NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
1520 H STREET, NORTHWEST · WASHINGTON 25, D. C.
TELEPHONES: DUDLEY 2-6325 · EXECUTIVE 3-3260

Cape Canaveral Press Room SUNSET 3-7626

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NOTE TO EDITORS:

Enclosed is a press kit detailing the first manned Mercury sub-orbital launch, Mercury-Redstone 3. The material in the kit is for release by all news media no earlier than PM's Saturday, April 29, 1961.

The kit contains eleven sections:

1. Mercury Redstone 3.
2. Astronaut Observations and Control Tasks During Manned Mercury Flight.
3. Pilot Preparation for the MR-3 Flight.
4. MR-3 Inside the Pilots Cabin.
5. Mercury Redstone Launch Vehicle.
6. Mercury MR-3 Recovery Operations.
7. Project Mercury - A Progress Report.
8. "IF" A Study of Contingency Planning for the Project Mercury Mission.
9. Mercury Redstone Abort.
10. Astronaut Biographies.
11. Astronaut Training Program Summary.

O. B. Lloyd
Director, Office of Public Information

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MERCURY-REDSTONE-3

In the next week or so, the Project Mercury's third Redstone launch will take place at Cape Canaveral. In this connection, James E. Webb, Administrator of National Aeronautics and Space Administration, stated:

"Our Nation's space program will soon enter a new era - man's participation in the exploration of space by our first astronaut. The upcoming Mercury-Redstone flight is a most important step in the U. S. program - a step that will lead on to man's ultimate conquest of this new and hostile environment. It is also a most serious step; for it cannot be taken without risk to human life. It is the kind of risk that Lindbergh took when he crossed the Atlantic, that Chuck Yeager took in the X-1's first supersonic flight, and test pilots Scott Crossfield, Joe Walker, and Bob White have taken in their flights in the X-15 airplane.

"I am confident that in Project Mercury every reasonable precaution has been taken to minimize this risk.

"My very best wishes for success to to the Mercury team that has worked so hard to bring this day about.

"To all the astronauts who volunteered and to the one making this flight, let me say 'Godspeed'."

Mercury's first manned space flight is to take place approximately one hour after daybreak at Cape Canaveral, Florida, after a 2-day countdown operation. Maximum hold time on any given day will be 5 hours. The flight may be postponed from day to day for 5 days.

The one-ton-plus spacecraft, boosted by a modified Redstone launch vehicle, will follow a ballistic arc with a range of 290 statute miles and a maximum altitude of 115 statute miles. The flight time - lift-off to splash - will be about 15 minutes.

Primary mission test objectives include:

1. Familiarizing a man with a brief but complete space flight experience including lift-off, powered flight, weightless flight, entry and landing phases of space flight.

2. Evaluating man's ability to perform useful functions during space flight by (a) demonstrating manual control of the spacecraft attitude before, during and after retrofire and (b) using voice communications during flight.

3. Studying man's physiological reaction during space flight.

General objectives include the continued qualification of the Mercury spacecraft and its systems for manned flight, and to provide training for ground support and recovery forces for future manned flights. During the flight the pilot will be subjected to approximately "6g" through the powered portion of the flight, approximately 5 minutes of weightlessness after separation from the launch vehicle and approximately 11g during reentry into the earth's atmosphere.

The spacecraft which stands about 9 feet high and 6 feet across its blunt base will be launched vertically on a path slightly south of east.

Here is the normal or planned mission profile: The Redstone engine will be shut down about two and a half minutes after lift-off when the vehicle has achieved a speed of about 4500 miles per hour in a climbing attitude about 40 degrees above the horizontal. At engine cutoff, the escape tower clamp ring is separated and both the escape rocket and tower jettison rocket are fired to remove the tower.

Ten seconds after engine cutoff, a clamp ring securing booster and spacecraft will be separated. Three 350-pound-thrust solid propellant rockets at the base of the spacecraft will be fired to separate the spacecraft from the launch vehicle. The pilot's periscope is then extended. At the same time, the autopilot swings the spacecraft around so the blunt end is forward and tilted slightly upward, 14.5 degrees above the horizontal, the same position the craft is to maintain in orbital flights. Thirty seconds before the craft reaches peak altitude, the astronaut will manually control the attitude of the craft moving it into retrorocket firing position - 34 degrees above horizontal - and will hold this attitude manually while the retrorockets are fired. It must be noted that the retrorockets are not needed for reentry in this ballistic flight but will be fired to test their operation in space and to provide pilots with flight experience in controlling the retrofire maneuver. The astronaut will be able to maneuver the craft for a short period of time before he establishes the reentry attitude and retracts the periscope. After the periscope is retracted, control of the craft's flight attitude returns to the automatic mode.

When the "g" forces of reentry build up to at least ".05g", the spacecraft starts revolving in a slow top-like motion at two revolutions per minute.

At 21,000 feet, a pressure sensitive switch deploys a drogue parachute and automatically scatters radar reflective "chaff."

At 10,000 feet, the antenna fairing at the neck of the spacecraft is released, automatically deploying the main landing parachute. Concurrent with main chute deployment, an underwater charge is ejected to aid recovery forces, the UHF recovery beacon is turned on, remaining hydrogen peroxide, used to control the position and roll of the spacecraft, is jettisoned. The periscope is extended so the pilot may check visually on his parachute; should the main chute fail to work, the pilot can jettison the main chute and deploy a reserve landing parachute. During the descent, valves open to allow outside air into the cabin.

Upon landing, an impact switch jettisons the parachute, releases flourescein sea-marking dye, turns off instrumentation recorders and transmitters. The pilot, however, will still have a voice radio link to Mercury recovery forces.

The spacecraft will be picked up by the Mercury Recovery Forces. These forces include an aircraft carrier and two destroyers in the prime landing area. Search aircraft will also be deployed in the prime landing area. Other ships and forces will be deployed along the intended path of flight to provide for recovery in case of undershoot or overshoot.

If the flight and recovery are normal, a helicopter will lift the craft out of the water and place it on the carrier's flight deck. The pilot may elect to remain in the spacecraft until it is onboard the carrier. He can also climb out the spacecraft side hatch, inflate a liferaft and be picked up by helicopter.

ASTRONAUT OBSERVATIONS AND CONTROL TASKS DURING MR-3 FLIGHT

CAPE CANAVERAL, FLA. - One of the prime objectives in Project Mercury is to determine man's capabilities in the environment of space. During the MR-3 flight, therefore, the astronaut will have several definite tasks to perform. In addition, the astronaut will inform the ground of the action he is taking, the events as they unfold, and what he is seeing during his control of the spacecraft.

At the moment the Redstone lifts from the pad at Cape Canaveral, the pilot will check to determine if the flight timer on his instrument panel has begun to operate. If it has not, he actuates the clock start button and announces "clock operating." The following events will occur in a normal mission:

Thirty seconds after lift-off, and for each subsequent 30 seconds of elapsed time during powered flight, the pilot will report on his control-system fuel supply, the amount of "g" loading he is experiencing, the pitch angle of his craft (in degrees), his cabin pressure (in pounds per square inch) and if his oxygen supply is satisfactory. If anything unusual happens he will report the event immediately to the ground.

Two minutes and 15 seconds after lift-off, he will announce, "standing by for cutoff." A few seconds later the Redstone engines will cut off and the spacecraft's escape tower will jettison. The pilot will monitor these events and report them as they occur.

About two and one-half minutes away from the ground, the pilot will turn the retrojettison switch off to safeguard against inadvertent jettisoning of the retrorocket package beneath the heat shield. The craft will then separate when the cluster of three small posigrade rockets (contained within the retrorocket package) are fired, pushing the capsule up and away from the Redstone. The automatic pilot then is to remove any capsule oscillations which might be generated by separation. The pilot's periscope, which will reveal the curvature of the earth at peak altitude, will be extended several inches into space. The pilot announces, "capsule separate ... posigrades fired ... auxiliary damping OK ... periscope out." Several key members of the Mercury Control Center team will be able to talk with the pilot if necessary. However, if all goes well, all communications will come from a fellow astronaut at the capsule communicator console in the Mercury Control Center.

About 15 seconds after engine cutoff, the pilot announces, "Turn around started." The craft's automatic pilot turns the craft around 180°, placing the blunt end forward.

Just before T+3 minutes, the pilot announces, "In orbit attitude." The craft is now traveling about 4,500 m.p.h. and is nearing peak altitude. The blunt end is pitched slightly upward (14°).

When the spacecraft is 3 minutes from the launch pad, the pilot begins to twist and turn the control stick in his right hand, announcing, "Hand controller movements ... pitch down ... yaw left ... pitch up ... roll left ... yaw right ... roll right." This will be done during periods when the control stick will not be connected to the craft's control system. The purpose of this is to provide a study of the pilot's ability to perform while he is in a weightless environment. His hand motions will be instantaneously telemetered to the ground for analysis after the flight.

Just after 3 minutes the astronaut announces, "Manual control handle on," then takes control of the attitude of the spacecraft on one axis at a time in the manual proportional control mode. For example, he will be able to perform basic maneuvers by manually taking control of the craft on one axis while the remaining two axes are controlled by the automatic pilot. He will announce, "manual pitch on ... pitching to retro ... returning to orbit." He will then announce, "manual yaw on ... yawing left twenty (degrees) ... returning right to zero." He will then pull a third "T" handle on his instrument panel and announce, "manual roll on ... rolling left to twenty (degrees) ... returning right to zero." The spacecraft motions throughout this sequence of simple control actions will be closely monitored.

Time: Almost 4 minutes: The pilot for the first time in the flight begins to use his earth periscope as a navigational aid, controlling the capsule's attitude by using the periscope presentation for attitude reference. At this time he will describe his view of the earth and inform the ground what predetermined checkpoints he can see from this altitude of approximately 100 miles. He is expected to say something like this, "Holding orbit with scope ... Weather map essentially correct, no alto cumulus in northeast quadrant of Carolina Coast ... Florida to Gulf visible, Lake Okeechobee visible ... Gulf of Mexico visible ... Island 5 visible ... Island 3 visible ..." and so on.

Just over four minutes from lift-off, he will announce, "Going high mag ... yawing left twenty (degrees) ... returning right to zero ... MARK." This will tell ground observers that the pilot has gone to high magnification on his earth periscope. Curvature of the earth is now noticeable and the astronaut's field of view is reduced from 1900 miles to about 80 miles of the Earth's surface. He can see earth landmarks more clearly now. The pilot yaws his craft, then returns to his normal (zero degrees) position using his periscope for reference. This maneuver determines the accuracy to which he can determine yaw attitude with the periscope.

About 4½ minutes from the launch pad, the pilot manually pitches the blunt end up to 34°, announcing "Start retrosequence ..." (then, seconds later,) "in retroattitude ... on manual."

At a little past five minutes the flight is one-third over, Ground monitors listen as the pilot announces, "fire one." (then seconds later,) "fire two," and "fire three."

Three powerful solid-propellant rockets on the blunt face of the craft ripple-fire. Each burns about 10 seconds. They will be fired in overlapping five-second intervals. During later orbital flights around the earth, these rockets will be used to brake the speed of the craft, allowing the pull of gravity to bring it back into the atmosphere. On the Redstone suborbital training flights, they will be fired only for continued qualification of the retromotors and to provide pilots with manual retrofire control experience.

The pilot will control any retrofire misalignment torque by the manual proportional control mode, reporting each retrofiring and announcing the precise moment at which the "fire retro" light comes on on his instrument panel.

Seconds later the pilot arms the "retrojettison" switch so that the exhausted retrorocket package will be jettisoned through the automatic sequence.

Coming up on 6 minutes: The pilot announces, "Going fly by wire." Simultaneously he switches his control mode to link his hand controller to a system of electrical relays which in turn operate the hydrogen-peroxide thrust output from nozzles around the neck and base of the craft.

About 30 seconds later, he announces that his retropackage has been jettisoned. "Going HF," he then says, as he turns on the high frequency transmitter to check its operation.

Six and one-half minutes: "To reentry attitude," he reports, as the craft starts pitching blunt end down to reentry attitude in response to the pilot's control movements. "In reentry attitude ... ASCS (auto pilot) holding," he says, as he switches from manual control back to automatic pilot.

A few seconds later he reports the automatic retraction of his periscope.

"Going UHF and starting hand controller movements," the pilot says. Can he now perform manual control tasks as well after 4 minutes of weightlessness as when he entered zero g? Here is a chance to compare his performance. "Pitch down ... yaw left," he says as his right hand moves the sidearm controller, "pitch up, roll left ... yaw right, roll right ..."

Seven minutes from launch: Time for the touch test. The astronaut touches, with his right hand, preselected instruments. His eyes are closed. "Cabin air," he says ... "telemetry key ... scope ... AC volts ... oxygen warning light ..." his fingers move deftly across the maze of instruments ... in all there are some 127 switches, dials, buttons and fuses. The touch test is a check of his psychomotor ability, and the complete sequence is recorded by the control panel camera.

"Returning to manual control," announces the pilot. At this time he returns to manual in the roll axis to control the spin of the craft on its vertical axis during reentry. (Some roll is planned, to reduce landing dispersion.)

Seven minutes, plus: "Point 05g," says the pilot. The Mercury spacecraft touches the delicate fringe of the earth's atmosphere. "Roll rate IN," he continues. The force of gravity presses him deeper and deeper into his contour couch.

"Three g ... 6g ... 9g ..."

"E-L-E-V-E-N ... g ..."

There is a protracted period of silence.

"Nine g ... 6g ... 3g ..."

His voice is clear and is no longer strained.

"Rate of descent and altimeter on scale ...

Sixty thousand ... fifty ... forty ..."

He is $9\frac{1}{2}$ minutes from launch now.

"Drogue (the small 6-foot parachute) deployed," he announces, then (four seconds later); "snorkel (ambient air valve) open ... twenty thousand (feet)."

Ten minutes plus from lift-off: From a small mirror at one of the craft's two viewport windows he should see the large (63 foot) red and white parachute unfurl from the capsule's upper neck. Seconds later the astronaut feels a pronounced tug.

"Main chute out," he says ... "reefed ... coming open ... rate of decent - 30 feet (about 20 m.p.h.) ... periscope out ... peroxide (control system fuel) dumped ... landing bag (instrument panel indication) green. READY FOR LANDING."

Ships and aircraft have the colorful parachute in view and vector to the landing area.

A Project Mercury astronaut has returned from space.

The functions described here are those established for test exercise purposes to investigate man's capabilities during a normal flight. In addition to these functions, the pilot of the Mercury craft can manually activate every system which is essential to the completion of the mission.

PILOT PREPARATION FOR THE MR-3 MISSION

CAPE CANAVERAL, FLA. - Pilot rehearsals for Mercury-Redstone-3, using actual flight hardware under realistic conditions, have been vigorously conducted for more than a month.

Before the launch, many mission simulations were conducted using training facilities at Project Mercury Headquarters, Langley Field, Virginia, with the Mercury pilot "flying" his spacecraft within a specially designed altitude chamber located in Hangar "S" at Cape Canaveral, Florida, and in the Navy Centrifuge at Johnsville, Pa.

In preparation for chamber runs to space equivalent altitude, the pilots were subjected to preflight physicals, equipped with medical sensors, and assisted into their 20-lb. full-pressure space suits. The pilots and medical attendants simulated all requirements as realistically as conditions would permit, conducting pressure and biomedical checks on the suit.

About two weeks before the programmed launch date, three days were devoted to conducting simulated flight tests with the medical transfer van, carrying an astronaut and aeromedical attendants, moving from Hanger "S" to the launch site. Wearing his full-pressure suit, a pilot went up the gantry and entered the spacecraft. A realistic countdown and simulated Mercury flight, followed with ground flight controllers at their stations.

During the first two simulations the gantry remained up against the vehicle and the side hatch of the spacecraft was left off. The third day, "dry run" simulation included securing the side hatch, purging the pilot's cabin with oxygen and pulling away the gantry.

During the four days preceding launch, the MR-3 mission was repeatedly rehearsed, both in the vehicle and in a Link-type spacecraft simulator (the Mercury Procedures Trainer) in the Mercury Control Center.

Three days before the flight, the pilots will be placed on a low-residue diet.

At two in the morning on the day of the launch, lights will go on in the crews' quarters on the second floor of Hangar "S". After a shower and a shave, the pilot will have breakfast. He will have a selection of things to eat; however, a typical breakfast will consist of: 4 ounces of orange sherbert; 4 ounces of frozen strawberries in syrup, 2 sugar cookies and 8 ounces of skim milk.

Forty minutes after he is wakened, he will be given a preflight physical. About 35 minutes will be spent placing medical sensors against tattooed reference marks on his body. Then he will climb into his pressure suit.

At T- 145 minutes the astronaut will leave Hangar "S" in a medical van, together with a procession of escort vehicles and will begin the 15-minute trip to the launching site.

The astronaut's suit is purged with oxygen during the transfer period, and as the pilot relaxes in a reclining couch, continuous medical data are read out from the trailer consoles.

At T- 2 hours the pilot's final briefing will be conducted. The medical van will have halted near the Mercury-Redstone.

Fifteen minutes are devoted then to donning his gloves and conducting a leakage test of the suit. An additional 5 minutes elapses as the pilot and his attendants ascend the gantry.

T-100 minutes:

The flight surgeon in the Mercury Control Center passes the word along to the Flight Director - "The astronaut is on gantry." The pilot enters the craft through the side hatch and adjusts himself in the contour couch. Communications and biomedical leads are connected. Restraint harnesses are secured about his shoulders, torso, and knees. At T - 75 minutes, the astronaut's helmet visor is closed and the suit is inflated to 5 pounds per square inch. Leakage checks are conducted. A button is depressed on the side of the pilot's helmet and the pressure is exhausted. The suit will not be inflated during the flight unless the cabin pressure should fail. The suit, therefore, serves as a backup "pressure chamber" providing the proper gaseous environment to sustain life in the event of the failure of the primary system (cabin).

Installation of the spacecraft's side hatch commences. The operation takes 20 minutes. A flow of cold oxygen is forced into the cabin. Leakage checks are conducted to insure that the pilot's chamber is properly sealed.

<u>T - 55 minutes</u>: Spacecraft technicians leave the gantry and the gantry is moved away from the launch vehicle.

<u>T - 15 minutes</u>: Mr. Walter Williams, Mercury Operation Director, informs Dr. Kurt Debus, that he may obtain Range Clearance for the Redstone.

<u>T - 4 minutes</u>: All spacecraft systems are in GO condition. Mercury Control Center is GO on telemetry and voice communications. Atlantic Missile Range is GO on spacecraft C and S (radar) beacons. The spacecraft ready light is ON.

<u>T - 2 minutes</u>: Onboard cameras and tape recorders are started. The astronaut serving as capsule communicator in the blockhouse announces that all further communications between the spacecraft and the ground will be by radio.

<u>T - 1 minute</u>: Freon flow (spacecraft cabin coolant) is stopped. Remaining commands are initiated by the Test Conductor.

<u>T - 35 seconds</u> to lift-off - in rapid sequence: The test conductor announces "Capsule umbilical dropped." Other controller voices announce:

"Periscope OK"

"Vent valves closed"

"Fuel tank pressurized"

"LOX tank pressurized"

"Vehicle Power"

"Boom drop"

"Ignition"

"Main stage"

"Lift-off"

MR-3 - INSIDE THE PILOT'S CABIN

CAPE CANAVERAL, FLA. -- The pilot's cabin of the MR-3 spacecraft contains many items of equipment.

Instrument Panel - Instruments are located on a main instrument panel, a left console, and a right console. The main panel is directly in front of the pilot. Navigational instruments are located in the left and center sections of the panel and the periscope is located in the center. The right section of the main panel is composed of environmental system indicators and controls, electrical switches, and indicators and communication system controls. The left console includes sequencing telelights and warning panel, indicators and controls for the spacecraft's automatic pilot (ASCS), environmental control and landing systems. All told there are well over 100 lights, fuses, switches and miscellaneous controls and displays.

Periscope - Approximately two feet in front of the pilot will be located the earth periscope which will provide a 360° view of the horizon. The pilot may manually adjust for "low" or "high" magnification. On "low" he will have a view of the earth of about 1900 miles in diameter - on "high" the field of view will be reduced to about 80 miles. Altitude can be measured within ±10 nautical miles. The Mercury-earth periscope will, in addition, serve as a navigational aid.

Pilot Support Couch - The astronaut's couch is constructed of a crushable honeycomb material bonded to a fiberglas shell and lined with a rubber padding. Each astronaut has a couch contoured to his specific shape. The couch is designed to support the pilot's body loads during all phases of the flight and to protect him from the acceleration forces of launch and reentry.

Restraint System - The pilot restraint system, which consists of shoulder and chest straps, leg straps, a crotch strap, lap belt and toe guards, is designed to restrain the astronaut in the couch during maximum deceleration.

Environmental Control System - The environmental control system provides the MR-3 spacecraft cabin and the astronaut with a 100-percent oxygen environment to furnish breathing, ventilation, and pressurization gas required during the flight. The system is completely automatic, but in the event the automatic control malfunctions, manual controls can be used.

The system consists of two individual control circuits, namely the cabin circuit and the suit circuit, which will normally operate for about 28 hours. Both systems are operated simultaneously. The suit circuit is simply isolated from the cabin circuit by the astronaut closing the faceplate on his helmet. Unless there is a failure in the cabin circuit causing loss of pressure, the pilot's pressure suit will not be inflated.

Aeromedical Information - Throughout the flight the physical well-being of the pilot will be monitored. The pilot's respiration rate and depth, electrocardiogram, and body temperature will be telemetered to flight surgeons on the ground.

Pilot Communications - The astronaut may remain in touch with the ground through the use of high-frequency and ultra-high-frequency radios, radar recovery beacons, and if the situation dictates, a command receiver and/or a telegraph-type code key.

Main Battery System - Three 3,000-watt-hour batteries and one 1,500-watt-hour battery are connected in parallel to provide power for the complete mission and about a 16-hour post-landing period. A standby backup power system of 1,500-watt-hour capacity is also provided. To further insure reliable operation of the pyrotechnic system, each device has a completely isolated power feed system.

Cameras - A 16mm camera is installed to the left of the astronaut's head to photograph the instrument panel display from launch through recovery. A pilot observer camera is mounted in the main instrument panel and will also be operated from launch through recovery.

Clock - There will be a clock in the MR-3 spacecraft with three major separate operational components, (1) a standard aircraft-type elapsed time clock, (2) a "seconds from launch" digital indicator with a manual reset, and (3) a time-delay relay which is to initiate the retrograde fire sequence. When the preset time has passed, the relay closes and actuates the retrograde fire signal, at the same time sending a telemetered signal to the ground.

Altimeter - The Mercury barometer altimeter is a single-revolution indicator with a range from sea level to 100,000 feet. The dial face will have reference marks at the drogue and main parachute deployment altitudes.

At the top right corner of the main panel are located environmental displays, providing the pilot with readings of cabin pressure, temperature, humidity, and oxygen quantity remaining.

Food, Water, and Waste Storage - As with all manned capsules, MR-3 will be supplied with about 3,000 calories of non-residue food and about 6 pounds of water. The water supply, which is sufficient for at least 28 hours, is contained in two flat bottles, each fitted with an extendable tube. A container for liquid waste is located near the entrance hatch.

Survival Equipment - A survival kit on the left side of the pilot's couch will contain a personnel parachute which may be used as a third parachute backup for use in an extreme emergency. The survival package will also consist of a one-man life raft, desalting kit, shark repellant, dye markers, first aid kit, distress signals, a signal mirror, portable radio, survival ration, matches, a whistle, and 10 feet of nylon cord. Although not expected to be needed in Redstone flights it is the same kit as carried in the orbital flights where contingencies might arise which require its use.

For obvious reasons, it is not possible in this paper to include a detailed breakdown of all onboard systems and displays. Information contained in this paper is for the sole purpose of equipping newsmen with a general understanding of the types and functions of major Mercury spacecraft equipment. More detailed information on Mercury flight systems may be obtained by writing: The National Aeronautics and Space Administration, Project Mercury Public Affairs Office, Space Task Group, Langley Field, Virginia.

MERCURY REDSTONE VEHICLE

The Mercury-Redstone vehicle, a proven modification of one of the most reliable large rockets developed in the United States, will serve as the launch vehicle for the coming experiment in the nation's Mercury manned space flight program.

Personnel of NASA's George C. Marshall Space Flight Center at Huntsville, Ala., who originally developed the Redstone, first altered the rocket for use in scientific space exploration and more recently for the Mercury project. A Mercury-Redstone will soon launch an astronaut on a sub-orbital flight down the Atlantic Missile Range from Cape Canaveral, Fla., in a prelude to future U.S. manned orbital flights.

In an earlier modified version, the Redstone was used as the first stage of the Jupiter C vehicle, which oribted the free world's first satellite -- Explorer I. The greatest achievement of Explorer I was the discovery of the inner Van Allen radiation belt encircling the earth. A special long-range version of the rocket had previously boosted the first nose cone to successfully reenter the atmosphere from space.

As the initial launch vehicle to be used in the manned phases of the Mercury program, the Mercury-Redstone is a further departure from its original design. Some 800 changes were required to transform the "old" Redstone into a modern, man-carrying power plant. The MR-3 mission Redstone was built by the Chrysler Corporation.

In its redesign, the rocket's 70-inch-diameter tank section was lengthened about 6 feet, adding more than 20 seconds of burning time. This increased the vehicle's length to 83 feet -- including spacecraft and escape tower -- and its lift-off weight to 66,000 pounds. Major changes in the engine, which increased its reliability, were also necessitated. For example, provisions were built into the engine to allow for the extra burning time, and major improvements were made in the peroxide system which drives the fuel and liquid oxygen pumps and provides thrust control. Other modifications improved the engine's stability, and added an anti-fire hazard system. The Mercury-Redstone engine, developed and built by the Rocketdyne Division of North American Aviation, generates a thrust of 78,000 pounds. In addition, a new instrument compartment, a completely automatic emergency sensing system, and a spacecraft adapter were added.

The instrument compartment, produced by the Marshall Space Flight Center, houses the sensitive control system. It is located between the fuel tanks and the spacecraft. Unlike the ordinary Redstone, this compartment does not separate from the booster after burnout, rather it descends to the earth attached to the propulsion unit. The sensing or "abort" system, also developed by MSFC engineers, gives an electric signal warning of possible trouble. If this signal is given, it causes (1) termination of launch vehicle thrust, (2) separation of the spacecraft from the booster and (3) activates the spacecraft's escape rocket which propels the craft to a safe distance within a fraction of a second.

The abort system senses and is activated by such conditions as unacceptable deviations in the programmed attitude of the rocket, excessive turning rates, loss of thrust, critical irregularities of thrust or loss of electrical power. In a manned mission, the escape system could be activated by the pilot in the spacecraft, and manually in the launching blockhouse and at the NASA Mercury Control Center.

The control system of the Mercury-Redstone is less complex than the earlier ballistic model. This system, simpler and more reliable than before, uses an autopilot which minimizes drift during powered flight. Carbon vanes located in the jet exhaust of the propulsion unit coupled with air vanes are used as control surfaces to maintain proper attitude. The major portion of this system was provided by the Ford Instrument Company.

Instruments are installed in the booster to provide and telemeter some 65 measurements surveying all aspects of booster behavior during flight, such as attitude, vibration, acceleration, temperature, pressure, and thrust level. These measurements are in addition to the many channels of information which will be telemetered from the spacecraft itself during its journey. Several tracking signals are also telemetered by the booster.

Three Mercury-Redstones have been flown. The first fired on December 19, 1960, launched a heavily-instrumented production Mercury spacecraft on a successful suborbital flight. The test verified the operation of the Mercury system in the space environment.

A second vehicle, launched on January 21, carried a chimpanzee on a similar flight. The passenger, named Ham, was recovered unharmed in a test that proved the Mercury life support system in flight. The test did, however, reveal several trouble areas. Systems vibration, resulting from the greater length and altered mass distribution of the Mercury-modified Redstone, fed into the vehicle's automatic pilot and disturbed its control system. In addition, the Redstone engine ran with its throttle wide open, increasing the vehicle's speed from 4,900 to 5,300 mph. Consequently, liquid oxygen was consumed at a higher rate than usual, causing the engine to cut off prematurely. The rocket's abort sensing system reacted properly, activating the spacecraft's emergency escape device which pulled the craft away from the vehicle. Firing of the escape rocket added further to the already greater range and altitude of the craft's flight.

As a result of this flight, steps were taken to correct the problems and a test of the effectiveness of these modifications was conducted on March 24, when a Mercury-Redstone carrying a dummy spacecraft was fired from Cape Canaveral.

Project officials at the Marshall Center termed the test an unqualified success. The rocket, with its spacecraft remaining attached throughout the flight, followed its prescribed trajectory, reaching an altitude of about 100 miles and a distance of some 400 miles.

During the flight, the power plant functioned normally, the vehicle was well controlled along the planned trajectory, and all networks and ground equipment operated as programmed.

The MR-3 rocket, assembled at MSFC, will be launched by the Center's Launch Operations Directorate.

MR-3 RECOVERY OPERATIONS

Ships, aircraft, helicopters and ground vehicles will be deployed in a number of areas to effect quick recovery of the spacecraft. These areas include Cape Canaveral, to cover the possibility of an abort while the booster is either on or just off the pad; the off-shore waters near Cape Canaveral, for an abort during the early stages of flight; and the entire flight path from Cape Canaveral to beyond the predicted impact point for the case of later abort in addition to a normal landing.

The Task Force assigned to recover the astronaut and spacecraft, in NASA's MR-3 test, will be under the command of Rear Admiral F. V. H. HILLES. The force will be made up of units from the Destroyer Force, Naval Air Force, Fleet Marine Force, Service Force, Mine Force, Air Resuce Service, and the Air Force Missile Test Center. Many of the units have participated in the successful recovery exercises previously conducted. Past experience and close coordination with NASA in the development of procedures and techniques for safe but expeditious recovery have been developed over the past two years.

Admiral HILLES, Commander Destroyer Flotilla FOUR and Commander Project Mercury Recovery Force, will exercise command of the Recovery Force from the Recovery Control Room located in the National Aeronautics and Space Administration, Mercury Control Center at Cape Canaveral, Florida. The Task Force is comprised of several Task Groups, each under an individual commander.

A Task Group dispersed along the track and in the predicted landing area will be under the command of Rear Admiral G. P. KOCH, Commander Carrier Division EIGHTEEN, who will fly his flag in the aircraft carrier USS LAKE CHAMPLAIN (CVS 39). The units of this group are:

USS LAKE CHAMPLAIN (CVS 39) commanded by CAPT. R. WEYMOUTH, USN
USS DECATUR (DD 936) commanded by CDR A. W. MC LANE, USN
USS WADLEIGH (DD 689) commanded by LCDR D. W. KILEY, USN
USS ROOKS (DD 804) commanded by CDR W. H. PATTILO, USN
USS THE SULLIVANS (DD 537) commanded by CDR F.H.S. HALL, USN
USS ABBOT (DD 629) commanded by CDR R. J. NORMAN, USN
USS N.K. PERRY (DDR 883) commanded by CDR O. A. ROBERTS, USN

Air Support for this group will be provided by Patrol Squadron FIVE P2V's commanded by CDR T. H. CASEY, Jr., USN and supplemented with Air Rescue Service Aircraft. Carrier and shore based helicopters will be provided from the veteran recovery unit, Marine Air Group TWENTY SIX, commanded by COL P. T. JOHNSON, USMC.

A group positioned off shore consists of two minecraft and the USS RECOVERY (ARS 43) under the command of LCDR R. H. TAYLOR, USN.

Another group located at Cape Canaveral consists of numerous land vehicles and small craft from the Air Force Missile Test Center will be under the command of LT COL Harry E. CANNON, USAF, of the Air Force Missile Test Center.

PROJECT MERCURY PROGRESS

CAPE CANAVERAL, FLA. -- Project Mercury, the first step in the United States manned space flight program, has been vigorously pursued by the National Aeronautics and Space Administration since the project was begun two and one-half years ago.

Carrying the nation's highest priority (DX) the project has had extensive support by the Department of Defense, other Government agencies, the scientific community, and U. S. industry. Main purpose of Mercury is to provide vitally needed information for future, more advanced, manned space flights.

PROGRESS TO DATE

With the launching of a man into suborbital flight, Mercury reaches a milestone -- first major event in the research and development process which got under way in early October, 1958. Subject to successful completion of other tests, orbital flight by an American astronaut is scheduled late this year.

Project Mercury has been built on a solid body of scientific knowledge and has involved a wide variety of ground and flight tests, engineering problems and operational planning. It has involved hundreds of wind tunnel and aircraft drop tests, under direction of NASA's Space Task Group and supported by the entire NASA staff and plant. Ten major rocket launches have succeeded out of 13 tries (See attached table). Specially modified rocket boosters have been put in production; the McDonnell Mercury spacecraft has gone through the entire process of design, engineering, production and test, and 12 capsules have been completed and delivered; the seven astronauts and the operating forces have been trained, and a worldwide network of communications and tracking stations is in the final phase of construction. Cost of the program is expected to total about $400 million for the entire process from design and production, through the planned series of orbital flights.

A high-priority project, Mercury has incurred overtime work by the NASA staff and the contracting personnel. For many months the McDonnell plant at St. Louis, Missouri, and the NASA and other employes at Cape Canaveral, have been on a three-shift, seven-day week. A number of NASA employes work as much as 60 hours each week.

As with all research and development projects, Mercury has kept pace with scientific and technological advances as the work progressed, and its flight schedules -- now coming into the phase of increasing frequency -- have followed a steady course.

ORGANIZATION

Project Mercury was born a few days after the NASA was born October 1, 1958. It followed closely the formation of the NASA Space Task Group under the Office of Space Flight Programs.

Space Task Group, located at Langley Field, Virginia, has a staff of more than 700 headed by Robert R. Gilruth, Director. Gilruth formerly was Assistant Director of NASA's Langley Research Center. Walter C. Williams, Associate Director, who heads Mercury flight operations, was drawn from the Flight Research Center, Edwards, California, where he directed NASA's high speed and altitude research flights.

Greatest government support of Mercury has been given by the Department of Defense. From its large pool of experienced aeronautical engineering test pilots, NASA selected its seven astronauts. The Army, Navy and Air Force are supplying valuable medical services and personnel. Each of the services is providing communications and tracking equipment and facilities for sections of the Mercury network. By agreement with the Department, the NASA reimburses the individual armed forces for services above their normal operations.

The Air Force Space Systems Command also supplies Atlas rocket boosters and launch services, air rescue units, map-making and charting, aircraft for astronaut flight and zero G training, use of the Atlantic Missile Range, and animal specimens for the space flight program.

The U. S. Army is furnishing a tracking base at its White Sands Missile Range and amphibious vehicles for recovery needs near the launch site. The Redstone rocket, originally developed by the Army and now produced by NASA and industry, is the prime launcher for Mercury suborbital flight series.

The Navy, whose main responsibility is location, recovery and delivery of the capsule and astronaut following flight, provides ships, aircraft, early warning craft, amphibious and service vessels, Marine helicopters, and associated gear from the Atlantic fleet. The Navy is assisting with construction and operation of tracking and communications stations on its Pacific Missile Range.

Much of the progress of the Mercury project to date is due to the assistance and capability of American industry. A large share of its work has been performed by the hundreds of contractors and subcontractors from many segments of industry.

\- end -

"IF"

A Study of Contingency Planning

for

The Project Mercury Mission

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPACE TASK GROUP

Langley Field, Va.

April 10, 1961

In any research and development program in which the state-of-the art is being pressed or is about to be surmounted, there is always an undetermined number of "IF's" or unknowns. Project Mercury is just such a program. Its purpose is to investigate man's capabilities -- perhaps to confirm those capabilities -- in space.

In Mercury, extreme efforts have been made to attempt to insure operating reliability mission success and pilot safety. But these are mechanical, man-made pieces of equipment and are therefore subject to malfunction. Many repetitive or backup systems have been built into the Mercury spacecraft and related equipment. From prelaunch until safe recovery, hundreds of different possible contingencies have been anticipated. For example, in the Redstone-boosted flights:

IF space vehicle-to-ground connections indicate an unsafe condition in the booster before lift-off and umbilical disconnect, the escape system can be fired on signal from the blockhouse through the launch vehicle or through the spacecraft umbilical line.

IF an unsafe condition is indicated before lift-off but after ground umbilical disconnect, the escape system can be fired by a signal from the blockhouse ground-command equipment or by the astronaut in the cockpit.

IF an impending catastrophic failure is indicated between lift-off and escape tower separation about 140 seconds after launch, the automatic abort-sensing and implementation system (ASIS) can automatically initiate an escape sequence to remove the spacecraft from the booster, or the escape system can be fired by ground command from the blockhouse or by ground command from the Mercury Control Center, or, by the astronaut in the cockpit.

IF a mission abort becomes necessary after tower separation, the spacecraft can be separated from the booster by firing the posigrade rockets on the blunt face of the spacecraft, by automatic sequencing equipment, or by the astronaut in the cockpit. Since only about ten seconds elapse between escape-tower jettison and spacecraft separation from the booster, a near-normal Redstone-boosted mission is still possible at this point.

IF the automatic sequencing equipment does not jettison the escape tower, the astronaut in the cockpit can trigger the system manually from the cockpit.

IF the spacecraft does not automatically separate from the launch vehicle at booster burnout, separation can be initiated by ground command or by the astronaut. The astronaut can initiate separation from the cockpit manually.

IF the automatic stabilization and control system (ASCS) fails to orient the spacecraft after separation from the booster, the astronaut has two separate manual backup control systems to achieve proper attitude control.

The success of the mission and the safety of the astronaut also depend on the Life Support System, communications, and electrical power.

IF the automatic environmental control system, which provides the spacecraft cabin and astronaut with oxygen and temperature control, fails - alternate systems can be selected manually by the astronaut.

IF the spacecraft pressure vessel develops a leak during flight, the astronaut's full-pressure suit automatically inflates to five pounds per square inch to provide a second closed environment.

IF the system which supplies oxygen to the astronaut's pressure suit fails, an emergency supply, which is in parallel with the normal supply, automatically cuts into the circuit. The astronaut can start the alternate systems.

IF the spacecraft's main batteries fail during flight, a standby system of 15-hour duration capacity is activated automatically or manually by the astronaut.

IF the astronaut's primary ultra-high frequency voice link with the ground-tracking network fails, he may switch to a second UHF or a high frequency channel.

IF the astronaut's microphone fails, a second mike in parallel with the first automatically begins to operate.

IF all voice link systems fail, the astronaut may resort to a code key in the cockpit and use the telemetry transmitters and frequencies to send messages back to the tracking network.

IF command receiver "A" fails, receiver "B" may be used to receive commands from the ground.

IF one telemetry transmitter fails, another with four channels will convey aeromedical information and 90 other different measurements to ground-tracking stations.

IF all telemetry transmission equipment fails, onboard recorders will record and preserve data for use after recovery.

One of the most important phases of the flight is the landing-recovery phase. Although the retro (braking) rockets are not needed on the Redstone-boosted flights to cause reentry, one of the objectives of these flights is to exercise the retro-rocket system for "in space" qualification. This phase of the flight begins with the establishment of the proper retrorocket firing attitude and ends with the successful delivery of the spacecraft aboard the recovery ship.

IF the automatic attitude control system does not orient the spacecraft to the proper retrorocket firing attitude, the astronaut in the cockpit can assume attitude control through one of two alternate control systems.

IF the automatic timer in the cockpit does not fire the retrorockets, they can be fired by ground command from the Mercury Control Center, or, they can be fired by the astronaut in the cockpit.

IF the automatic system fails to initiate jettisoning of the spent retrorocket pack, the pilot can initiate the sequence from the cockpit.

IF the automatic system does not retract the periscope before reentry into the atmosphere, the pilot can retract it manually from the cockpit.

ALL SYSTEMS ARE AUTOMATIC IN SPACECRAFT

Since each Mercury manned mission profile is to be flown unmanned before man can fly the same profile, all systems must be designed, manufactured, and installed in the spacecraft to operate on a completely automated basis. Many of the primary flight actions and systems can be activated or controlled from the ground. However, it has not been possible to provide for ground control over all spacecraft systems. The introduction of the astronaut - the human observation and judgment factor - serves to enhance operational reliability to a great degree.

For example, automated electronic equipment which controls the initiation of the landing and recovery aids is duplicated. These systems are installed in parallel so that failure of one system should automatically cause a switchover to the alternate system.

IF, however, these parallel systems fail to deploy the six-foot-diameter drogue parachute at about 21,000 feet, the astronaut in the cockpit can deploy the chute manually. At this point, small strips of aluminum (radar chaff) are dispersed to provide a target for radar location.

IF the antenna canister, to which the drogue parachute is attached, is not jettisoned to automatically deploy the main 63-foot ringsail-type landing parachute, the pilot can manually jettison the canister and deploy the main chute.

IF the main landing parachute does not deploy or open properly, at about 10,000 feet, a reserve landing parachute is available and can be deployed by the astronaut in the cockpit.

When the main landing parachute is deployed, a SOFAR underwater bomb is deployed over the side to provide an audible sound landing-point indication, and an ultra-high frequency SARAH radio beacon begins transmitting. A can of sea-marker dye is deployed with the reserve parachute and remains attached to the spacecraft by a lanyard regardless of when the reserve chute is deployed.

On landing, an impact switch jettisons the landing parachute and initiates the remaining location and recovery aids. These include release of sea-marker dye with the reserve parachute if it has not previously been deployed, triggering a high-intensity flashing light, extension of a 16-foot whip antenna and the initiation of the operation of a high-frequency radio beacon.

IF the automatic equipment fails to release the main parachute and jettison the reserve parachute, the astronaut in the cockpit can initiate the systems manually.

IF the ultra-high frequency SARAH radio beacon fails, the high-frequency radio beacon automatically becomes the primary radio location aid.

IF both the UHF SARAH beacon and the HF recovery beacons fail to operate, the astronaut's UHF and HF radio transmitters become primary radio location aids.

IF all of the radio beacon location aids fail, the high-intensity flashing light and sea-marker dye become valuable aids to visual location by searching aircraft and ships.

IF after landing, the spacecraft should spring a leak or IF the life support system should become fouled after landing, the astronaut can escape either through the upper neck of the spacecraft or through the side hatch.

IF it becomes necessary to terminate or

IF the flight terminates early, inadvertently, elements of the Mercury recovery forces are deployed along the intended flight path to make the recovery.

IF it is necessary to abort the mission, either off-the-pad or immediately after engine ignition and lift-off, emergency rescue and recovery crew and equipment have been stationed near the launch area to make the recovery.

The foregoing is NOT a complete study of all redundant Mercury systems or of all of the vexing "IF's" which must be considered in the conduct of Mercury flight tests.

It is intended, rather, as a primer for the layman interested in acquiring a basic understanding of contingency planning in the Mercury mission and the role of the astronaut as a "backup system" capable of greatly increasing mission reliability.

MERCURY-REDSTONE ABORT

What is an "abort" in Mercury-Redstone? It is any unplanned termination of the flight mission. The possibility of such aborts has been foreseen and provided for in this program through the inclusion of an escape rocket mounted on a tower above the spacecraft and through the provision of both automatic and manual means of firing the escape rocket to pull the spacecraft away from an impending launch vehicle malfunction. In addition, an elevating boom known as a "cherry picker" has been provided to remove the pilot during an emergency arising during the final 90 minutes of the countdown.

Once the Redstone launch vehicle has received its firing signal and even before it has lifted off the pad, automatic failure-detecting systems especially built into the vehicle will sense impending trouble and will initiate an abort. When this happens, the clamp ring which attaches the spacecraft to the launch vehicle is released by explosive bolts, the retro-rocket package attached to the spacecraft heat shield is jettisoned, and the escape rocket is fired. The thrust of the escape rocket is sufficient to pull the spacecraft to an altitude of over 2000 feet and well to one side of the launch pad. As the spacecraft reaches its peak altitude in this short flight explosive bolts are fired to release another clamp ring which attaches the escape rocket and tower to the spacecraft. A small rocket mounted beneath the escape rocket begins thrusting to carry the tower and now empty escape rocket away from the spacecraft and clear the way for deploying parachutes from the small upper end of the spacecraft. When the tower has gone the small 6-foot drogue parachute is deployed. This parachute stops any rotation of the spacecraft, then pulls away the antenna can and deploys the 63-foot main landing parachute. When the landing parachute is deployed the heat shield is released and this, in turn, extends the landing-impact bag which forms a pneumatic cushion to absorb the shock of landing. The impact bag is needed primarily for impacts on land but is also required for landings on water when wind and waves are high.

In addition to the automatic system described above, the escape rocket can be fired, if necessary, by the astronaut or by radio command from the Redstone blockhouse, the Mercury Control Center, or the Atlantic Missile Range range safety officer from the AMR Central Control Building.

For impending booster malfunctions after lift-off the automatic system described above goes through the same sequence to assure that the spacecraft is moved well away from any potential booster explosion.

For other emergencies such as systems malfunctions within the spacecraft the astronaut and the flight monitors in the Mercury Control Center can also initiate an abort, thus separating the spacecraft from the booster and safely terminating the flight.

The attached brochure entitled "IF" describes a number of the possible emergencies that could lead to an abort in a Mercury flight mission and also describes the many steps that have been taken to minimize the number of such emergencies that could reach the stage of requiring an abort.

JOHN HERSCHEL GLENN, Jr. **BIOGRAPHY**
Project Mercury Astronaut

John H. Glenn, Jr., a lieutenant colonel in the U. S. Marine Corps, was born July 18, 1921 in Cambridge, Ohio. He considers New Concord, Ohio, his permanent home. He is 5 feet 10½ inches tall, weighs 168 pounds and has green eyes and red hair. His wife is the former Anna Margaret Castor, daughter of Dr. and Mrs. H. W. Castor. The Glenns have two children: John David, 14, and Carolyn Ann, 13. His parents are Mr. and Mrs. John H. Glenn. The elder Mr. Glenn is a retired operator of a plumbing and heating business. The elder Glenns and Castors all live on Bloomfield Road in New Concord. Glenn also has a sister, Mrs. Jean Pinkston, of Cambridge.

Glenn attended primary and high schools in Concord and attended Muskingum College there also. Glenn entered the Naval Aviation Cadet Program in March 1942. He was graduated from this program and commissioned in the Marine Corps a year later. After advanced training, he joined Marine Fighter Squadron 155 and spent a year flying F4U fighters in the Marshall Islands. During his World War II service he flew 59 combat missions. After the war, he was a member of Fighter Squadron 218 on North China patrol and had duty in Guam. From June 1948 to December 1950, he was an instructor in advanced flight training at Corpus Christi, Texas. Glenn then attended Amphibious Warfare School at Quantico, Virginia. In Korea he flew 63 missions with Marine Fighter Squadrons 311 and 27 while an exchange pilot with the Air Force in F-86 Sabrejets. In the last nine days of fighting in Korea, he downed three MIG's in combat along the Yalu River. After Korea, Glenn attended Test Pilot School at the Naval Air Test Center, Patuxent River, Maryland. After graduation, he was project officer on a number of aircraft. He was assigned to the Fighter Design Branch of the Navy Bureau of Aeronautics in Washington from November 1956 to April 1959, during which time he also attended the University of Maryland. In April 1959 he was selected as an astronaut for Project Mercury.

Glenn has been awarded the Distinguished Flying Cross on five occasions, and holds the Air Medal with 18 Clusters for his service during World War II and Korea. In July 1957, while project officer of the F8U, he set a transcontinental speed record from Los Angeles to New York, spanning the country in 3 hours and 23 minutes. This was the first transcontinental flight to average supersonic speed. He has more than 5,100 hours of flying time, including 1,600 hours in jet aircraft.

The Glenn family hobbies are boating and water skiing.

VIRGIL IVAN GRISSOM BIOGRAPHY
Project Mercury Astronaut

Virgil I. Grissom, a captain in the U. S. Air Force, was born April 3, 1926 in Mitchell, Indiana. He is 5 feet 7 inches tall, weighs 150 pounds, has brown hair and brown eyes. Mrs. Grissom is the former Betty L. Moore. They have two sons: Scott, 11,and Mark, 7. Grissom's parents, Mr. and Mrs. Dennis D. Grissom, live at 715 Baker Street, Mitchell. He has two brothers: Norman, of Mitchell; and Lowell, a senior at Indiana University; and a sister, Mrs. Joe Beavers, who resides in Baltimore, Maryland. His wife's father, Claude Moore, lives in Mitchell; her mother is deceased.

Grissom attended primary and high schools in Mitchell. He first entered the Air Force in 1944 as an aviation cadet and was discharged in November 1945. He was graduated from Purdue University with a degree in mechanical engineering in 1950. He returned to aviation cadet training after his graduation from Purdue and received his wings in March 1951. Grissom joined the 75th Fighter-Interceptor Squadron at Presque Isle, Maine, as an F-86 fighter pilot. He flew 100 combat missions in Korea in F-86's with the 334th Fighter-Interceptor Squadron. He left Korea in June 1952 and became a jet pilot instructor at Bryan, Texas. In August 1955 he went to the Air Force Institute of Technology at Wright-Patterson Air Force Base, Ohio, to study aeronautical engineering. In October 1956 he attended the Test Pilot School at Edwards Air Force Base, California, and returned to Wright-Patterson Air Force Base in May 1957 as a test pilot assigned to the Fighter Branch. He has flown more than 3,400 hours, over 2,500 in jets.

Grissom has been awarded the Distinguished Flying Cross and Air Medal with Cluster for service in Korea.

His hobbies are hunting and fishing.

ALAN BARLETT SHEPARD, JR. BIOGRAPHY
Project Mercury Astronaut

Alan B. Shepard, Jr., a commander in the U.S. Navy, was born November 18, 1923 in East Derry, New Hampshire. The 37-year-old astronaut is 5 feet 11 inches tall, weighs 160 pounds, has blue eyes and brown hair. Shepard is married to the former Louise Brewer of Kennett Square, Pennsylvania. The couple has two daughters: Juliana, 9, and Laura, 13. His parents, Col. and Mrs. Alan B. Shepard, live in East Derry where the elder Shepard, a retired officer of the Army of the United States, is an insurance broker. Shepard's sister, Mrs. Pauline S. Sherman, resides in Attleboro, Massachusetts.

Shepard attended primary school in East Derry and was graduated from Pinkerton Academy, Derry, New Hampshire, 1940. He studied one year at Admiral Farragut Academy, Toms River, New Jersey, and then entered the Naval Academy, Annapolis. He was graduated from Annapolis in 1944. He was graduated from the Naval War College, Newport, Rhode Island, in 1958.

The astronaut saw service on the destroyer COGSWELL in the Pacific during World War II. He then entered flying training at Corpus Christi, Texas, and Pensacola, Florida. He received his wings in March 1947. Subsequent service was in Fighter Squadron 42 at the Norfolk Naval Air Station and Jacksonville, Florida. He also served several tours aboard aircraft carriers in the Mediterranean. Shepard went to USN Test Pilot School at Patuxent River, Maryland, in 1950 and served two tours in flight test work there. During this service he took part in high altitude tests to obtain data on light at different altitudes and on a variety of air masses over the North American Continent. He also took part in experiments in test and development of the Navy's in-flight refueling system, carrier suitability trials of the F2H3 Banshee, and Navy trials of the first angled carrier deck. Between his flight-test tours at Patuxent, Shepard was assigned to Fighter Squadron 193 at Moffett Field, California, a night fighter unit flying Banshee jets. He was Operations Officer of this squadron and made two tours with it to the Western Pacific on board the carrier ORISKANY. He has been engaged in the test of the F3H Demon, F8U Crusader, F4D Skyray, and F11F Tigercat. He was project test pilot on the F5D Skylancer. The last five months at Patuxent were spent as an instructor in the Test Pilot School. After his graduation from the Naval War College, Shepard joined the staff of the Commander-in-Chief, Atlantic Fleet, as aircraft readiness officer. He has 3,700 hours of flying time, 1,800 in jets.

Shepard's hobbies are golf, ice skating, and water skiing.

ASTRONAUT TRAINING PROGRAM SUMMARY

Here are some of the general training activities that the astronauts have undergone since May 1959.

1. Systems and vehicle familiarization. - The astronauts were given lectures in the vehicle systems by NASA and several of the contracting companies. Langley Research Center gave them a 50-hour course in astronautics. McDonnell gave the astronauts lectures on the Mercury subsystems and sessions on code training. Lectures were given to the astronauts by Dr. William K. Douglas on aeromedical problems of space flight. At the Wright Air Development Division, the astronauts were indoctrinated with the Mercury pressure suit, operation of the suit in low pressure and heat chambers, on the centrifuge, and during weightless flying. At the Naval Medical Research Institute, they were familiarized with the physiological effects of a high CO_2 content in the environment. The Army Ballistic Missile Agency indoctrinated the astronauts on the Redstone. The Air Force Ballistic Missile Division and its associated contractors indoctrinated the astronauts on the Atlas.

2. Star recognition. - Each astronaut was given concentrated personal instruction on the elements of celestial navigation and on star recognition at the Morehead Planetarium, Chapel Hill, North Carolina, during February 1961. A trainer simulating the celestial view through a capsule window permitted astronaut practice in correcting yaw drift.

3. Desert survival. - A 5½-day course in desert survival training was accomplished at the U. S. Air Force Training Command Survival School at Stead Air Force Base, Nevada. The course consisted of survival techniques through lectures, demonstrations, and application in a representative desert environment. The Mercury survival kit was also evaluated.

4. Egress training. - During March and April 1960 open-water normal egress training was conducted in the Gulf of Mexico off Pensacola, Florida. Each astronaut made at least 2 egresses through the upper hatch. State 3-4 seas (up to 10-foot swells) were experienced. Water survival training was also accomplished during this program. A training program of side hatch egress was

accomplished in August 1960 at Langley. Each of the astronauts made underwater egresses, some of which were made in the Mercury pressure suit.

5. Specialty assignments. - The astronauts contributed to the Mercury development program by working directly with Space Task Group engineers and by attending NASA-McDonnell coordination meetings and Mercury-Redstone or Mercury-Atlas panel meetings in their specialty areas. Astronaut specialty areas are:

a. Carpenter - Communication equipment and procedures, periscope operation, navigational aids and procedures.

b. Cooper - Redstone booster, including configuration, trajectory, aerodynamics, countdown, and flight procedures.

c. Glenn - Cockpit layout or configuration, instrumentation, and controls for capsule and simulation.

d. Grissom - Reaction control system, hand controller, autopilot and horizon scanners.

e. Schirra - Environmental control systems, pilot support and restraint, pressure suit, aeromedical monitoring.

f. Shepard - Recovery systems, parachutes, recovery aids, recovery procedures and range network.

g. Slayton - Atlas booster and escape system including Atlas configuration, trajectory, aerodynamics, countdown, and flight procedures.

Some of the more specific training programs and equipment are:

1. Centrifuge programs. - During the three Johnsville centrifuge programs, astronauts received extensive training in the full-scale simulations of the Mercury-Redstone and Mercury-Atlas flights and the aborts associated with each type of trajectory. The primary purpose of these programs was to give the astronauts training in capsule attitude and rate control, monitoring normal sequencing functions, and

rectifying emergency problems while being exposed to environmental conditions that might be associated with the Mercury-Redstone and Mercury-Atlas profiles. The environmental factors emphasized during these programs were acceleration, reduced cabin pressures, and Mercury pressure suit condition, and the effects of these conditions on astronaut performance. The astronauts also received additional training with voice communications and code. Further evaluation of the McDonnell hand controller, couch, capsule lighting and instrument design was also accomplished during these programs.

2. Weightless flying. - The astronauts received familiarization with weightlessness by being flown as passengers through several parabolic trajectories in C131, C135, and F-100 type aircraft. The durations of weightlessness varied from 15 seconds to a minute, and the number of parabolas per flight varied from 3 to 24, depending upon the type of aircraft being used. Each astronaut has experienced approximately 40 minutes of weightlessness. During these flights, data were collected on the astronaut's ability to perform a simple tracking task, changes in normal speech, experience in eating and drinking, visual acuity and visual orientation problems for various body positions, and post weightless psychomotor testing.

3. Procedures trainers. - The procedures trainer is a complete mockup of the Mercury spacecraft with operating instruments and controls connected to an analog computer to simulate all flight conditions. This trainer enables astronaut training with practically all of the environmental variables of the Mercury-Redstone and Mercury-Atlas trajectories with the exception of the involved accelerations. Primary emphasis has been astronaut training on the spacecraft systems, operations and procedures. Voice communications and pressure suit experience is also accomplished during this program. Because of the trainer flexibility, the astronaut can practice with any of the control-display modes utilizing a variety of retrofire misalinement torques and reentry oscillations. Astronauts have concentrated on flying Mercury-Redstone mission simulations for the past several months, but they have also had extensive training in flying the Mercury-Atlas mission, controlling capsule attitudes and rates during retrofire practice sessions, and resolving a multitude of inflight systems failures.

4. ALFA trainer. - The astronauts received extensive training in the Air Lubricated Free Axis Trainer utilizing a periscope display or a window with a simulated earth horizon for controlling actual capsule attitudes and rates during orbit and retrorocket firing. The astronauts control the capsule by a Reaction Control System consisting of pressurized air reaction control nozzles. The astronauts received periodic training in the ALFA trainer for the past year.

5. MASTIF. - In March 1960 the astronauts received training in the multiple axes space test inertia facility located at NASA-Lewis Research Center. The purpose of the study was twofold: (1) to give the astronauts familiarization with physiological and psychological effects of tumbling, and (2) to recover from tumbling when it occurs. A slow buildup of axes and rates was used to a maximum of 30 rpm rotating about all three axes. The astronauts in all cases were able to stop tumbling in a relatively short period of time, using the Mercury-type rate indicator and hand controller.

6. Summary of experience in pressure suit. - The astronauts have had extensive experience in the pressure suit, a good deal of it while undergoing training for Mercury-Redstone and Mercury-Atlas flight missions. During the early Mercury pressure suit development stage, much of the astronauts' experience in the suit has been concerned with fittings both at Goodrich and Langley. In the past year, however, almost all the training in the Centrifuge, Procedures Trainers, Egress Trainer, Environmental Control Trainer at ACEL, and weightless flight training have incorporated the Mercury pressure suit in the overall training programs.

7. Flight record. - The astronauts maintain flying proficiency as part of their regular astronaut training activities. Currently two F-106's have been assigned to them for these purposes. The astronauts continue to obtain regular proficiency and annual instrument checks in T-33 aircraft assigned to the Tactical Air Command, Langley Air Force Base, Virginia.