

Schirra Announces Spacecraft Changes Via Telstar

Emphasis To Be Placed On Lunar Orbit Method

NASA has announced that lunar orbit rendezvous (LOR) will be the prime mission mode for the Apollo manned lunar exploration program, using the advanced Saturn C-5 as the booster. Saturn C-5 can launch 45 tons to escape velocity.

The next phase of NASA planning, research, development and procurement will concentrate on LOR, one of three possible methods of putting astronauts on the moon. The other two are the direct earth-to-moon-surface flight, and the earth orbit rendezvous.

Studies of the earth-orbit rendezvous method, using the advanced Saturn with a two-man spacecraft, will be continued, as will studies of a direct flight to the moon, using such a spacecraft and the advanced Saturn. But prime emphasis will now be placed on lunar orbit rendezvous.

Studies of the Nova-launch vehicle, with a weight lifting capability of at least two to three times that of Saturn C-5, will be continued but development has been deferred at least two years. Such a booster could be used for possible missions beyond Apollo.

"We are putting major emphasis on lunar orbit rendezvous because a year of intensive study indicates that it is most desirable from the standpoints of time, cost and mission accomplishment," NASA administrator James E. Webb said. "However, we have also acted to retain the degree of flexibility vital to a research and development program of this magnitude. Many of the modules and booster stages are interchangeable between the various modes open to us. If what we learn in the future dictates a further change in direction, we will be in a position to make it."

In connection with the decision to concentrate on LOR, NASA is requesting industrial proposals for the development of a lunar excursion vehicle, nicknamed a "bug," which will be carried aboard the Saturn booster with the Apollo mother craft as it is launched into orbit around the moon. The "bug" will be capable of landing two men on the lunar surface and returning them to the mother craft while a third crewman remains on board the Apollo spacecraft in lunar orbit.

Plans call for the use of a two-stage Saturn (configuration C-1B) using the present eight-

engine Saturn first stage, and the high energy S-IVB stage already under development, for early flight tests in earth orbit in the mid-1960's. These flight tests will be utilized to perfect maneuvers in earth orbit with minimal fuel loads. Saturn C-1B will develop sufficient thrust to put 16 tons into earth orbit. Saturn C-5 will put 120 tons into earth orbit.

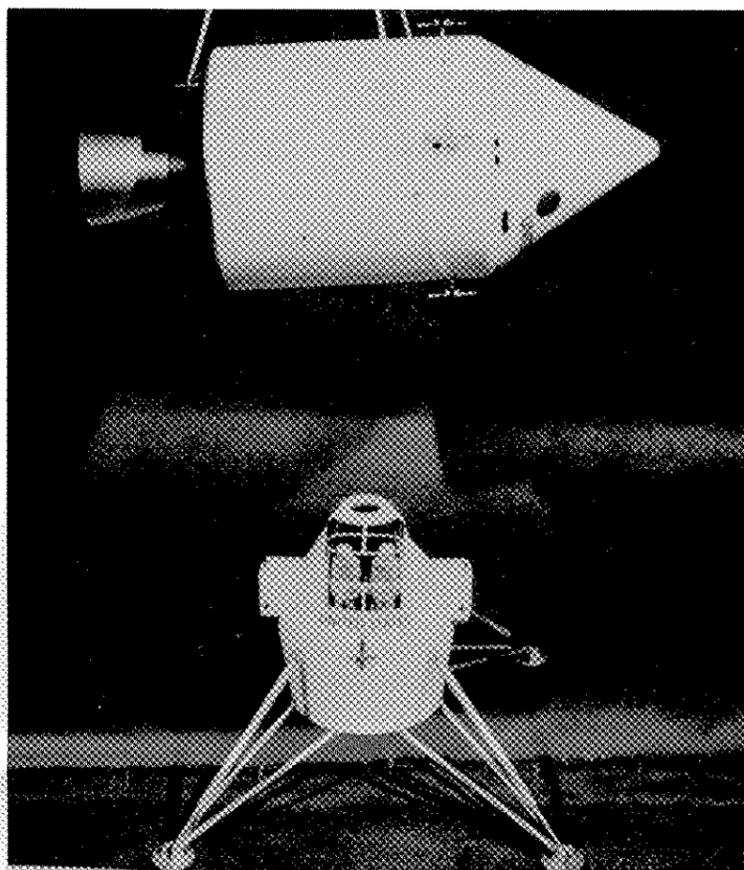
An in-depth study of an unmanned lunar logistic vehicle to support the lunar exploration program will be begun immediately.

Members of NASA's Manned Space Flight Management Council, under the chairmanship of Manned Space Flight Director D. Brainerd Holmes, recommended LOR unanimously for four reasons. It provides a higher probability of mission success with equal safety some months earlier than other modes, and within the national goal period of this decade. It will cost 10 to 15 per cent less than other modes, and requires the least amount of technical development beyond existing commitments.

The Council is composed of the directors of the Office of Manned Space Flight in Washington, D. C. headed by Holmes; MSC here in Houston headed by Dr. R. R. Gilruth; Launch Operations Center at Cape Canaveral headed by Dr. Kurt Debus; and Marshall Space Flight Center in Huntsville, Ala. under Dr. Wernher Von Braun.

As presently envisioned, LOR would require a single launch of a Saturn C-5 boosting a 13-foot diameter, three module spacecraft. The spacecraft would include a five-ton, 12-foot tall command module housing the three crewmen; a 23-ton, 23-foot tall service module providing mid-course correction and return-to-earth propulsion; and a 15-ton, 20-foot tall lunar excursion vehicle. The three modules would be placed in lunar orbit as a unit. Two astronauts would then transfer to the lunar excursion vehicle and descend to the moon while the Apollo

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PRESENT CONCEPTION of landing on the moon using the lunar orbit rendezvous method, now designated the prime mode for Project Apollo, will include an excursion vehicle (shown here in small model form) with two astronauts aboard descending to the surface as the command and service modules remain above in lunar orbit. (See additional pictures on page 3.)

Slayton Is Grounded From Mercury Flights

Donald K. (Deke) Slayton, the Mercury astronaut with a heart irregularity that kept him from making the last orbital flight has been grounded from the Mercury flight program, as of July 12.

"Naturally, I am greatly disappointed. For more than three years I have been training and looking forward to an early flight assignment. But I am ready to do whatever is needed," Slayton commented from his hometown of Sparta, Wisconsin where he was on vacation.

Slayton will continue to participate in astronaut training programs and Special Assistant Paul E. Purser, who made the announcement, would not rule out the possibility that Slayton might be included in a two or three-man flight.

The doctors decided that the stresses would be too great for Slayton to undertake solo flights, Purser said.

When asked if the decision meant that Slayton would never fly in a spacecraft, Purser replied "not necessarily."

His ailment is known as atrial fibrillation, a periodic lack of rhythm in the heart

action, and is not considered serious from a health standpoint.

Slayton and the Air Force have known about it since 1959, before he was selected for the space flight program by

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Astronaut Donald K. Slayton

The space age turned one of its more spectacular sides to view Monday afternoon as Astronaut Wally Schirra, soon to orbit the earth, spoke to the better part of its people via a package of electronics which was already doing so.

Part of the 45-minute show on Americana which was broadcast through American Telephone and Telegraph's experimental communications satellite, Telstar, was devoted to changes in the Mercury spacecraft which will lift Schirra into orbit late in September.

The program was beamed to most countries of the world, with the exception of Japan.

One day soon, via Telstar perhaps, the nations of Europe will join us for a live coverage of a man in orbit.

Schirra was speaking from Hangar S at Cape Canaveral, where he is hard at work on preparations for the MA-8 mission.

"My flight plan calls for up to six orbits . . . nine hours in space," Schirra explained. "There are only a few equipment changes.

"We were able to take out a radio transmitter and receiver by making the main command radio do double duty and work on earth as well as in space. We added a new antenna to make it work better. I also have a new small radio to use from a life raft if I decide to leave the spacecraft while waiting to be picked up."

America's last astronaut in space, M. Scott Carpenter, was out of touch for some 45 minutes after his spacecraft splashed down in the Atlantic. He floated in a one-man life-raft beside the spacecraft for three hours before he was picked up. "We put a sofar bomb back in to sound off on landing and help recovery forces locate me sooner," Schirra said.

"There are a couple of control circuit changes," he added, "parachute wiring for one, and a new switch to insure against using too much fuel during flight for another."

Carpenter's flight was hampered by a shortage of fuel for the attitude control rockets which at one point was considered serious.

Schirra will take with him

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Friendship 7 Gets Rousing Reception

G. Merritt Preston, Manager of Cape Operations and Chief of the Preflight Operations Division for NASA's Manned Spacecraft Center, returned recently from a tour of duty as NASA representative with the Friendship 7 spacecraft.

The spacecraft which carried Astronaut John H. Glenn, Jr., on his history making flight is currently on the final legs of its world-wide tour.

Preston, who accompanied the spacecraft to Karachi, Pakistan; Bombay, India; Colombo, Ceylon; and Rangoon, Burma, was amazed at the reception given the event, the interest exhibited by the people and their apparent familiarity with the space flight.

He emphasized that much was accomplished by the tour in addition to showing the Friendship 7 to the peoples of other countries. During his stay in the aforementioned countries, Preston was required to spend many working days which extended to 18 hours and longer—days which were made shorter by the realization of the good being done.

The highlight of the trip was the reception accorded the arrival of the exhibit at Bombay. At that city, more than one million people lined both sides of the street for 25 miles.

In Bombay, while the exhibit was open, the line to see the spacecraft was eight city blocks long and it took those waiting approximately five hours to get a six-second glance at the craft.

Preston admitted freely that there were frequent lighter

Slayton Grounded From Solo Flight

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National Aeronautics and Space Administration officials.

Slayton himself has discounted it but the heart irregularity stopped him from being the second man in space and eliminated him from the last orbital flight that was conducted by Malcolm Scott Carpenter.

He has been examined by NASA doctors, a group of Air Force doctors and Dr. Paul Dudley White, an internationally known heart specialist.

Purser said that the conclusion that the stresses would be too great "represents the consensus of all the medical specialists involved."

The announcement emphasized that Slayton's general health is excellent.

"I would be happy to have Slayton on our team in any capacity, and I know he will be making new and perhaps more important contributions to our program in his new capacity," Director Robert R. Gilruth said.

Slayton will continue to work on the Mercury (one-man orbital flights), Gemini (two-man orbital flights) and Apollo (three-man moon flights) projects, Purser said.

moments along with the hard work on the strenuous trip. For instance, he found that in Karachi, the now-famous camel driver for Vice President Johnson holds a daily conference in front of the U. S. Embassy, at which time he grants interviews and signs autographs.

He also cited an incident in Rangoon which he classified as one of comic-terror. The iron gates surrounding the exhibit area were only opened about a foot in an endeavor to accommodate the crowd only in single file. The anxious crowd foiled this attempt in a mob scene as they crowded around the opening with such vigor that it was impossible for those in front to get through. Preston said, "they wound up to being three deep at the gate, some on their hands and knees, others standing on them, some holding babes in arms. Police inside the gate tried to assist by helping to pull those closest inside with a resultant loss of clothing in many instances. Another group of about 3,000 circumvented the problem by scaling the fence to gain admittance as they followed a small group of persons in distinctive garb 'over the top.' Once inside they straightened their clothing, smiled and were very polite."

Preston added that in Rangoon the exhibit was set up in a manner that two lines of persons could view the Friendship 7 at the same time, one which would allow them to look into the capsule from close up, another which would permit a view from a raised platform and might really permit a better overall view of the exhibit. Long lines formed in both cases but when the people arrived at the foot of the stairs for the raised view they dropped out and went to the end of the other line in order that they might work their way forward and touch the spacecraft as they passed.

Among the interesting persons Preston met on the trip was Arthur Clark, a successful British space science fiction writer. Clark had just returned to Ceylon from an American Rocket Society meeting in New York and had served as a panel moderator.

Since there were many demands upon Preston's time, a system was worked out to use local students in answering the many routine questions by those viewing the exhibit. At each stop a group of these students were briefed thoroughly and accepted the assignment with much enthusiasm. This permitted Preston to make appearances at universities and before important local groups to explain in

Changes In Schirra Mission Equipment Are Revealed

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special shingles coated with five kinds of material being researched for possible use in heat shields.

He will carry two radiation packs of a new design from the Goddard Research Laboratory, to give us new information on what could be a hazard to men in the future as

Beech Will Build Gas Storage Tanks For Apollo Craft

Beech Aircraft Corp. of Wichita, Kansas, has been selected to build the super critical gas storage system for the National Aeronautics and Space Administration's Apollo spacecraft.

North American Aviation's Space and Information Systems Division, Downey, Calif. principal Apollo spacecraft contractor for MSC, said the contract will be for an estimated \$4 million. Work on the system will be performed at Beech Aircraft's Boulder, Colo. facility.

The system is part of the spacecraft's environmental control and electrical power systems and consists of a series of pressure tanks, heat exchangers, and valving. It stores the oxygen and nitrogen for the Apollo crew, and the hydrogen and oxygen fuel for the operation of the spacecraft's electrical power systems.

greater detail the missions and objectives of America's space program.

In each case, Preston wrote to the students concerned and thanked them for their help during the exhibitions. These letters have had a profound impact and Preston is already receiving fan mail as a result. For example, Manzoor Ahmad of Karachi wrote: "I am in receipt of your favour of June 22, 1962 appreciating my humble work in connection with the National Aeronautical and Space Exhibition in Karachi. While I thank you for your kindness, I cannot help saying that whatever I did I did as a part of my duty to promote the cause of cooperation between the two countries and never deserve this high appreciation of yours. However, as I am a student of Hamia Talim-e-Milli College, Malir City, I value this letter and consider it a boon from heaven as I hope that this will improve my future career in life."

Preston re-emphasized that the value of the tour of the spacecraft and the accompanying good will which has resulted is inconceivable. He pointed out that among those observing the spacecraft during his stay with it were the local Communist leaders—leaders who looked at the Friendship 7 and offered no comments.

they fly in deep space.

Finally the periscope on the Mercury spacecraft has been removed and a camera with a special lens put inside, so that he can take ultra-violet photographs of star systems in clear space. Here on earth, the atmosphere screens out most ultra violet rays.

"These should give the scientists of the world more information about the universe around us."

Astronaut John Glenn, first man to orbit the earth, also had a part in the Telstar television broadcast.

From the first flight we needed to confirm that a man could, in fact, perform useful tasks in space, he said. Next, with Astronaut Scott Carpenter we began to apply man's talents as a scientific observer. Now, with Wally Schirra's mission, we begin to expand the period of time in space.

To date, we have learned enough to decide that the astronaut is, in practice a primary spacecraft system capable of taking over a number of functions for which we formerly used mechanical equipment. We have evolved to the stage where now we can begin to use men instead of machines in some cases.

"These flights are transitional, evolutionary, leading us toward the one-day missions we expect to start flying next year, from there into Project Gemini, which will put two men into space for periods up to a week, and finally Apollo, our three-man spacecraft that will take us to the moon and back."

Wallops Station Launches Aerobee

The National Aeronautics and Space Administration launched a scientific experiment from its Wallops Station, Wallops Island, Va. recently to discover previously unobserved spectral emission lines in our upper atmosphere and to measure their intensity as a function of altitude, thus determining the distribution of certain molecular and atomic species in the upper atmosphere.

The Aerobee research rocket was used to launch the experiment and reached an altitude of approximately 130 statute miles. Weight of the payload was 185 pounds. Impact occurred in the Atlantic Ocean approximately 111 statute miles from the launch site and no attempt was made to recover the payload.

Information obtained from the experiment will be forwarded for analysis to NASA's Goddard Space Flight Center, Greenbelt, Maryland, and The Johns Hopkins University, Baltimore, Maryland, where the experiment was designed.

LOR Rendezvous Method Is Chosen

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mother craft (command and service modules) remains in lunar orbit.

After a period of exploration extending up to four days, the two men would use the lunar excursion vehicle to ascend from the moon to a rendezvous with the mother craft still in orbit. They would transfer to the mother craft, and the lunar excursion vehicle would be jettisoned.

The command module would be boosted back toward earth by the service module with an engine generating 20,000 pounds of thrust. Just before entering the earth's atmosphere, the service module would be jettisoned.

The Apollo LOR configuration and its Saturn C-5 booster would stand about 325 feet tall and weigh six million pounds at launch (3,000 tons). The first stage will be powered by five F-1 engines generating 7.5 million pounds of thrust, the second by five hydrogen-oxygen J-2 engines, each generating 200,000 pounds of thrust; the third by a single J-2 engine. All elements of this launch vehicle are currently under contract.

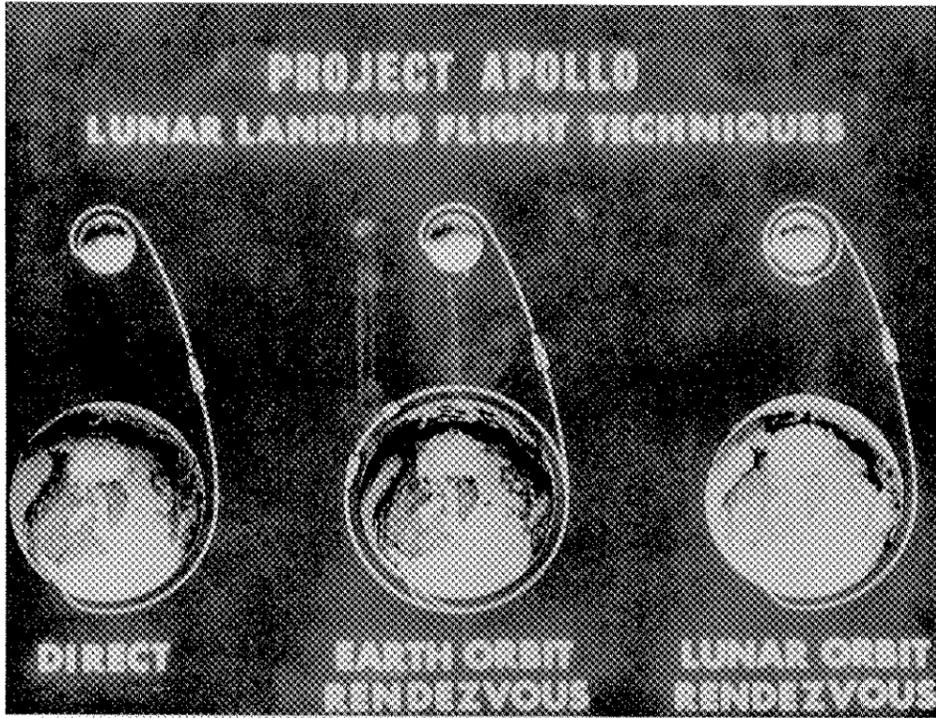
Using command and service modules now under development, earth-orbit rendezvous would require the additional development of two propulsion modules weighing about 50 tons—a lunar braking module and a lunar touchdown module—in order to decelerate the 28-ton command and service modules to a soft landing on the moon.

Earth-orbit rendezvous is currently conceived as meaning that each mission would require earth launchings of two or more advanced Saturns. One would boost into orbit a 60-foot liquid oxygen tanker weighing 110 tons. A separately launched spacecraft attached to a fueled but unloxed third stage of an advanced Saturn would rendezvous with it, the lox would be transferred and the third stage would then power the spacecraft to the moon.

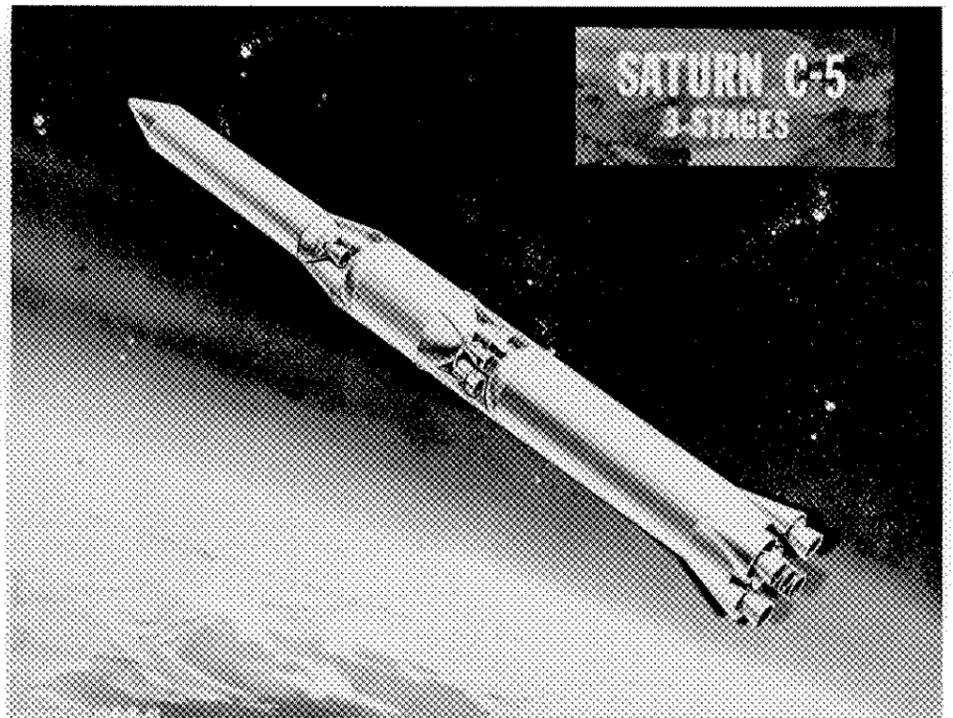
A three-man direct flight would have the same requirements as earth orbital rendezvous for the command and service modules and the lunar braking and touchdown stages, and in addition would require the immediate development of the Nova vehicle with a 12-million pound thrust first stage and upper stages employing the 1.2 million pound thrust hydrogen-oxygen M-1 engines.

A similar experiment to obtain the same type of data under daytime conditions was scheduled.

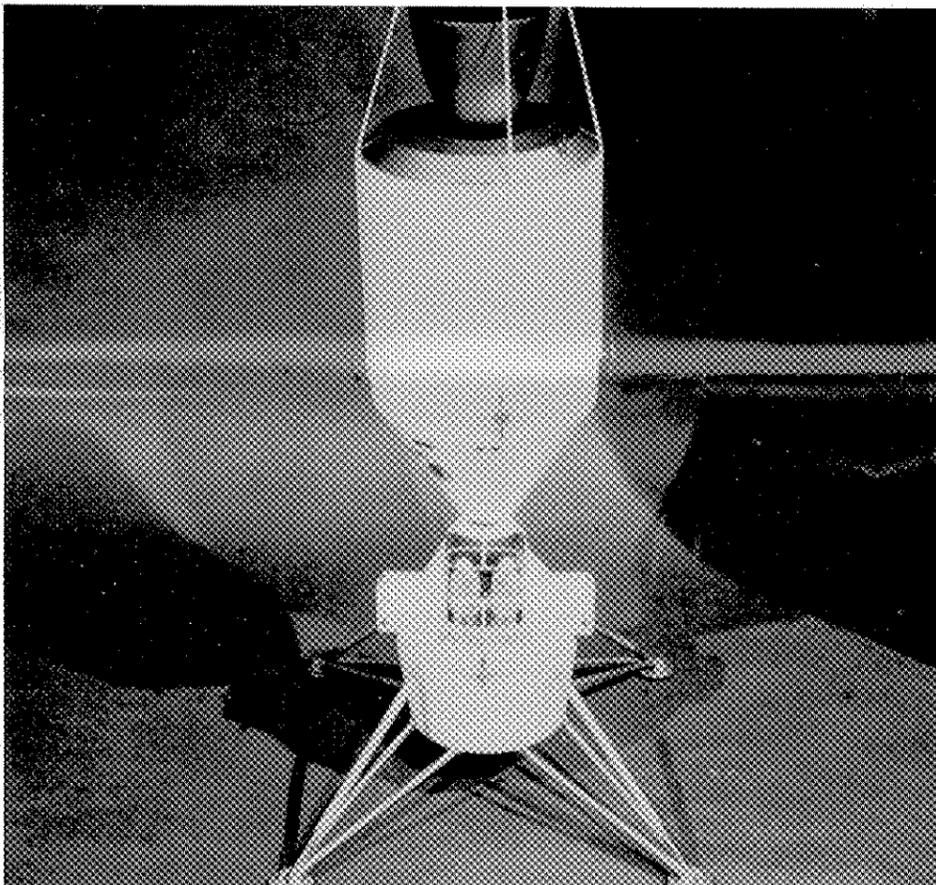
Mr. W. G. Fastie of Johns Hopkins University is the Project Scientist for these experiments; Jon R. Busse is the Goddard Vehicle Manager; and Robert T. Long is the Wallops Project Engineer.



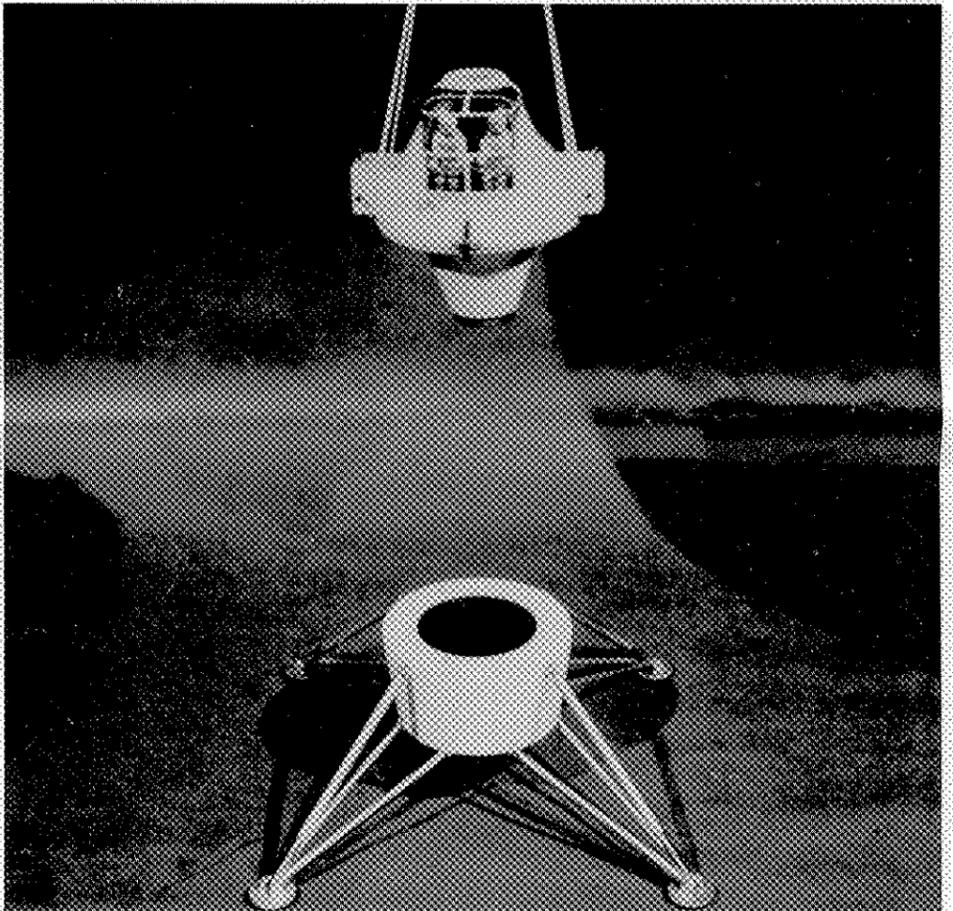
THREE POSSIBLE METHODS of achieving lunar landing include a direct earth-to-moon flight (left), the joining of two separately launched Saturns in earth orbit, one containing the necessary liquid oxygen fuel for proceeding to the moon and the other the Apollo spacecraft; and the one-launching lunar orbit method, now designated the prime mode. (See story on page 1.)



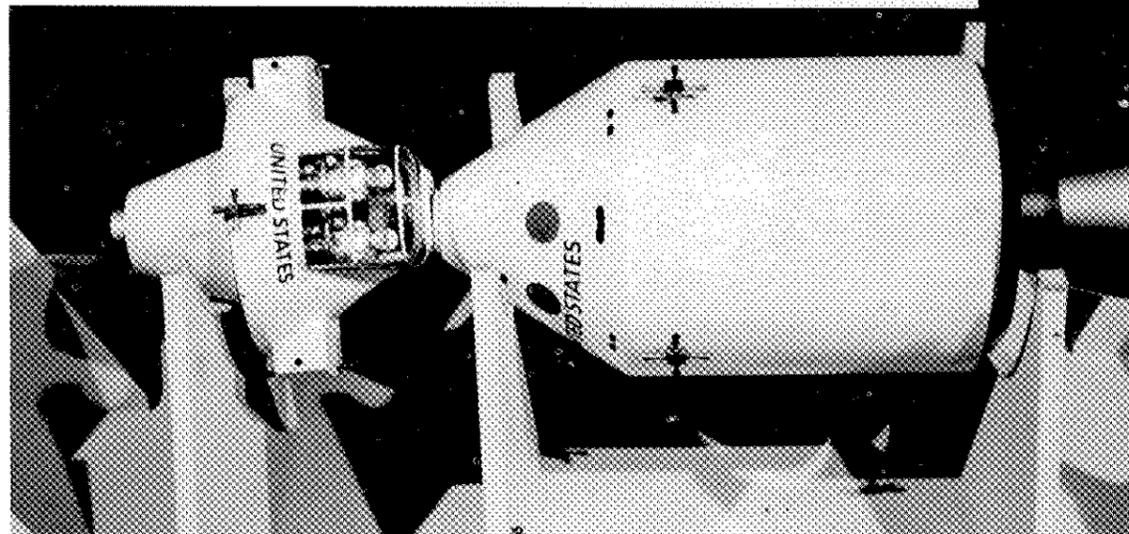
ARTIST'S CONCEPTION of the Saturn C-5 booster designated for use in LOR. This would boost a 13-foot three-module spacecraft including a five-ton command module, a 23-ton service module and a 15-ton lunar excursion module.



THIS IS THE GENERAL CONFIGURATION of the command-plus-service module (top unit) and the lunar excursion module (with legs) after achieving lunar orbit and turnaround. The Saturn booster has been jettisoned. The excursion vehicle with two astronauts is now ready to descend to the surface of the moon, leaving the command and service modules in lunar orbit with one astronaut.



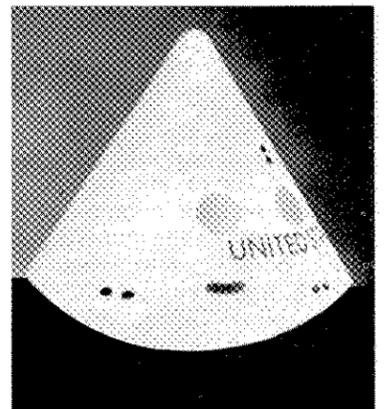
AFTER EXPLORING the lunar surface (see photo on page 1) the excursion module will lift away from the moon, leaving its base structure (legs) behind, and return to the command-and-service module still in lunar orbit.



LUNAR ORBIT RENDEZVOUS itself takes place when the excursion vehicle rejoins the command-and-service modules in lunar orbit. After the two astronauts exit the excursion vehicle and get aboard the command module (cone-shaped top of unit at right) the excursion vehicle will be jettisoned.



THIS IS THE PART that will leave lunar orbit and start back to earth. Fuel for the return trip is contained in the cylinder-shaped service module, the three astronauts in the conelike Apollo spacecraft at the top.



AFTER THE SERVICE MODULE is jettisoned, the Apollo spacecraft will look something like this on "the long trip home," all that is left of the huge booster-and-payload configuration which began the trip. The service module will be dropped as soon as it has furnished sufficient thrust to push the spacecraft out of lunar orbit into a long fall toward earth.



JACQUES TIZIOU OF PARIS was welcomed to MSC by Paul E. Purser, Special Assistant to the Director on Friday, July 13. Tiziou was visiting MSC as part of a tour of NASA facilities in the eastern and southwestern United States. Tiziou, an aeronautical engineer, is in the States to write a series of articles on NASA for *Air Revue*, an aeronautical magazine in Paris. While at MSC, he interviewed Purser, Charles Frick, Martin Byrnes, Homer Dotts, and Dave Lang.

McDonnell Gave Capsule Lots Of 'TLC' Says Carpenter

Astronaut Malcolm Scott Carpenter, in St. Louis, Mo. for the first time since his space flight May 24, thanked employees of McDonnell Aircraft Corp. last week for their "tender, loving care" of his spacecraft.

Speaking over the plant loudspeaker during a rest period, the astronaut expressed

Boating Enthusiasts In MSC Offered Navigation Classes

Free classes in navigation, small boat handling, and safety at sea will be offered to the public by the Galveston Bay Power Squadron. Registration will be held 7:00 p.m., Thursday, Sept. 13, at the Marine Biological Laboratory of the Fish and Wildlife Service, Building A, 2nd floor, Fort Crockett, Galveston.

The course consists of 14 weekly lectures. Subjects covered include rules of the nautical road, equipment required by law, seamanship, the compass, and chartwork. An examination concludes the course. Classes are open to men and women, regardless of whether or not they own a boat.

All persons interested in getting more enjoyment and safety while afloat are encouraged to register and take this free course of instruction. Please write or call P/C R. M. Sinclair, JN, P. O. Box 12494, Houston 17, phone MI 4-5559, or call P/C D. J. Dousman, AP, Galveston SH 4-9175, for additional information.

Barney A. Myatt, of 8280 Park Place, Houston 17, is Commander of the Galveston Bay Power Squadron, which is one of 317 squadrons, each a unit of the United States Power Squadrons.

his "deep debt of gratitude to all of the people who made Aurora 7 possible."

The corporation presented Carpenter with a one-tenth scale model of the Aurora 7 capsule in which he made his historic three orbits of the earth. The spacecraft and its escape tower, 21 feet high, were manufactured at McDonnell.

The astronaut went to St. Louis for an all-day session with McDonnell personnel working on Projects Mercury and Gemini.

J. S. McDonnell, president of McDonnell Aircraft, Walter F. Burke, vice president and general manager for Mercury-Gemini, and Carpenter stood in front of the Aurora 7 spacecraft to speak to McDonnell personnel. Their talks were repeated by tape during later rest periods to reach all the 23,000 McDonnell employees.

"I am very glad to have this opportunity to express to you personally my deep debt of gratitude to all of the people who made Aurora 7 possible," Carpenter said.

"I would like to give you this first-hand report that the spacecraft performed perfectly throughout the flight, as good evidence of the tender loving care that you all gave it here. I am deeply in your debt for the fine job you did."

It is a "great pleasure" to be associated with "such a fine group of people at McDonnell," he said.

Gemini Roll-Pitch-Yaw Panel To Include Simplified Reading

A spacecraft instrument to simplify flight attitude readings is being designed and built by the Instrument Division of Lear Siegler, Inc., for installation in the Gemini two-man orbiting and rendezvous vehicle.

Called a flight director-attitude indicator, this instrument concept will be the central control display for Gemini's crew. It will present on a single pictorial cockpit display information found on three separate displays on the Mercury spacecraft's instrument panel.

This single display indicates to the crew the spacecraft's attitude in roll, pitch and yaw throughout the flight and also shows corrections in attitude which must be made to perform certain maneuvers. Unlike those who have gone before them, Gemini astronauts will not be required to read three separate instruments (one each for roll, pitch and yaw) and from this information to compute their spacecraft's overall attitude in space. Instead, using the Lear Siegler display, they will see at a

glance the exact relation of the spacecraft to the horizon with no computation necessary, a feature that frees them for other flight duties. Proper alignment of the spacecraft's attitude in some phases of the flight will be essential to the safety of the crew.

The Lear Siegler central display will be the primary visual guide used by the astronauts for reference during launch, in preliminary and intermediate rendezvous maneuvers and at the critical time of reentry.

Similarly, in preparing the spacecraft for docking with the Agena B, the flight director-attitude indicator will tell the crew how to position the spacecraft for a precise lock-on to the Agena. On reentry, the crew will again depend on the indicator to keep the ship at the proper angle.

WELCOME ABOARD

Manned Spacecraft Center acquired 173 new employees between June 17 and July 12. The 16 listed for Preflight Operations, Cape Canaveral Administration, and Mercury Project Office will be stationed at Cape Canaveral; the rest here in Houston. The letters "RTD" after a name mean "returned to duty."

Mercury Project Office: Charles M. Vaughan.

Apollo Project Office: James M. Peacock, Billy D. Etherton, John G. Presnell, Jr., and Alfred G. Mardel (consultant).

Gemini Project Office: Mary J. Heffelfinger, William R. Wakeland, and Lillian Anderson.

Preflight Operations: Harry K. Hiers, George I. Webster, Robert H. Buckley, David A. Bauman, John F. Walter, Jr., Joseph B. Ftizsimmons (RTD), Leon Dugoff, Walter T. Norwich, Elizabeth D. Allen, Joseph D. Collner, Charles P. Elms, Terry Lamar Wilson.

Flight Operations: Donald E. Stullken, Alma A. Hurlbert, Kenneth A. Young, Harold B. Franklin, Charles W. Pace, Donald C. Brown, James P. Arnold, Arthur C. Bond, Jr.

Flight Crew Operations: Miles G. Springfield.

Systems Evaluation & Development: James P. Vincent, James S. Kelly, Allen D. Gist, Jesse R. Dull, Edward G. Burroughs, George W. H. Blundall, Jr., James L. Cioni, Robert B. West, Leland C. Norman, Robert L. Turner, George E. Griffith, William C. Schneider, Thomas Buckler (RTD), Paul E. Tilson (RTD), Jerome L. Winkler, Jr., Mary R. Barnes, Patricia J. Daniels, William N. King.

Life Systems: Gerald A. Lorenzen, Donald F. Price, John W. Shipman, Jaye C. Jarrett, Ellis N. Zuckerman, James H. O'Kane, Frank A. Burgett (RTD), Clifford W. Hess, Kenneth S. Snyder,

Donald R. Osgood, Lewis O. Casey, James J. Haven, Robert L. Jarboe, Howard D. Thames, Jr., Richard A. Klimaszewski, John Shipman, Ted Gutwein, James B. Moore, III, JoAnn P. Shumilak.

Cape Canaveral Administration: Juanita P. Thomas, Larry R. Clark.

Facilities: Stanley E. Wood, Jr.

Audit Office: Jack I. Shearin.

Spacecraft Research: Patricia A. Kelly, Ellis W. Henry, Kenneth Baker, John W. Dale, Ted Mendoza, Gerald S. Cyprus, Arthur M. Whitnah, Patrick B. Burchfield, Daniel A. Dansak, James V. Vanden Boosche, John W. Orsag, Stephen E. Hale, Arthur T. Hiemer, W. Walter Jaderlund, William H. Herrick, George W. Sandars, William E. Gandy, Allen C. Washburn, David S. McKellar, Larry P. Ratcliff, James R. Smith, David A. Dyer, Robert Bazhaw, Errol C. Wilkins.

Data Computation: Carroll B. Holley, Gary R. Barron, James A. Banks, Walter A. Bollfress, Mary S. Davis.

Steno Services: Ruth M. Deason, Nina P. Hight, Mary V. Moore, Lois M. Bradshaw, Arlene Hoffman, Mary G. Webber, Tina L. Dickson, Regenia A. Miller, Edna F. Fowler, Mary V. Moore, Carole D. Anderson, Patricia Williams.

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Fogleman, Elina C. Rose, Jane E. Nevinger.

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Program Analysis Evaluation: Jimmie L. Gibbons, Roy W. Savell, David W. Camp.

Aerospace Medical Operations: Allen D. Catterson, Dr. Charles A. Berry, (Lt. Col., USAF)