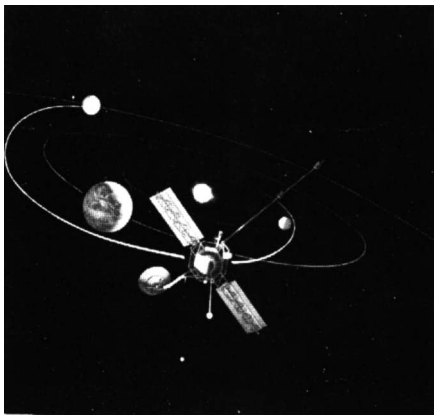

MARINER VENUS / MERCURY 1973
STATUS BULLETIN
Mariner 10 Anomaly Cleared - All Systems Go for Kohoutek, Venus and Mercury

On Thursday evening, 17:50 PST, 3 January 1974, the high-gain antenna (HGA) problem cleared up apparently as a function of increased HGA feed temperature. A pre-determined contingency plan was immediately implemented to position the HGA more directly into the Sun? the purpose being to warm the HGA feed. Clearing up of the problem would have resulted in approximately a 20°F drop in the HGA feed temperature because power is no longer dissipated in the HGA feed hybrid coupler load. However, this drop in temperature was partially counter-acted by the change in HGA position, i.e., the HGA dish was warmed up hence warming up the HGA feed. The net result was a drop of approximately 5° F, well above the threshold where the problem had occurred previously.

In addition to thermal considerations, the new HGA position was selected to direct a side lobe of the HGA pattern to Earth since the side lobes have more power than the low-gain antenna. A side lobe of the HGA was acquired. A HGA slew sequence of approximately 2 deg cone by 2 deg clock movement was implemented to characterize the antenna pattern in the vicinity of this new pointing direction.

On the morning of 4 January, using the 64-meter net (DSS 63), the downlink automatic gain control (AGC) and signal-to-noise ratio (SNR) were sufficiently high to permit switching to the non-imaging science (NIS) data mode 1 (2450 bps). However, the bit error rate increased to a point where the data rate was switched to 490 bps (NIS-2), Data Mode 14.

STATUS—13 DECEMBER 1973 THROUGH 5 JANUARY 1974

On 14 December the Mariner 10 solar panels were tilted 25 degrees off the sun to reduce panel surface temperature approximately 18°F. The panels were tilted in the same direction with one panel tilted 12 degrees and the other panel 40 degrees from horizontal.

On 18 December the scan platform was tilted to the maximum so the ultraviolet airglow spectrometer (UVSAG) could make important new measurements of emissions from instellar helium gas in a direction opposite from the Sun. The scan platform showed some balkiness during the UVSAG observations.

On 19 December the Mariner 10 gyros were turned on and the Roll Calibration Maneuver (RCM-4) was performed. No power on reset (POR) occurred in the flight data subsystem as it had during the two previous maneuvers. At the end of Mariner's 8th roll, the star tracker did not automatically lock on the star Canopus. Commands sent from Mission Control enabled the tracker to stop on the star after Mariner's 9th roll.

It had been planned to position the scan platform so that it would sweep through different positions and the UVSAG could observe different parts of the Gum Nebulae and the bright stars within it. However, the scan platform was left in its stowed position since it had shown some balkiness during the exercise on 18 December. The UVSAG therefore did not observe the Gum Nebulae.

The two magnetic field instruments mounted on the 20-foot boom extending out from Mariner were calibrated.

At the conclusion of the RCM-4, the steerable high-gain antenna dish was moved about and the signal strength and its radio beam was measured by Goldstone's 64-meter antenna.

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

3 January 1974
BULLETIN NO. 11

Some real-time engineering data and the data from Mariner IO's tape recorder on station tapes was not received at the JPL Mission Control until 20 December due to equipment problems at Station 14 at Goldstone.

On 20 December the Charged Particle Telescope (CPT) received one of its regular calibrations.

On 23 December, Dr. Richard Goldstein of JPL used the 210-foot antenna at Station 14 of Goldstone to perform one of his well known Radar Bounce experiments. It is hoped the radar images of the surface of Venus will be helpful in interpretations of pictures of Venus clouds to be taken in February by Mariner 10.

On Christmas day, 25 December, shortly before 13:00 PST, a part of the feed system of the Mariner 10 steerable dish antenna failed causing a drop in radio signal power from the antenna. Tests and analysis indicates a joint in one of the feed systems two probes may have cracked or fractured due to temperature changes during flight.

The TV team is confident that very good picture coverage of Mercury is possible in March. However, the real-time TV sequences of Mercury will not be transmitted to Earth at the high rate of 117,000 bits per second. Although there will be no loss of overall photo coverage of the planet's surface, the longer transmission times will provide fewer high resolution photo mosaics and the mosaics will cover less area of the planet's surface.

On 28 December the Mariner Mission Control released use of the 210-foot antenna (DSS-14) and Venus DSS-13 at Goldstone for 7.5 hours to JPL 's Dr. Goldstein. The radar bounce experiments should provide useful radar images of the surface of Venus.

On Saturday, 29 December, the portion of the Mariner's dish antenna feed system which failed on Christmas day healed itself for about four hours, and then failed again. It is evident that this problem is related to changing temperatures. This anomaly is under thorough investigation in the hope that it can be solved. Since the feed horn will be pointed toward the Sun during Mercury encounter, it is possible that the radio system will be functioning properly again.

The UVSAG measurements planned for 2 January, 1974, the RCM planned for 3 January, and other spacecraft tests have been postponed or cancelled so engineers can design tests using duplicate hardware on Earth to simulate possible causes of the Mariner 10 directional radio antenna problem. Today the antenna and the instrument that measures charged particles coming from the Sun were calibrated.

On Wednesday, 9 January 1974, plans are scheduled to observe the Comet Kohoutek using the Mariner 10 Ultraviolet Airglow Spectrometer.

The directional antenna's signals are still strong enough to transmit very high rate TV pictures of the comet in real time. The Mariner is now in its 61st day of flight to Venus and Mercury. It is travelling at a speed of 68,530 mph relative to the Sun, 13 million miles from Earth and 18 million miles from Venus. In 34 days it will fly by Venus and then head for its ultimate target Mercury.