST
Sharpies	34	14
FABBS	32	16
Wayouts	25½	22½
Perigees	24	24

Christmas Gifts For Boys Harbor Provided By IESD

Some 60 boys from broken homes who now live at Boys Harbor in LaPorte, Tex., will have a somewhat happier Christmas this year due to the generosity of the members of the Instrumentation and Electronic Systems Division here at the Center.

Members of the division's four branches and two project groups raised over $200 which was used to buy enough sports equipment to fill the needs of the boys at the home who range in age from eight to 16 years.

International Students Would Like Invitations To Holiday Meals, etc.

A number of international students in the Houston area colleges and universities will not be able to be with their families during the Holiday Season and would welcome an invitation to be a guest in an American home especially on Christmas Eve, Day and New Year's Day.

These international students are now attending Baylor University College of Medicine, Methodist Hospital Nurses Program, M. D. Anderson Hospital, University of Houston, and Rice University.

If any families at MSC are interested in having a foreign student in for Christmas dinner or any other time during the Holiday Season, they may call Mary Sylvia at Ext. 3958, or Philip Hamburger at Ext. 2765, for further details and arrangements.

Nearly 400 Attend MSC/EAA Children's Christmas Party

The Christmas party for the children of MSC employees on December 12, was attended by nearly 400 children.

Sponsored by the Employees Activities Association, the party was considered a huge success and some of the adults had as good a time as the children.

Entertainment was furnished by a group of hard working clowns and a Santa Claus, with Bill Johnston of the Photo Division acting the latter part. The clowns, Phil Hamburger, Hal Hunt, Chris Christman, Ronnie Phillips and Al Layton, circulated among the crowd giving the children candy and balloons.

Gifts were exchanged by the children with Santa doing the honors. Refreshments furnished by the EAA were served to the children.

Liftoff Thrust For America's First Space Feats

of six each for re-entry control. This work is being performed for the Space and Information Systems Division of North American Aviation, Apollo prime contractor.

Like the Gemini systems, the Apollo engines utilize ablative thrust chambers and fast-acting propellant valves. They may be operated either in pulses, in which the engines are started and stopped many times a second, or in a steady thrust mode.

For LEM, a descent engine is being developed under subcontract to the Grumman Aircraft Engineering Corporation. The engine can be throttled from 10,500 pounds of thrust down to 1,050 using a unique method of gaseous injection.

Other SED programs include a system of engines to provide attitude control for the U. S. Air Force Titan III Transtage; the P-4 pressure-fed engine used in the KD2B-1 target drone and adaptable to small missiles; and the pump-fed AR (aircraft rocket) series to supply super-performance to manned aircraft such as the F-104 used for Air Force pilot training.

Rocketdyne's beginning dates back to the end of World War II in 1945 when North American Aviation, Inc., assigned a five-man team to study the feasibility of developing guided missiles for the United States. How best to propel such missiles was one of its major considerations.

A contract in April, 1946, to develop the Navaho ground-to-ground missile led to the subsequent development of the nation's first high thrust rocket engine. Out of this program, which was later cancelled in 1957, came not only the engines for that missile but also those for the Redstone, Jupiter, Thor, and Atlas ballistic missiles.

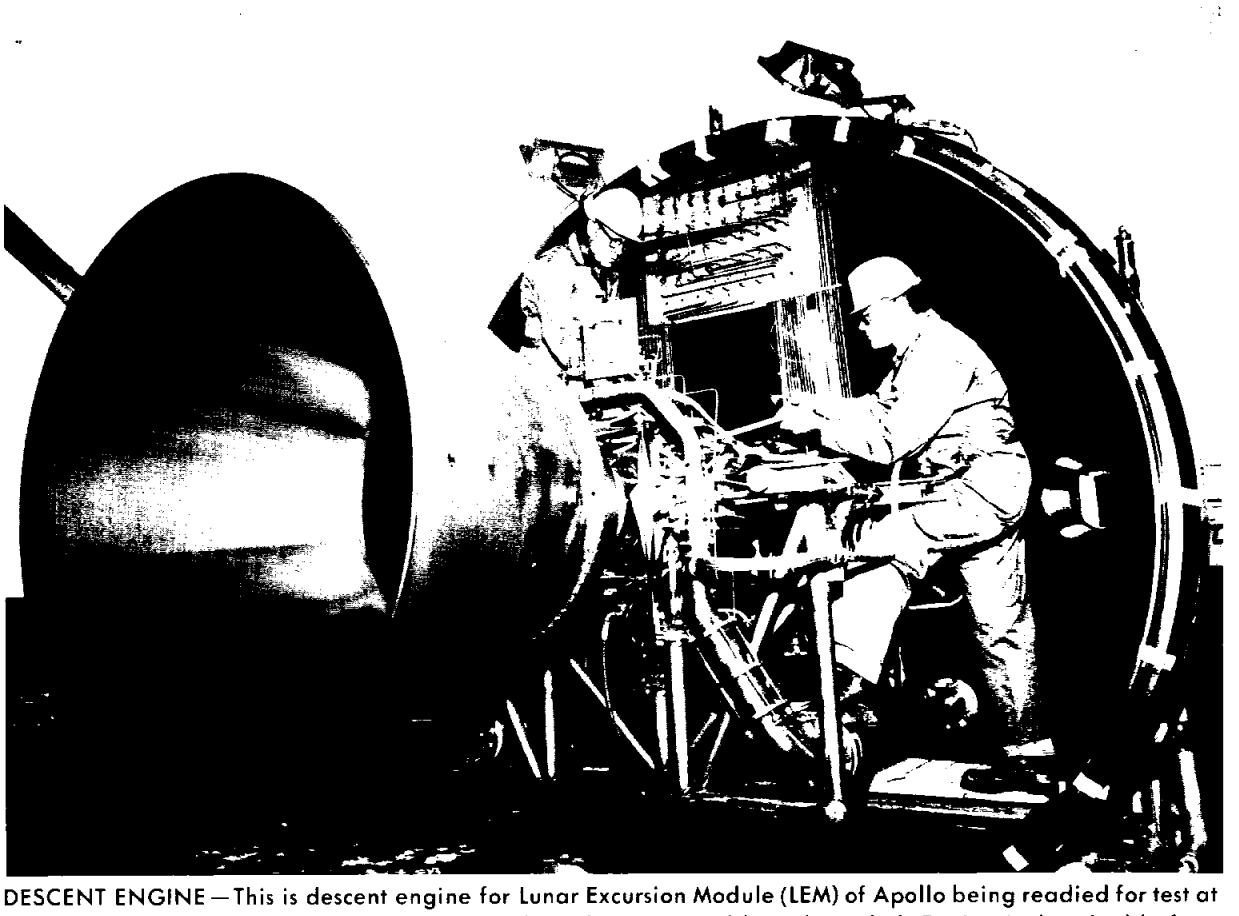
S. K. Hoffman, Rocketdyne president and one of America's foremost rocket engineers, joined the North American propulsion organization as its chief in November, 1949. His chief of design and development in that early organization was P. R. Vogt, now vice-president and general manager of the spacecraft engine activity.

Rocketdyne was established as a separate operating division in November, 1955. It currently utilizes nearly 3,000,000 square feet of floor space in support of six product operations: the Liquid Rocket division with its main plant at Canoga Park and a supporting plant at Neosho, Mo.; the Solid Rocket division centered at McGregor, Tex.; the Spacecraft Engine division at Van Nuys, Calif.; and Ordnance Engines, Nuclionics and Research at Canoga Park.

The Liquid Rocket division supported the Manned Spacecraft Center in the Mercury program with Redstone and Atlas propulsion systems.

Currently, LRD is developing and producing three engines —H-1, J-2 and F-1—for NASA's Marshall Space Flight Center, Huntsville, Ala. The 1,500,000 pound thrust F-1 and the 200,000 pound thrust hydrogen fueled J-2 will be used to power NASA's Saturn V, the vehicle that will launch the manned Apollo spacecraft to the moon.

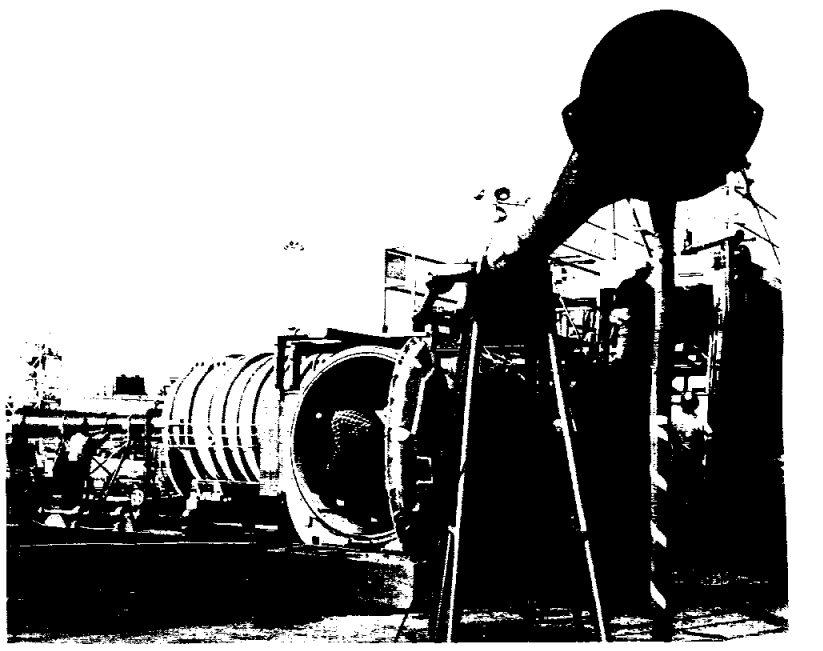
The 188,000 pound thrust H-1, eight of which provide 1,500,000 pounds of booster thrust for the Saturn I and IB, has powered all the seven successful launches to date of the Saturn I.



DESCENT ENGINE—This is descent engine for Lunar Excursion Module (LEM) of Apollo being readied for test at Rocketdyne's Nevada Field Laboratory. Long skirt of engine is ablatively cooled. Engine is throttleable from 10,500 pounds of thrust down to 1,050. Bulkhead, with engine, instrumentation and propellant lines mounted to it, moves forward on track to close vacuum chamber for altitude testing.

P. G. VOGT
Vice President and
General Manager,
Spacecraft Engine Division,
Rocketdyne

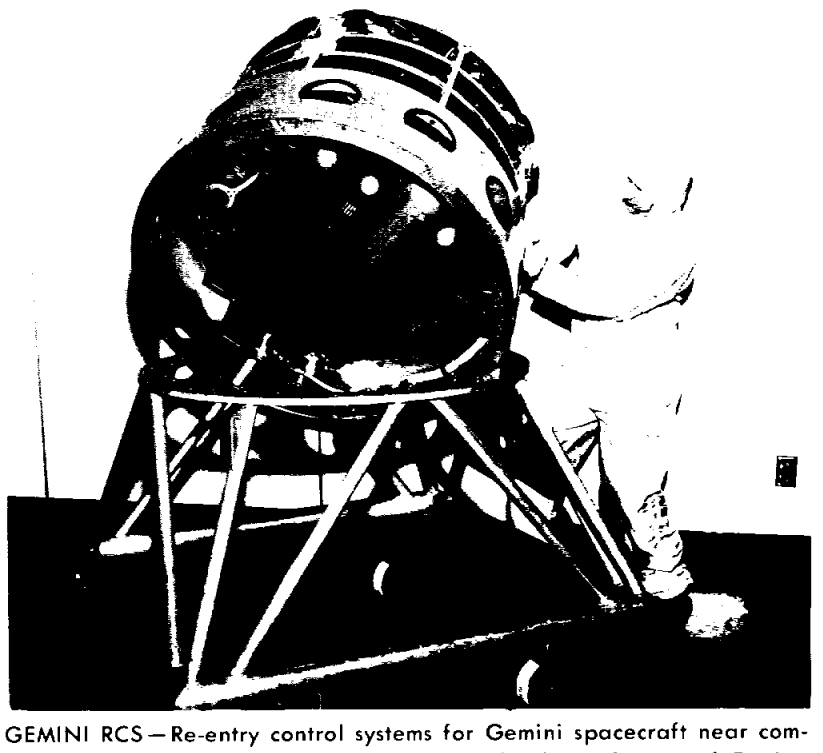
EDITOR'S NOTE: This is the thirty-seventh in a series of articles designed to acquaint MSC personnel with the Center's industrial family, the contractors who make MSC spacecraft, their launch vehicles and associated equipment. The material on these two pages was furnished by the Information Office of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



ALTITUDE TESTS—Space rocket engines can be tested individually in this altitude simulation chamber at the Santa Susana Field Laboratory of Rocketdyne. Chamber is capable of sustaining simulated altitude of 100,000 feet. Larger chambers are used for tests of full systems of engines for simulated mission duty cycles.

ıe is located in this complex at Canoga
elopment and production of spacecraft
at McGregor, Tex., for design, develop-

POSITIVE EXPULSION—Precise movement of propellants during orbital and re-entry operations of spacecraft engine system is assured by positive expulsion technique. Rocketdyne engineer watches movement of expulsion bladder through transparent covering during simulated development test.



GEMINI RCS—Re-entry control systems for Gemini spacecraft near completion for test series at Van Nuys plant of Rocketdyne's Spacecraft Engine division. Two systems are installed together like this in each spacecraft. Each system operates independently, consists of eight 25-pounds-thrust engines and their positive expulsion tanks, pressurizing system.

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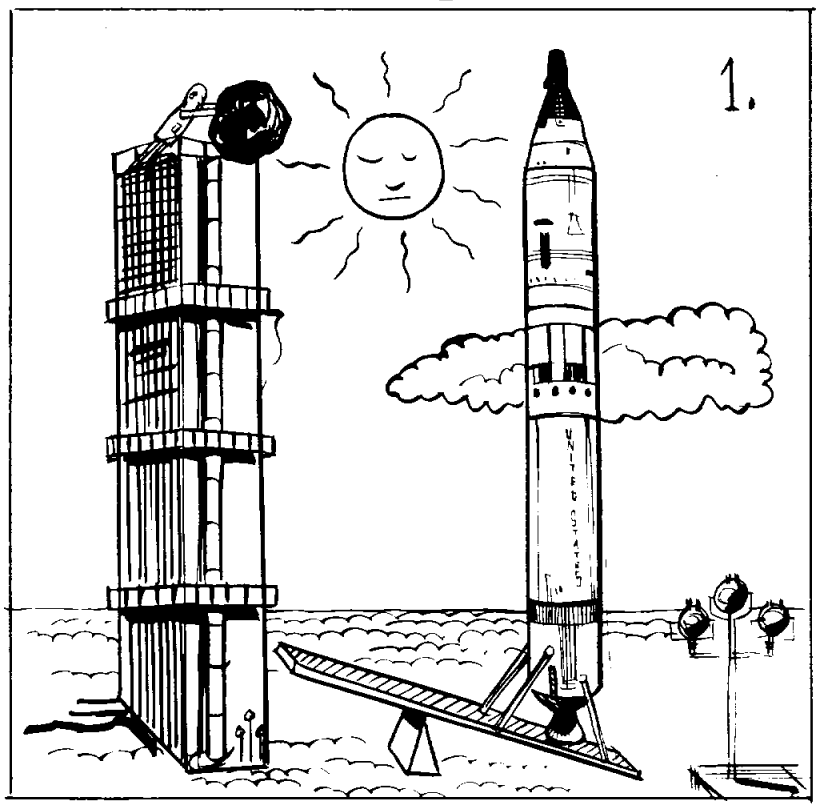
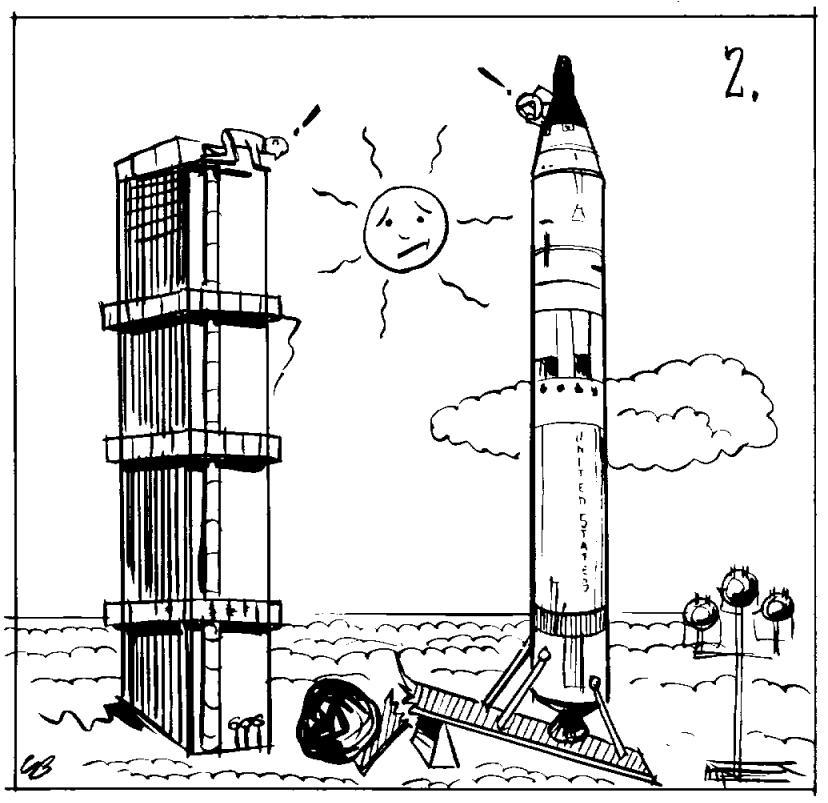
Staff Photographer . . . . . A. "Pat" Patnesky

On The Lighter Side





Space News Of Five Years Ago

Dec. 31, 1959—More than 100 drop tests of boilerplate Mercury spacecrafts had been completed from aircraft to test and develop the parachute system.

—The Mercury astronauts completed basic and theoretical studies of Project Mercury in their training program and began practical engineering studies. Shortly thereafter the astronauts began a practical training program involving egress training, methods of arresting rapid spacecraft motions, and familiarization with the weightless conditions of space flight.

During the month — A weightless training program was started by the Mercury astronauts in the F-100 aircraft at Edwards Air Force Base, Calif. Eating, drinking, and psychomotor tests were conducted while the astronauts were in a weightless state.

— The Space Task Group approved monitoring facilities proposed by the Stromberg-Carlson Division for the Mercury Control Center at Cape Canaveral and Bermuda.

—In the development of the Mercury spacecraft reaction control system, Bell Aircraft Corporation, started the preliminary flight rating test of the automatic subsystem.

At end of year 1959—NASA funds in support of Project Mercury had been obligated to the listed organizations as follows: Air Force Ballistic Missile Division, Atlas launch vehicles, $22,830,000; Army Ordnance Missile Command, Redstone launch vehicles, $16,060,000; and McDonnell Aircraft Corporation, Mercury spacecraft, $49,407,540.

Welcome Aboard

During the last reporting period, a total of 86 persons joined the Manned Spacecraft Center. Of these, six were assigned to MSC-Florida Operations, Merritt Island, Fla., one to St. Louis, Mo., and the remaining 55 here in Houston.

Center Medical Office: William L. Tomkins.

Public Affairs Office: Lindy B. Davis.

Logistics Division: Judy P. Hilliard.

Procurement and Contracts Division: William D. Drastata, Terrence C. Heil, John P. Kochner, Kenneth W. McCormick, Richard Regenburgh, David T. Riley, William A. Ritz, and Stephen P. Simmons.

Personnel Division: Jerry A. Lewis, and Emma Sustaita.

Resources Management Division: Clay C. Bailey, James W. Dunlap, Roger C. Henderson, Robert F. Root, Kenneth L. Schnell, Gerald D. Waddell, and Barbara A. Williams.

Security Division: Theodore C. Paulos.

Engineering Division: John C. Deloney.

Flight Crew Support Division: Roy A. Powell, David W. Scruggs, and Susan P. Shrader.

Crew Systems Division: George P. Armstrong Jr., and Gerard M. Burnett.

Computation and Analysis Division: William B. Bond, and Jerome H. Carney.

Instrumentation and Electronic Systems Division: Maurice E. Bowes Jr., and Alexander W. Pajak.

Propulsion and Power Division: Thomas L. Davies.

Structures and Mechanics Division: Howard D. Green.

Flight Control Division: Stephen G. Bales, George M. Bliss, Charles L. Dumis, Louis E. Mercier Jr., John A. Morian, and Quincy J. Vandervort.

Landing and Recovery Division: Frank J. Janoch III.

Mission Planning and Analysis Division: Charles E. Allday, Alexie M. Benney Jr., Dorothy C. Brown, and James P. Walker.

Flight Support Division: Otho C. Lindsey, James E. Mager, and Joseph S. Sobieski Jr.

Gemini Program Office: Ezra L. Elliott, Thomas P. Larkin, Hubert B. Maguire Jr. (St. Louis), and Melvin J. Medack.

MSC-Florida Operations (Merritt Island, Fla.): William E. Bennett, John M. Crockett, Richard H. Harris, Jimmy V. Hawley, Malcolm Minor, and Frederick F. Watson.

Apollo Spacecraft Program Office: Dorothy E. Newberry, Mary B. Nolin, Jones P. Seigler, and Ross R. Loomis.

Aircraft Operations Office: Richard D. Smith.

MSC PERSONALITY

Gemini, Apollo Preflight Tests Directed By William Durrett

A naval communications officer, a specialist in the field of radar, a stalker of Nazi submarines as part of a submarine hunter-killer team, and a manned spacecraft instrumentation engineer, have made up the successive facets of the career of William R. Durrett since his graduation from the U. S. Naval Academy just prior to World War II.

Durrett is now the assistant manager for Engineering at NASA's Manned Spacecraft Center-Florida Operations, Merritt Island, Fla.

At MSC-Florida Operations, Durrett is charged with directing engineering efforts in preflight preparation and acceptance testing of Gemini and Apollo spacecraft. Directly responsible to MSC-Florida Operations manager, G. Merritt Preston, Durrett is the focal point for converting test program requirements into levels of effort and for determining manpower requirements to support Gemini and Apollo preflight acceptance test operations.

Durrett was born in Louisville, Ky. After receiving his BS degree from the U.S. Naval Academy, he was assigned duty as communications officer aboard the destroyer USS Blach. Here, he was first exposed to the new science of radar, which at that time, according to Durrett, was "a pretty secret device."

Durrett was employed by the Radio Corporation of America from 1943 to 1950, but was "lend leased" by RCA until 1945 to the Airborne Coordination Group assigned to the U.S. Navy.

As a member of this special team, Durrett was assigned aboard hunter-killer (anti-sub-

WILLIAM R. DURRETT

marine warfare) aircraft carriers with Squadron VC-13, operating in the Atlantic Ocean against Nazi submarines. Later he was assigned to the South Pacific and served as a "free agent" radar specialist in various U.S. Navy squadrons.

At the war's end, Durrett was assigned by RCA as a field engineer for electron microscopes in the Cleveland, Ohio area.

From 1950 to 1962, Durrett served with Designers for Industry, Inc., an organization specializing in independent electronic research and development.

Joining NASA in 1962, he was appointed branch chief for Telecommunications during Project Mercury Operations. In that capacity, he was responsible for spacecraft instrumentation and communications systems and for design inputs for future spacecraft instrumentation systems.

Despite his heavy schedule at MSC-Florida Operations, Durrett occasionally finds time for outside interests. One of these is his classic 1940 Lincoln "Continental" which, he points out, is still powered by its original V-12 engine.

He also enjoys boresight loading and firing antique Kentucky rifles. Thanksgiving dinner is usually a festive occasion indeed at the Durrett household as a result of his marksmanship at the annual local turkey shoots.

An avid sailor, Durrett enjoys sailing "snipe"—class sailboats. In 1938, he raced a U.S. Navy star-class sailboat against the Paris Sailing Club at the French Centennial at LeHavre.

In 1952, Durrett was a member of the first place epee team in the U.S. national fencing championships.

Durrett lives in Indialantic, Fla., with his wife, two daughters, ages 16 and 18, and son, age 14.

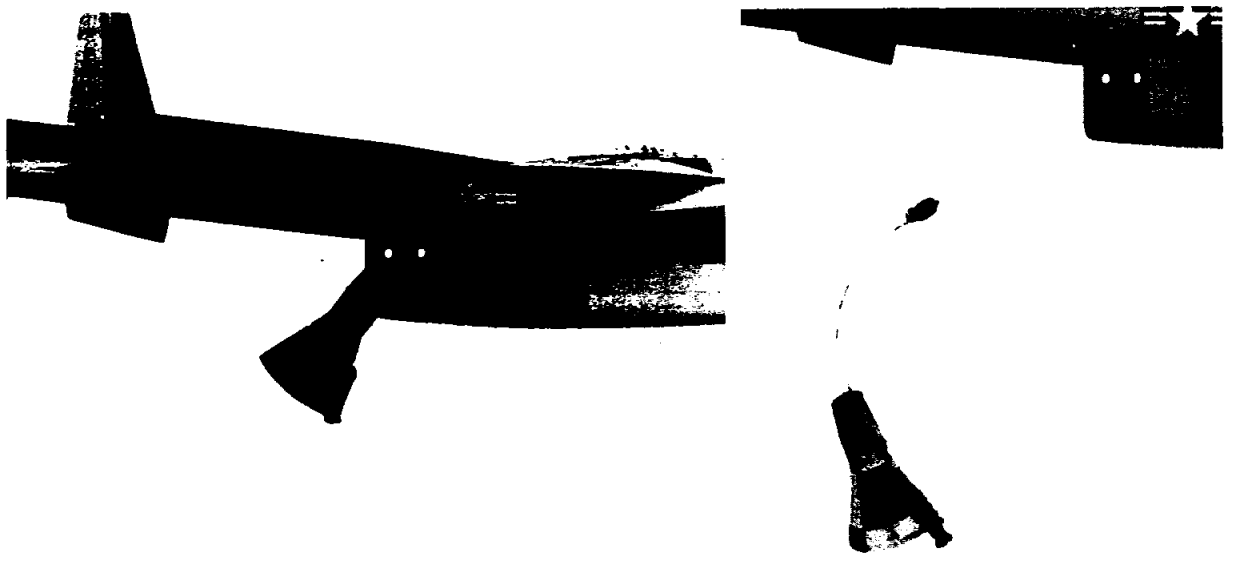
SPACE QUOTES

NATIONAL SPACE PROGRAM IS INTERNATIONAL. Administrator James E. Webb, Council on World Affairs, Dayton, Ohio, Nov. 17, 1964.

"When we talk about the 'National Space Program' of the United States, we must always remember it is—and will continue to be—international as well. The program's mission of achieving for this Nation pre-eminence in all major fields of space exploration and use carries with it the inseparable implication for all nations that this pre-eminence will be used for their benefit as well as our own.

"Space has become one of the newest dimensions of power: a dimension that ranks potentially with that of the land, sea, and the air. And because national security is based on such dimensions, our security is heavily involved in our space achievements. Prudence demands that we conduct our program on a scale and at a pace that will permit no hostile force to employ space against us as an unchallenged avenue of aggression, politically or militarily.

"At the same time we must never lose sight of another powerful concept, that in the eyes of the world, space has become an area of active competition with much more at stake than considerations of national pride or prestige. In the view of other nations, the relative effectiveness of the American system of free enterprise is, in a very real sense, being tested in space."



SPACECRAFT LANDING ROCKETS TEST—The spacecraft is ejected and dropped from the C-119 aircraft above and in the sequence of photos on the right, the landing rockets are shown just after ignition in the top photo, for a one and one-half second burn, still burning in the second photo, and impact of the spacecraft in the bottom photo. The landing rockets slow the rate of descent from 27 feet per second to about nine to 10 fps.

Developmental Spacecraft Landing Rockets Tested In Bay Using A Gemini Boilerplate

A Gemini boilerplate spacecraft was gently lowered into the waters of Trinity Bay on December 11 by two developmental spacecraft landing rockets, after being dropped from a C-119 aircraft.

The landing rockets are not a definite part of either the Gemini or Apollo programs but evaluation and testing of the rockets is being conducted by the Mechanical and Landing Systems Branch of the Structures and Mechanics Division. Project engineer for the rocket program is Lee Norman.

When the rockets are fired, the landing speed of the spacecraft is slowed from 27 feet per second to about nine to 10 feet per second. A normal g-force of seven to eight g's is reduced to approximately two and one-half g's on impact.

The two 12,000 pound thrust rockets fire simultaneously when the spacecraft is ten feet above the water. Sensors suspended below the spacecraft actuate the rockets and burn time of the rockets is one and one-half seconds.

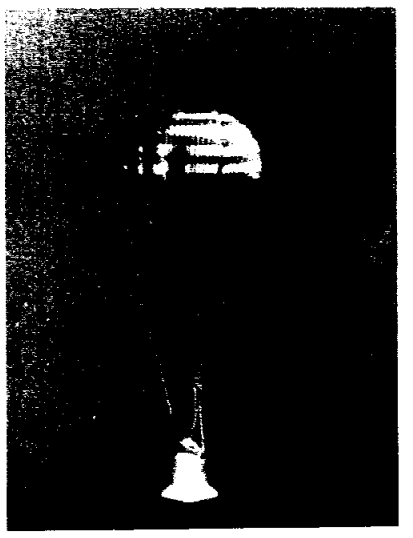
Each of the two landing rockets is 23 inches in length and is manufactured by the Thiokol Chemical Company of Elkton, Md. The solid-propellant rockets use a rubber base propellant with an oxidizer of polybutadine acryllic acid.

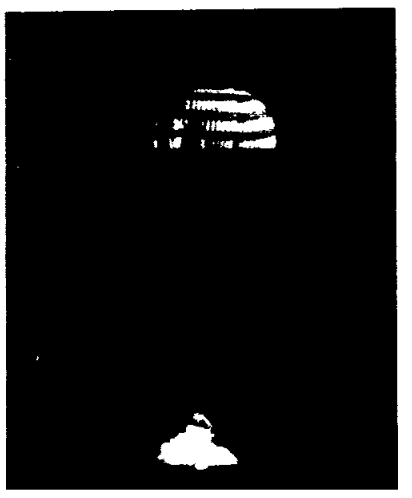
The December 11 drop was from 7,000 feet from a C-119 aircraft flown by the 446th Troop Carrier Wing at Ellington AFB. A controllable parachute was used to lower the spacecraft toward the water, steered by radio commands from the NASA motor vessel Retriever.

Test support for the rocket program is provided by engineers from the Operational Evaluation and Test Branch of the Landing and Recovery Division with Fred Koons as test conductor.

The MSC engineers are on the Retriever for ground control and pick-up of the spacecraft.

A pilot from the MSC Aircraft Operations Office flew a T-33 "high chase" aircraft that took photos of the drop from the C-119.



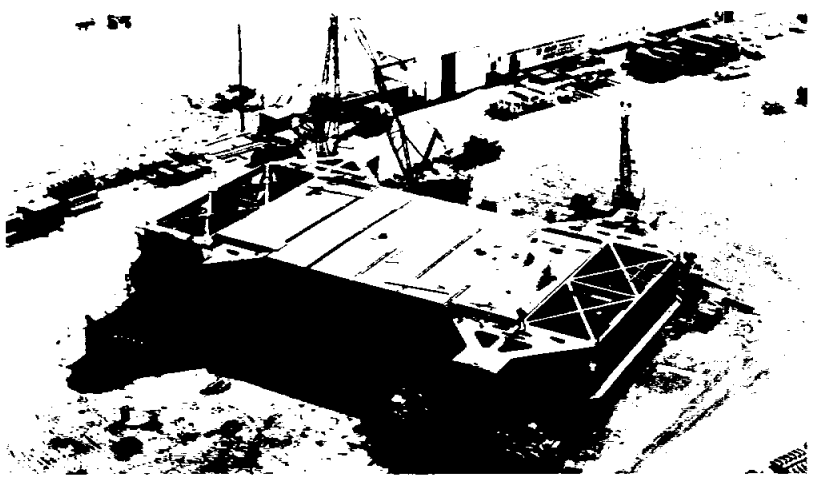


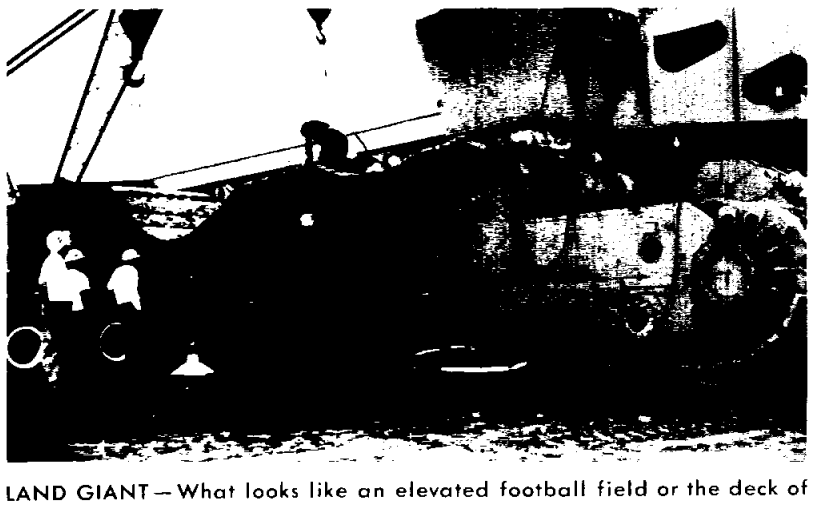
MSC Christmas Tree Placed By Area JC's

A 25-foot tall Christmas tree which has been lighted nightly near the main gate of the Manned Spacecraft Center since December 6, was placed there for public viewing by the Clear Lake Junior Chamber of Commerce.

Lighting of the tree took place during special ceremonies Sunday night, December 6, participated in by MSC representatives, the Clear Creek High School a capella choir, the Clear Lake Jaycees and other area officials.

Giant Crawler-Transporter





LAND GIANT—What looks like an elevated football field or the deck of an aircraft carrier in the upper photo is the first of two giant crawler-transporters which will be used to carry Apollo-Saturn V rockets and their mobile launch pads from the Vehicle Assembly Building to the launch area on Merritt Island. When finished, the 131 feet long, 114 feet wide and 20 feet high vehicle will weigh about 5.5 million pounds, and will be powered by a 5,600 hp diesel-electric system. (Lower photo) Workmen are shown as they install the track on one of the eight trucks on which the giant vehicle will move.

Mariner IV Now On Course To Pass Mars Next July 14

The midcourse maneuver performed by Mariner IV on its 325-million mile mission to Mars has changed its flight path to well within the aiming zone—to a closest approach of 5400 miles from the Martian surface.

A second midcourse maneuver will not be required.

National Aeronautics and Space Administration project officials said the new flight path past Mars satisfies all requirements of the scientific experiments carried by the spacecraft.

The accuracy of the midcourse maneuver, commanded by the Jet Propulsion Laboratory, Pasadena, Calif., December 5, will allow the occultation experiment to be performed. The spacecraft will now fly behind Mars, as seen from Earth, and its radio signals will travel through the Martian atmosphere enroute to Earth. Changes in the signals due to the Martian atmosphere are expected to yield information on characteristics of the atmosphere.

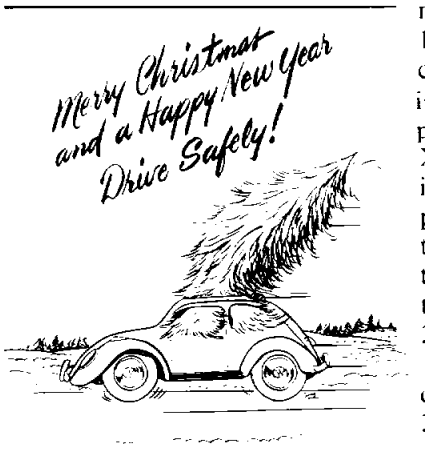
The midcourse maneuver made three changes in Mariner's path:

—the Mars fly-by from 151,000 miles in front of Mars to a closest approach of 5400 miles behind Mars. Additional tracking will further refine this distance.

—the arrival date from July 16, 1965, to 8:11 p.m., EST, July 14.

—and the flight path past Mars from above the Martian equator on the leading edge of Mars to below the equator, near the South Pole, on the trailing edge of Mars.

At the time of the midcourse maneuver on December 5, Mariner IV was 1,267,613 miles from Earth traveling at a velocity of 7,019 miles per hour relative to Earth. In its arcing flight, Mariner had covered 1,275,615 miles and its velocity relative to the Sun was 74,108 miles per hour.



COST REDUCTION CORNER

Center Duplicating Costs Reduced

Center-wide quick-copy duplicating needs were, until recent months, met by providing high volume requirement areas with self-operated rental electrostatic office copiers—Xerox 914 and 813.

Recognizing the inherent disadvantages of this method—uncontrolled usage and high copy cost—the Office Services Division conducted a study to develop a more efficient and economic method of meeting the Center's requirements for responsive duplicating services.

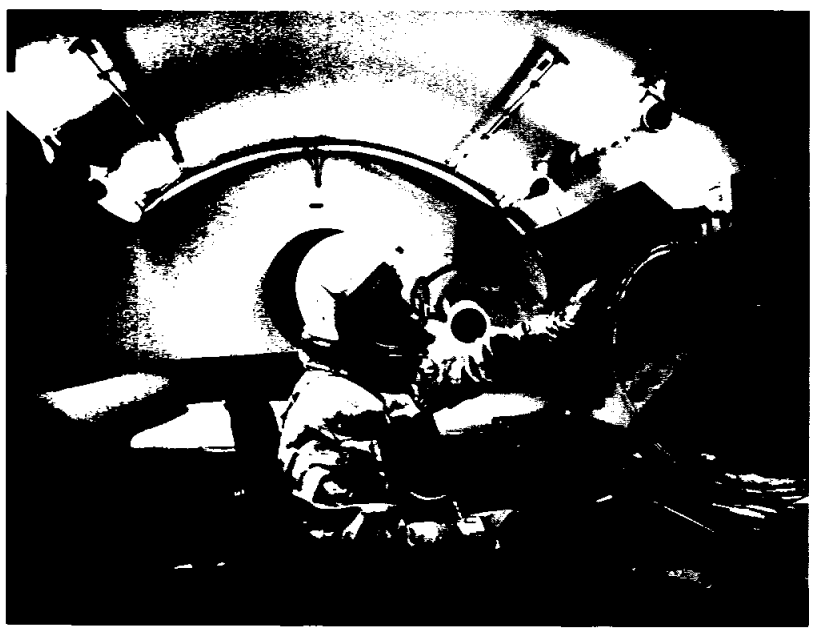
Based on the study's findings, it was decided to consolidate certain work stations and limit the use of Xerox rental equipment to operator controlled duplicating satellites. The rental agreement for 30 Xerox machines was terminated and 26 Bruning Copytron machines were purchased as replacements. These 26 machines were placed in 18 selected semi-controlled work stations.

During the past calendar year, the number of copies produced monthly per machine averaged 17,500. Since the individual copy cost for copytron machines is 2.5 cents per copy as opposed to 4.5 cents per copy for Xerox rental equipment, an immediate savings of two cents per copy is realized. Based on the average copy production for the past year, this will amount to an annual savings of $109,200.00.

Office Services Division credited for this savings of $109,200.00.

Space News ROUNDUP!

SECOND FRONT PAGE



GEMINI SUIT TEST—Hoyt Maples, test subject for the four-day Gemini suit comfort test, is shown operating the task panel in the eight-foot diameter pressure chamber in Building 7 here at the Center.

96-Hour Gemini Suit Test Declared Complete Success

Hoyt Maples, test subject for the Gemini suit comfort test, successfully completed a 96-hour stay in the 8 ft. diameter chamber in the Crew Systems Laboratory on December 11.

The test was rated as completely successful by Crew Systems engineers and medical personnel who monitored the test and evaluated the data.

Maples stated that he thought the model of the Gemini flight suit which he wore was a very good item. The suit was not pressurized during the test, but the test chamber was a pure oxygen environment with five pounds of pressure, the same environment that the Gemini spacecraft will use at orbital altitudes.

During the test, Maples followed a four hour work, four hours of rest cycle. He used a task board which tested his mental alertness by mathematical calculations he made on a series of lights on the panel board.

Maples food was a Gemini flight diet, which consisted of freeze-dehydrated, dehydrated, and bite size food. He commented that the food was quite edible and he gradually became accustomed to its preparation and flavor.

Other tasks Maples performed during his stay in the chamber included checks of the environmental control system and exercise with a bungee cord, similar to models carred by Mercury astronauts on their flights. Although Maples did not take off his helmet during the test, he was able to open the faceplate visor and take off his gloves.

Crew Systems officials stated that with this test, the Gemini suit passed another phase of its qualification program for use in the manned Gemini flights.

AFTER THE TEST—Hoyt Maples unlatches one of the gloves on the Gemini suit after completing the 96-hour suit comfort test which he performed in a pressure chamber.

Nearly 1000 Apply Or Inquire About Scientist-Astronaut Program

Nearly 1000 persons have applied or indicated interest in the scientist-astronaut program for future NASA manned space flights.

The recruiting program, which started in mid-October, closes December 31. So far, the NASA Manned Spacecraft Center has been receiving applications at a rate of approximately 20 per day.

Applications received by NASA ranged through every discipline in the fields of natural science, medicine, and engineering. NASA will select 10 to 20 scientist-astronauts from these applications to begin training in 1965.

Although applications are encouraged from all fields, MSC officials have expressed a particular interest in receiving additional inquiries from the geological sciences.

About 200 of the persons who applied or indicated interest have been termed ineligible.

Most of the ineligibles were ruled out for not meeting physical requirements of eyesight, age and height, or not meeting citizenship requirements.

Visual requirements called for 20/20 uncorrected vision in both eyes. Each applicant is required to pass a Class I military flight status physical that prohibits the wearing of glasses.

Pressure suit helmets worn in space flight cannot accommodate glasses and the wearing of contact lenses is impractical in space flight.

The National Academy of Sciences will review all applications by early spring 1965, and make its recommendations to NASA.

After the final selection of the scientist-astronauts, those who are not already qualified pilots will be given flight training in high performance jet aircraft and helicopters. At the end of flight training, there will be a refresher period in the research and academic fields of each selectee.

Pad 19 White Room Workers Practice Quick Exit Exercise

An old Texas oil hand might have executed a fast double-take if he had seen the high wire activities going on at Cape Kennedy's Gemini Launch Complex 19 recently.

Borrowing from an emergency "slide wire" rescue technique long used in oil fields to bring roughnecks down out of high rigs in case of fire, personnel from MSC-Florida Operations and McDonnell Aircraft Corporation began a series of tests and training exercises for emergency evacuation of astronauts and launch site personnel from the 100-foot high service structure "white room" at Complex 19.

The slide system uses a galvanized steel cable 5/8-inch in diameter which extends downward at an angle from the 118-foot level of the pad's service structure. The cable, which will support 23,000 pounds, is secured at ground level by two 8-foot anchors imbedded in 30 inches of concrete.

On the tower, the cable is supported by an anchor consisting of a 5/8-inch steel plate welded on a 6-inch tubular steel member. In case of breakage at the two anchor points, a redundant or back-up cable at the end points has been provided at both ends.

Here's how it works: the individual steps into and adjusts the harness, and grasping the hand brake which provides control of downward speed, starts his fast descent to the ground. As he approaches the ground, the brake is applied and the subject steps out of the harness.

The results of the slide tests revealed that one person could reach ground level 500 feet away in 18 seconds. The wire can accommodate a maximum of three people at one time. The test also determined that 20 people could be evacuated in 5 minutes.

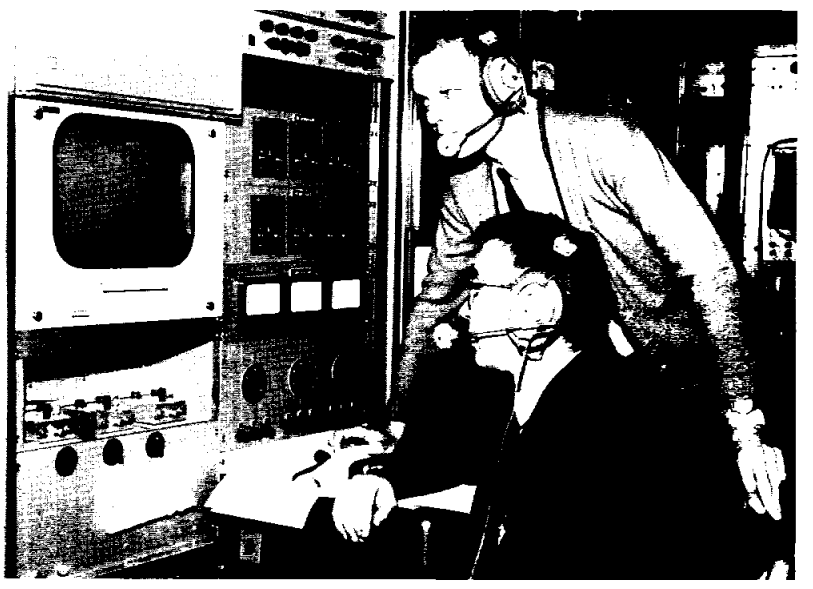
Apollo Suit Proposal Asked Based On The Gemini Design

The Manned Spacecraft Center has asked the David Clark Company, Inc., of Worcester, Mass., to submit a cost proposal for an Apollo early earth orbital space suit assembly based on the Gemini design.

The firm, which has a NASA contract for the Gemini suits, will be asked to provide a prototype suit for Apollo earth orbital flights. The Apollo lunar suit, being developed by Hamilton Standard, Windsor Locks, Conn. will be developed for Apollo operations which will use the lunar excursion module in orbit and on the lunar surface. The decision to use the modified Gemini suit for early Apollo earth orbital missions was made by NASA earlier this year.

Under the proposed contract, MSC will receive a prototype suit for Apollo for evaluation of the changes made in the Gemini suit and to determine if any further changes are necessary. A separate contract will be negotiated at a later date for production of the suit, as a part of the current Gemini contract with the David Clark Company.

Only minor changes are expected in order to adapt the Gemini suit to Apollo operations. Such items as communications, couch support, waste management and boot assembly will be initially modified.



SUIT TEST MONITORS—Dr. William Kemmerer (seated) and Lewis O. Casey, both of Crew Systems Division, were members of the crews that monitored Hoyt Maples around the clock during the 96-hour suit comfort test.

MSC Will Have A Flagpole Soon

The Manned Spacecraft Center will soon have a flagpole.

A $1,900 contract for an 80-foot flagpole has been awarded to the Baartol Company, Inc., of Kenton, Ohio.

The flagpole will be of two-piece cone-tapered seamless aluminum construction and will be stressed to withstand hurricane-velocity winds of 100 miles per hour.

Tentative plans call for installation of the flagpole in the mall area directly in front of the Center's Project Management building.

Dr. Berry Appointed To Editorial Position

Charles A. Berry, M.D., chief of Center Medical Programs was recently appointed to serve on the editorial board of the *Aerospace Medicine* journal.

The appointment for the calendar years 1965 through 1967, was made by John P. Marbarger, editor of *Aerospace Medicine*, the publication of the Aerospace Medicine Association.