

MARINER VENUS / MERCURY 1973 STATUS BULLETIN

FIFTH TRAJECTORY CORRECTION MANEUVER SUCCESSFUL

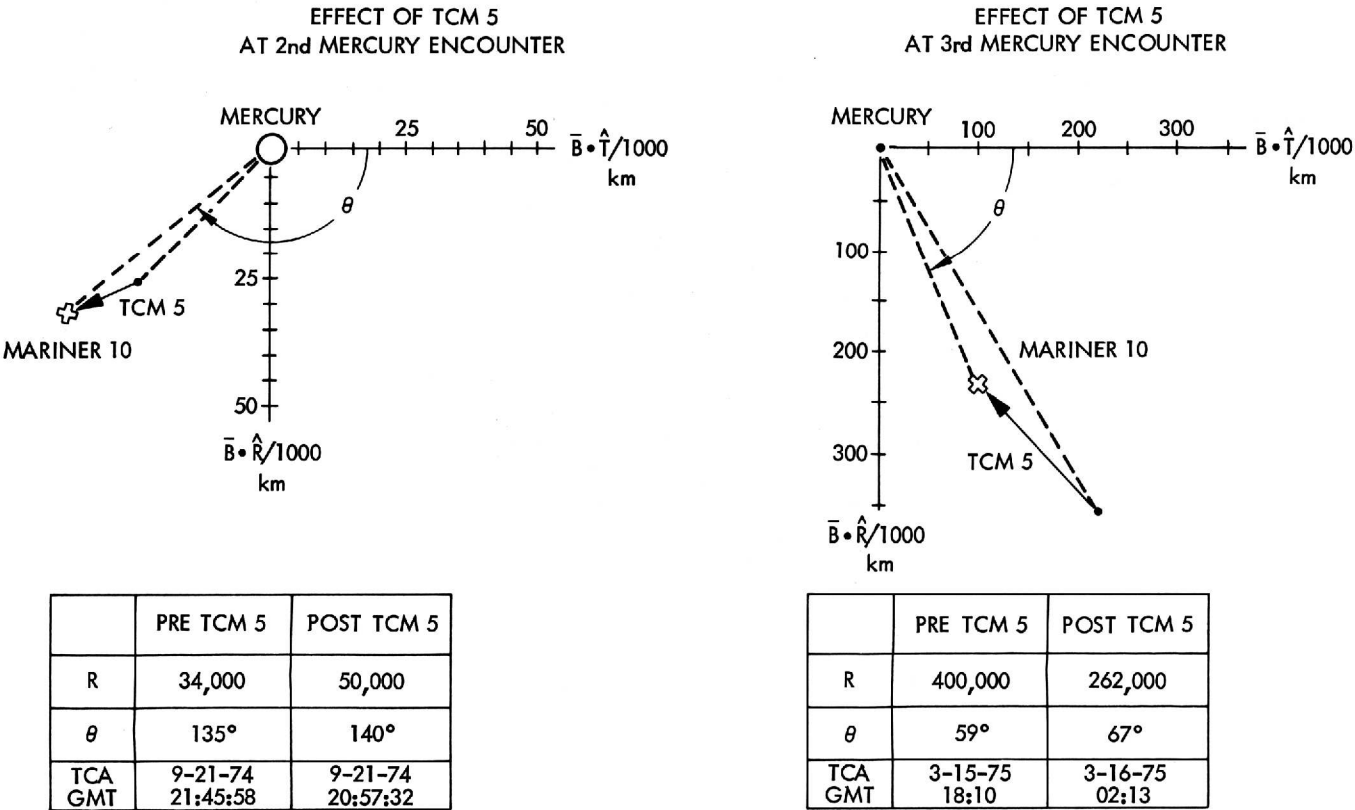
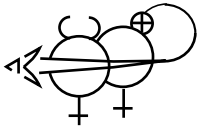


Fig. 1. Effect of TCM 5 at the Second and Third Mercury Encounters

TCM 5 PERFORMED ON 2 JULY

At 1:09 p.m. PDT on 2 July, Mariner 10's rocket motor was fired for 18.8 seconds to change the spacecraft speed by 3.32 meters/second (7.4 mph). The doppler shift observed in the radio signal frequency at DSS 14 indicated that the desired velocity change relative to Earth had been achieved. But it will take about a week of tracking data to be certain that the correct velocity relative to the Sun had also been achieved.

Without a correction to its previous course, Mariner 10 would have passed about 34,000 km (20,000 miles) from Mercury's sunnyside, at a point about 45 deg below the planet's equator. With its new orbit velocity, Mariner is expected to pass 16,000 km (10,000 miles) farther away from Mercury, or about 50,000 km (30,000 miles) out at about 40°S latitude, as shown by Fig. 1.



There were two reasons why TCM 5 was performed: First, a more favorable passage was desired at the second Mercury encounter (Mercury II) in terms of Science data return. The second objective was to allow the retargeting of the resultant trajectory between Mercury II and Mercury III to a variety of realizable aim points at Mercury III which would not exceed Mariner 10's remaining trajectory correction capability. Without further maneuvers, the B-plane target point at Mercury III is depicted on the right side of Fig. 1.

The TCM 5 viewing geometry relative to Earth and Sun is shown in Fig. 2. To provide the necessary thrust direction in space for the maneuver, the spacecraft was first roll-turned 56.1 deg and then pitch-turned 57.8 deg. The maneuver retarded Mariner's velocity relative to the Sun, resulting in a 48.5-minute earlier arrival time at Mercury II, or 13:57 PDT on 21 September 1974. Also its velocity relative to Earth appeared to be increased, causing the observed doppler frequency shift. The maneuver placed Mariner 10 on a trajectory that will provide a third encounter with Mercury on 16 March 1975 at 19:13 PDT.

Since Mercury will have the same side facing the Sun as it did during Mercury I on 29 March, scientists hope to obtain better photo coverage of Mercury's South Pole as well as the central strip which was at the planet's limb during the night-side flyby.

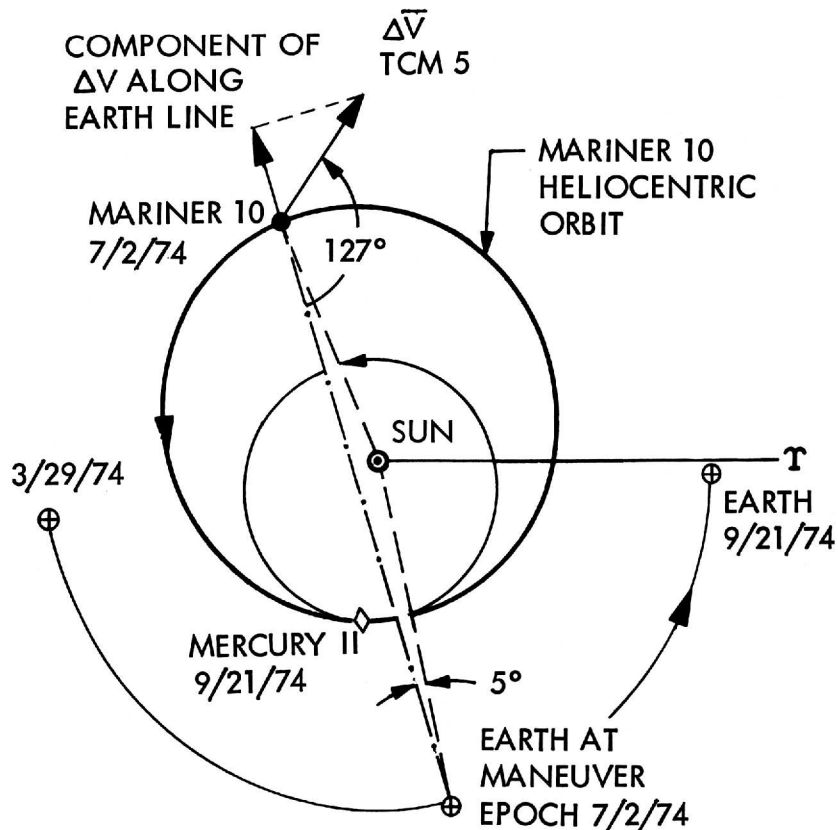


Fig. 2 Viewing geometry of TCM 5 Relative to Earth and Sun