

# MARINER VENUS / MERCURY 1973

## STATUS BULLETIN

### FOURTH TRAJECTORY CORRECTION MANUEVER SUCCESSFUL

On 9 and 10 May, Mariner 10 successfully accomplished phases A and B of the two-part TCM 4. This maneuver was required to reduce the closest approach distance to Mercury at the time for the second encounter (21 September 1974) from about 800,000 km (500,000 miles) to the desired 46,000 km (29500 miles) above the sunlit side from where the best TV pictures can be taken. A total velocity change of nearly 80 meters/second (180 mph) was achieved by means of two sequences as follows:

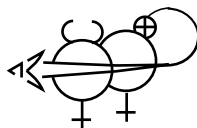
On 9 May at 12:44 p.m. PDT, the spacecraft began a 181-deg roll turn lasting 16 minutes and then performed at 27.5-deg pitch turn in 2.5 minutes. The propulsion motor was ignited at 1:05 p.m. PDT, and it burned for 195 seconds in order to change the spacecraft velocity by 50 meters/second. During this maneuver, excellent performance was evidenced by the observed doppler shift of 688.3 Hz which was within 1.4 Hz of the predicted value. To satisfy spacecraft thermal constraints, a 24-hour cooling-off period was inserted before the remainder of the required 77.6 meter/second velocity change was attempted. Starting at 12:44 p.m. on 10 May, the desired spacecraft attitude was obtained by means of a 178-deg roll turn followed by a 36-deg pitch turn. At 1:06 p.m. PDT, the motor was ignited for 139 seconds in order to achieve a 27.6-meter/second velocity change. Excellent performance was again indicated by the doppler shift of 351 Hz which was only about 5 Hz above the predicted value in the spacecraft/Earth direction. The combined results of the two maneuver segments indicate that the achieved velocity change was within 1% of that desired. About 10 days of tracking will be required, however, to confirm the unobserved velocity components.

During the two-part maneuver, the attitude control gas usage was entirely normal. The remaining gas supply appears to be adequate for accomplishing a successful second encounter with Mercury. For this encounter, the target zone is 46,000 km above the planet's 65-deg south latitude parallel on the sunlit side. From this vantage point, TV pictures can be taken of the South Pole as well as of the central north-south strip which was foreshortened along the planet's limb on all pictures taken while approaching and leaving the planet last 29 March during the close night-side flyby.

During the 176-day interval between the two encounters with Mercury, the planet will have revolved around the Sun twice and will have rotated on its axis exactly three times. Consequently, Mercury's identical surface features will again be illuminated, producing the same shadow patterns. However, the TV pictures will be taken from entirely different angles.

To help conserve the remaining attitude control gas supply, Mariner 10's solar panels have been differentially oriented relative to the Sun so that the solar wind can counteract the spacecraft's tendency to oscillate. Instructions have been stored in the spacecraft's central computer and sequencer for automatically updating the pointing angles for both the Canopus reference direction in space and the high-gain antenna orientation toward Earth.

Mariner 10 is now over 148 million miles from Earth, at which distance it takes 13.2 minutes for one-way radio communication. On 6 June, the spacecraft will pass on the opposite side of the Sun (conjunction) as seen from Earth. If another course correction should be needed, it could be performed



early in July either to refine the present flight path or to retarget it for another night-side pass which would permit further study of Mercury's strange magnetic field from an altitude of 8000 km (5000 miles).

On 14 May, the Mariner Science Team began some astronomy experiments by searching the region facing away from the Sun for ultraviolet sources. By the end of 1974, U.S. spacecraft will have provided scientists of the World the opportunity to study each of Earth's five nearest celestial neighbors (Moon, Venus, Mars, Jupiter, and Mercury) at least twice from relatively close range or actual landings. Pioneer 11 has been targeted to fly under Jupiter on 3 December so that the planet's enormous gravitational force will deflect the spacecraft into a path inclined about 15 degrees above the Ecliptic plane. It will then continue on the new path and reach Saturn late in 1979 as shown by the diagram.

### MARINER 10; PIONEERS 10 & 11 TRAJECTORIES

