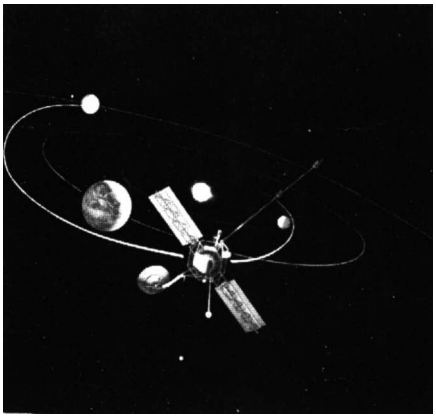
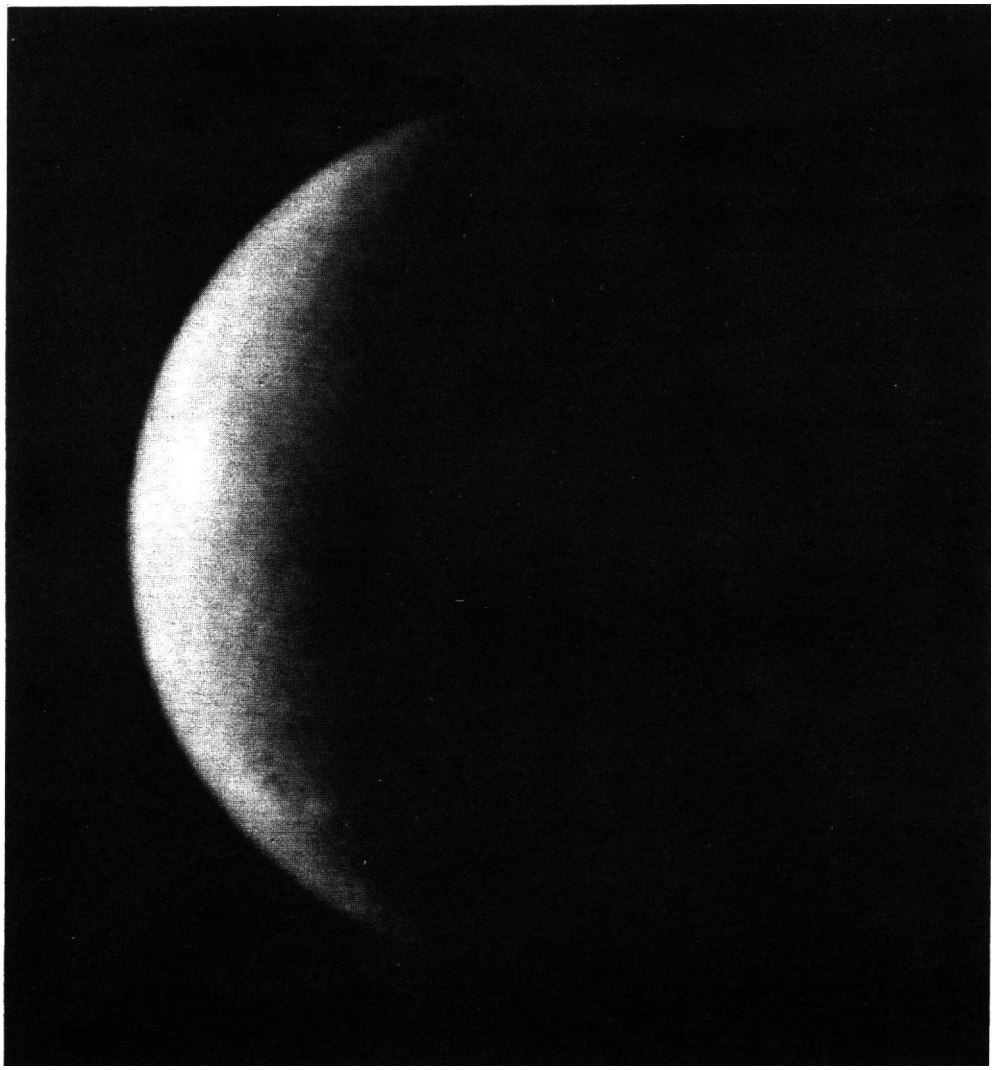


MARINER VENUS / MERCURY 1973

STATUS BULLETIN

FIRST FAR ENCOUNTER PHOTOS OF MERCURY BY MARINER 10



This computer enhanced Mariner 10 photograph of the planet Mercury was taken March 24, 1974 from a distance of 2,700,000 miles. The picture of the partially illuminated disc reveals a prominent bright area of unknown origin about 250 miles in diameter which has never been seen before in telescopic photographs from Earth. Additional photographs of this area will be obtained in succeeding days with higher resolution as the spacecraft approaches its point of closest approach to the planet on March 29.

MARINER VENUS/MERCURY 1973 PROJECT OFFICE
Jet Propulsion Labratory California Institute of Technology
National Areonautics and Space Administration
Pasadena, California

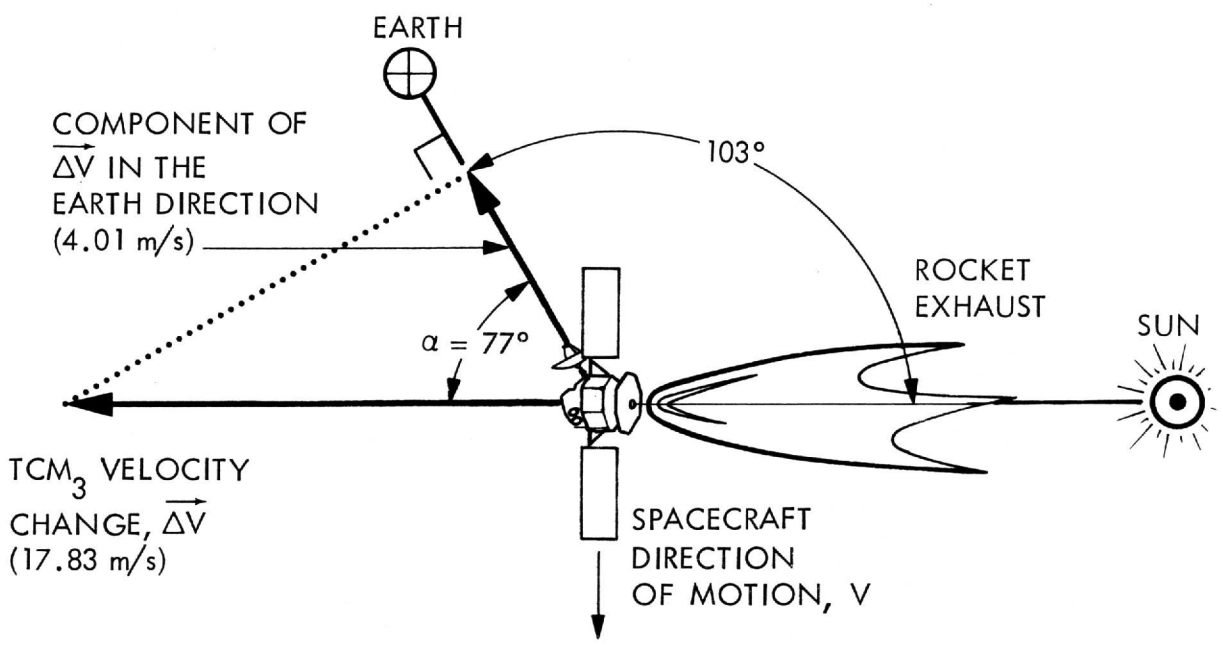
25 MARCH 1974

BULLETIN NO. 23

On Monday, 25 March, Mariner 10 was 2.3 million miles from Mercury and was approaching the planet at a speed of 25,140 miles per hour. Photography with the two TV cameras began Saturday noon for 3.5 hours and was repeated on Sunday. One of the enhanced pictures of the 76 taken is printed on the front page. Four bright spots have been observed, one of which appears to be 250 miles in diameter. Since the high-gain antenna problem appears to have corrected itself, Mariner 10 should be able to transmit TV images back to Earth in real time up to about 24 minutes before closest approach when the camera view fields pass the planet's terminator over to the dark side. Closest approach will occur on Friday, 29 March, at 01:46 p.m. PDT.

TRAJECTORY CORRECTION MANEUVER GEOMETRY

The Third Trajectory Correction Maneuver (TCM-3) was successfully performed as a Sun-line maneuver. Project Manager Gene Giberson described it as a "trick maneuver" because it had to be done at a particular time, i.e., 04:55 PDT on Saturday morning, 16 March, in order to change the trajectory characteristics in the desired manner, as described in Status Bulletin 21. The spacecraft orientation relative to the Earth and Sun is shown in the accompanying illustration.

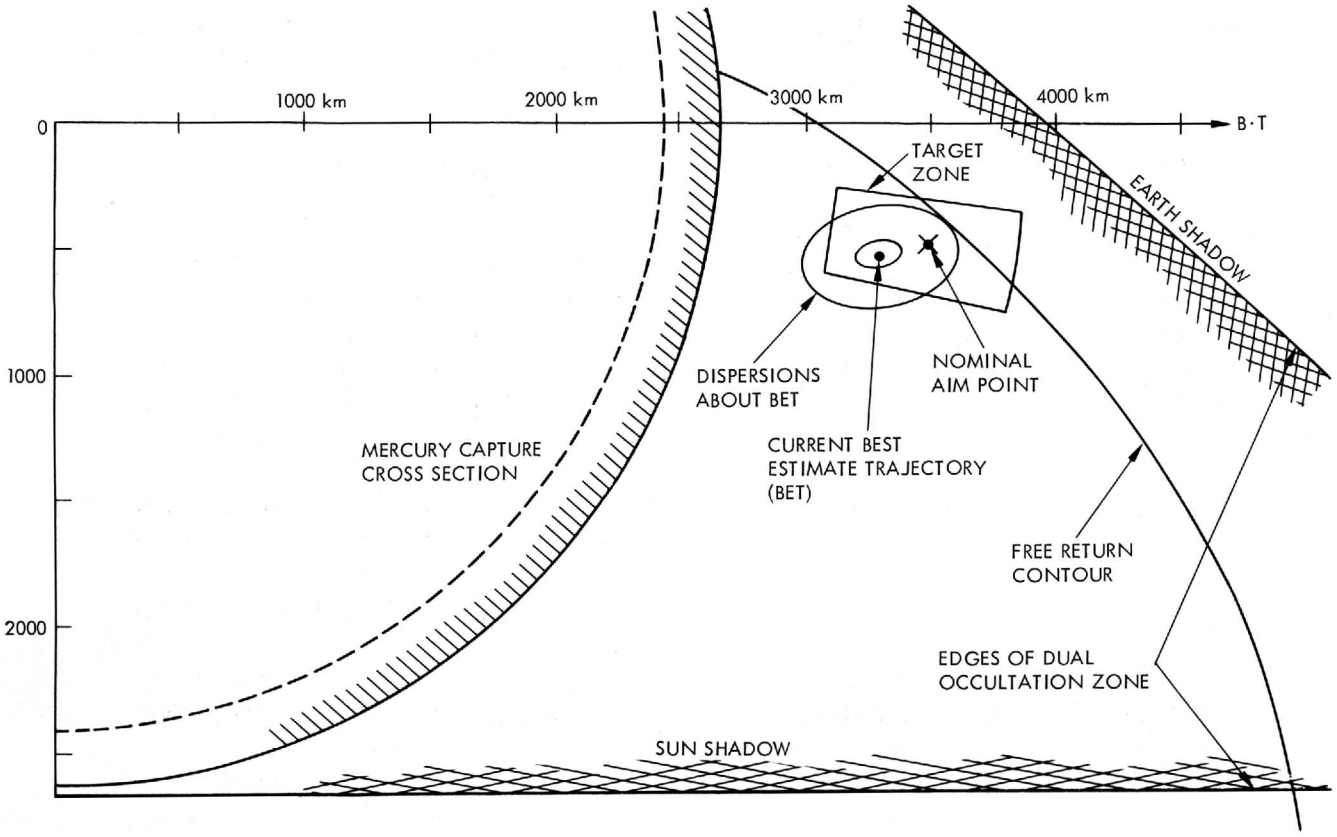


Usually, it is difficult to separate the effects of velocity magnitude and thrust direction during a maneuver because the doppler shift that is seen in real time is only a function of the magnitude of the velocity component in the Earth direction. However, during TCM-3 the Sun was constantly in the Sun sensor's view field, and an accurate estimate of spacecraft position in pitch and yaw relative to the Sun was obtained by telemetry. As shown by the drawing, the angular offsets were such that the angle a, nominally 77 deg, was determined to have been 76.75 deg. This 0.25-deg shift caused the Earth-line velocity component to be 2% larger than predicted.

Telemetered thrust chamber pressure data-indicated that the rocket engine thrust was about 1% low, which would make the two velocity vectors 1% smaller than planned. The observed 63.4-Hz doppler shift was in fact 1% higher than predicted due to the summation of the two effects just described.

The result of the TCM-3 maneuver on the Mercury encounter geometry is shown In the following drawing, which is an enlargement of the right half of the figure printed in Status Bulletin 21.

The current Best Estimate Trajectory (BET) is seen to be well inside the desired target zone, which by definition is inside both the Sun and Earth occultation zones for obtaining information on any possible atmosphere on Mercury and possible magnetic field interactions with the solar wind. The displacement of the BET from the Free-Return Countour means that one or more additional maneuvers will be needed after Mercury encounter to achieve a second close Mercury flyby about 176 days later (two Mercury years). On 26 March, after 10 days of tracking, data will be available for processing, the uncertainty around BET will be reduced, and more accurate estimates of the required arrival time and exit occultation time can be factored into the TV and Radio Science sequences which are now being developed. The spacecraft is now expected to pass about 750 km (466 miles) above Mercury's surface, well within the 90% science value zone.



SIGNIFICANT MISSION EVENTS/TIMES

	PDT	
21 March	07:30 - 11:30 am	U-16.2 CC&C Update to reconfigure a portion of computer memory to provide 117 kbps data at close encounter
21 March	12:00 - 03:45 pm	Near simultaneous ranging in support of navigation
21 March	04:40 - 06:40 pm	Magnetometer flips and calibration and charged particle telescope calibration
22 March	09:00 - 10:00 am	DSS-14 Bit-Error-Rate-Test
22 March	12:00 - 03:45 pm	Near Simultaneous Ranging
22 March	01:30 pm	TV subsystem on for checkout
23 March	04:00 pm	TV light flood and beams on in Edit Mode 1 (skip-slide) and begin imaging phase function measurement. This will return the first Mercury pictures.
23 March	12:00 - 03:30 pm	First far encounter daily TV and UVSAG science sequence
23 March	03:00 - 03:30 pm	DSS-43 Link Performance Measurement
24 March	12:00 - 03:30 pm	Second TV and UVSAG daily science sequence
24 March	03:00 - 03:30 pm	DSS-43 Link Performance Measurement
25 March	12:00 - 03:30 pm	Third TV and UVSAG daily science sequence
25 March	03:00 - 03:30 pm	DSS-43 Link Performance Meas
26 March	08:00 - 10:00 pm	U-16.4 EM-3 day tweak to incorporate latest navigation estimates for fine tuning the encounter sequence
26 March	12:00 - 03:30 pm	Fourth TV and UVSAG daily science sequence. Note: This sequence will utilize 117 kbps data mode
26 March	12: 10 - 01:10 pm	Special GCF to GSFC circuits checkout with 117 Kbps data
26 March	03:00 - 03:30 pm	DSS-43 Link Performance Measurement
27 March	12:00 - 03:30 pm	Fifth TV and UVSAG daily science sequence
27 March	03:00 - 03:30 pm	DSS-43 Link Performance Measurement
28 March	12:00 - 03:30 pm	Sixth TV and UVSAG daily science sequence
28 March	04:00 - 07:30 pm	Mercury Diameter Experiment
28 March	09:30	Begin 32-hour close encounter Mercury sequence under CC&S control. (Note: Spacecraft closest approach occurs 29 March at about 01:46 pm)