SPACE

# First U. S. Orbital Flight

## Here are the official details prepared in advance and made available by the National Aeronautics and Space Administration on the first U.S. manned orbital flight.

➤ MISSION—Manned orbital flight to evaluate the performance of a man-spacecraft system, to investigate man's capabilities in the space environment, and to obtain the pilot's opinions on the operational suitability of the spacecraft and supporting systems for manned space flight.

LAUNCH DATE—Scheduled for the latter part of January, the launch will be attempted between 7:30 a.m. and 12:30 p.m. and may "slip" on a day-to-day basis as required. Launch timing will be planned to provide at least three hours of daylight search time in the probable recovery areas.

FLIGHT DURATION—Depending on literally thousands of variables, the Mercury operations director, Manned Spacecraft Center associate director Walter C. Williams, may elect a one, two or three-orbit mission. That decision will be made only minutes before launch and may be changed at any time during the mission.

Recovery after one full orbit is planned for about 500 miles east of Bermuda; after two orbits, some 500 miles south of Bermuda; three orbits, about 800 miles southeast of Cape Canaveral, Fla.

Each orbit takes about 90 minutes, carrying the craft between 100 and 150 miles altitude, 32 degrees north and south of the equator.

If the mission ends after orbit one or two, the astronaut will be moved to the Kindley Air Force Base Hospital in Bermuda for a 48-hour rest and debriefing. If the mission goes a full three orbits, he will be flown to Grand Turk Island in the Bahamas for a similar operation before being returned to the mainland.

PILOT—Astronaut John H. Glenn Jr., 40. Lt. Col. Glenn of the U.S. Marine Corps has been with the National Aeronautics and Space Administration for three years on a detached duty basis. Backup pilot for this flight is Astronaut M. Scott Carpenter, 36.

SPACECRAFT—Bell-shaped, the MA-6 craft—listed as No. 13 in engineering documents and named "Friendship 7" by Astronaut Glenn—stands nine and a half feet high and measures six feet across the base. Spacecraft weight at launch will be about 4,200 pounds; spacecraft weight in orbit (after jettisoning of escape tower) will be 3,000 pounds; on-the-water recovery weight will be 2,400 pounds. Prime contractor for the spacecraft is McDonnell Aircraft Corp. of St. Louis, Mo.

LAUNCH VEHICLE—A modified Atlas D is used to launch orbital Mercury missions, reaching a speed of 17,500 miles per hour. At launch, booster and spacecraft stand 93 feet tall, including a 16-foot tower above the spacecraft.

The tower contains a solid propellant rocket hooked to an abort sensing system. Should trouble develop on the launch pad or in the early boost phase of the mission, the escape system will be triggered—automatically or by the pilot or from the ground—to pull the spacecraft away from the booster. The booster is manufactured by the Astronautics Division of General Dynamics Corp.

NETWORK—The Mercury tracking network consists of 18 stations around the world, including two ships, one on the equator in the Atlantic off the coast of Africa and the other in the Indian Ocean. Some 500 technicians man these stations, all of which are in radio or cable communication with the Mercury Control Center at the Cape via the NASA Goddard Spaceflight Center at Greenbelt, Md.

RECOVERY—More than 20 ships will be deployed in the Atlantic alone to take care of prime and contingency recovery areas. In addition, ships and rescue planes around the world will go into action in the event of an emergency landing. More than 15,000 men will have a hand in the recovery, search and rescue effort.

RESPONSIBILITIES—Project Mercury, the nation's first manned space flight research project, was conceived and is directed by NASA, the civilian agency of the Government charged with the exploration of space for peaceful and scientific purposes.

*READY TO ORBIT—Mercury astronaut John H. Glenn, Jr., beside a training device at Langley Air Force Base, Va., is the first U.S. astronaut scheduled to orbit the earth.*

Technical project direction for Mercury is supplied by NASA's Manned Spacecraft Center, directed by Robert R. Gilruth at Langley Field, Va., and soon to move to Houston, Texas. The Department of Defense, largely through the Air Force and Navy, provides vital support for Mercury. In all, more than 30,000 persons will have a part of this mission, including Government and industry.

PROJECT COST—Total Project Mercury cost through orbital flight is estimated at $400 million. About $160 million will have gone to the prime spacecraft contractor, McDonnell and its subcontractors and suppliers; $95 million for the network operations; $85 million for boosters, including Atlases, Redstones and Little Joes; $25 million for recovery operations, and roughly $35 million for supporting research in diverse areas.

MISSION PILOT TASKS—The MA-6 pilot will perform many control tasks during flight to obtain maximum data on spacecraft performance, his own reactions to weightlessness and stress, and to study the characteristics of the earth and stars from his vantage point more than 100 miles above the earth's surface.

The astronaut will participate actively during the flight. This will include the following tasks:

1. Manage the operation of all spacecraft systems, particularly the attitude control system, electrical system, environmental control system, and communications systems.
2. Observe and correct any discrepancies in system operation. Discrepancies will be correlated with telemetered observations received at ground stations.
3. Monitor critical events during launch, and terminate the mission if necessary.
4. Maintain a complete navigation log during flight which will enable him to compute his retro-fire time if ground communications should fail. This onboard navigation will include periscope ground sightings which indicate position over ground and altitude.
5. Ground communications to receive updated retro-fire information, and receive detailed behavior of spacecraft systems as determined from ground telemetry.
6. Evaluate his physical condition to augment the biomedical data which are telemetered to the ground.

About every 30 minutes, the pilot will make detailed voice reports on spacecraft systems and operations conditions. His own transmissions will include critical information as to mode of control, precise attitude, planned retro-fire time, control system fuel, oxygen, and coolant.

POWERED FLIGHT—The manned Mercury spacecraft will be launched atop an Atlas from Cape Canaveral following a two-day split countdown. Technical conditions

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or weather could, of course, delay the launch from minutes to days.

According to the flight plan, the spacecraft will be launched on a path along the Project Mercury Worldwide Tracking Range on a launch heading of about 72 degrees—just north of east from Cape Canaveral.

An internal programmer in the Atlas will guide the vehicle from lift-off until staging occurs. All of the Atlas liquid-propellant engines are ignited before lift-off.

At staging, about two minutes after lift-off, the two booster engines will drop off and the sustainer and vernier engines will continue to accelerate the vehicle. Staging occurs at an altitude of about 40 miles and a range of about 45 miles from the launch pad.

During the first two and a half minutes of flight, an electronic brain, called the Abort Sensing and Implementation System (ASIS), is capable of sensing impending trouble in the rocket and triggering the escape rocket. The astronaut can also trigger the Mercury escape rocket to pull the spacecraft away from the Atlas.

About 20 seconds after staging, and assuming the flight is proceeding as planned, the 16-foot escape tower and rocket will be jettisoned. Landing systems will be armed. The Mercury-Atlas vehicle will continue to accelerate toward the orbit insertion point guided by ground command guidance.

Until orbital insertion, the abort sensing system will continue to watch for trouble. If significant deviation should occur, the system will actuate circuits to release the spacecraft-to-Atlas clamp ring and fire the posigrade rockets on the base of the spacecraft.

About five minutes after lift-off, guidance ground command will shut down the sustainer and vernier engines. As the engines shut down, the spacecraft-to-booster clamp ring is released automatically and posigrade rockets are fired to separate the craft from the Atlas.

ORBITAL INSERTION—After a few seconds of automatic damping—getting rid of any unusual motions—the spacecraft will swing 180 degrees so that the blunt face of the craft is turned forward and upward 34 degrees above the horizontal. From that point on during orbital flight, the spacecraft can be controlled in proper attitude automatically or manually by the pilot.

If all goes well, the Mercury spacecraft will be inserted into orbit in the vicinity of Bermuda. By that time the vehicle will be at an altitude of approximately 100 miles and traveling at a speed of about 17,500 miles per hour. At engine cut-off, the craft will have been subjected to a "g" force of more than seven and one-half. Reentry "g" will also reach seven and one-half.

A three-orbit flight will last approximately four and three-quarter hours; a two-orbit flight, three and one-quarter hours; one orbit, one and three-quarter hours. The Mercury craft will reach a peak altitude, or apogee, of about 150 statute miles off the west coast of Australia and a low point, perigee, of 100 miles, at the insertion point near Bermuda.

*BIG WHEEL—A 70-foot wheel weighing 40 tons is machined to greater precision for its size than a fine watch. Constructed by McKiernan-Terry Corp. for Bell Telephone Laboratories, New York, it will be used to point a huge antenna for experiments in satellite communications.*

REENTRY—After the desired number of orbits, as the spacecraft approaches the west coast of North America, retro or braking rockets will be fired to initiate reentry.

Shortly after the retrorockets are fired, the exhausted rocket package will be jettisoned and the spacecraft automatically will assume reentry attitude. "Friendship 7" will begin to encounter more dense atmosphere of the earth approximately over the east coast at an altitude of about 55 miles. At this point, temperatures will start mounting on the spacecraft's ablation heat shield.

On a nominal mission, peak reentry temperature of about 3,000 degrees Fahrenheit will occur at 25 miles altitude while the spacecraft is moving at nearly 15,000 miles per hour. All told, the craft will sustain temperatures in this neighborhood for about two minutes.

Almost coincident with the heat pulse is a dramatic reduction in capsule speed. Between 55 miles and 12 miles altitude—covering a distance of 760 miles—spacecraft velocity should go from 17,500 miles per hour down to 270 miles per hour in a little more than five minutes.

At about 21,000 feet, a six-foot diameter drogue parachute will be opened to stabilize the craft. At about 10,000 feet, a 63-foot main landing parachute will unfurl from the neck of the craft.

On touchdown, the main chute will be jettisoned. On-board electrical equipment will be shut down, and location aids will be activated.

RECOVERY—Several new recovery techniques will be tried operationally for the first time in MA-6. If all is well, the astronaut, on leaving the craft via the neck or the side hatch, should be greeted by two frogmen who by that time will have cinched a new flotation belt around the base of the craft. This is to add to the craft's seaworthiness.

Plans call for the frogmen to leap into the water with the quick-inflating belt from one of several recovery helicopters staged off aircraft carriers in the three prime recovery zones. As soon as they have secured the three-foot-high belt, the astronaut will emerge, grab a "horse collar" lift from a hovering helicopter and be whisked up into the copter and to a nearby carrier.

Meanwhile, a smaller ship is to go alongside the spacecraft and hoist it onto its deck for transfer to the carrier or direct delivery to the Cape.

• Science News Letter, 81:51 January 27, 1962

PUBLIC SAFETY

# Accident Death Rate All-Time Low in 1961

➤ THE UNITED STATES death rate due to accidents plunged to an all-time low in 1961.

It was the first time that the accident death rate in the United States dipped as low as 50 per 100,000 population, which is about three percent under the previous low set in 1960, statistics compiled by the Metropolitan Life Insurance Company show. Provisional figures show that the actual accident death toll was about 91,500 lives in 1961, which represents a decrease of approximately 1,500 from the year before.

This relatively favorable record reflects largely the reduction of deaths from accidents in and about the home. About 26,500 persons were killed in such mishaps during 1961, or approximately 1,000 below the number of similar deaths recorded the year before.

• Science News Letter, 81:54 January 27, 1962

SPACE

# Echo Balloon Fails In First Space Test

➤ THE NEW TYPE green-tinted inflatable Echo balloon (SNL, 81:34, Jan. 20, 1962) burst apart shortly after launching Jan. 15. More tests are planned as a prelude to the orbiting of an experimental Echo II communications satellite.

The 135-foot sphere was nearly inflated in two seconds. Television pictures showed that it expanded much faster than expected.

• Science News Letter, 81:54 January 27, 1962