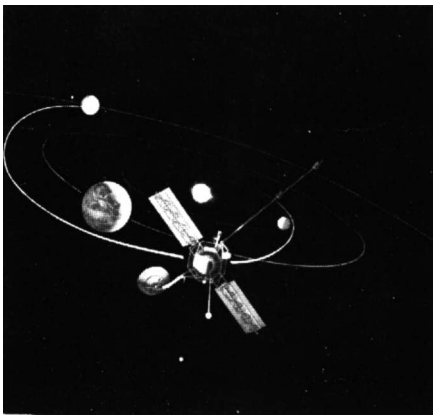

MARINER VENUS / MERCURY 1973
STATUS BULLETIN

TCM-2 PERFORMANCE SUPERB
TV HEATERS HAVE COME ON

During the 80 days since Mariner 10 was launched, it has travelled about 110 million miles along its arcing path relative to the Sun. In another 13 days, Mariner will fly by Venus, which is less than 6 million miles ahead. Mariner's distance from Earth is about 19.7 million miles, and its speed in orbit relative to the Sun is about 76,500 mph, compared with Earth's 66,000 mph speed.

In Status Bulletin No. 13, it was stated that the Trajectory Correction Maneuver (TCM-2) would take place on 18 January. In preparation for that event, Mariner 10's gyros were turned on the day before. The Maneuver was, however, postponed to 21 January in order to provide more time to calculate a new maneuver strategy which would use a smaller pitch turn to keep the solar panels facing toward the Sun at all times and avoid any possibility of having to switch to battery power. Commands for the maneuver were transmitted to Mariner 10 on 20 January to be stored in the computer's memory.

TCM—2 AN OUTSTANDING SUCCESS

On 21 January at 11:50 PDT, Mariner 10 rolled itself about 46 degrees then pitched over nearly 35 degrees. At 12:14 PDT, the rocket motor fired for about 3.8 seconds to change the spacecraft's speed by about 3 miles per hour. From the observed shift of—17.41 Hz in doppler frequency, which was within 0.04 Hz of the predicted value, it was concluded that excellent performance had been achieved in the radial component of the velocity change. It will take 10 days of tracking data to confirm the non-radial velocity components.

HEATERS FOR TV CAMERAS START OPERATING

On 17 January, during the time that heaters for other Mariner 10 instruments were being turned off in preparation for TCM-2, the heaters for the TV Cameras unexpectedly began to operate. This event was most welcome since the Science Investigators had been concerned that the cameras might not operate properly during Venus encounter because their temperature had dropped below freezing. After TCM-2 had been completed on 21 January, the instruments needed for Kohoutek and solar wind studies were turned on, but the heaters which were on the same circuit as those for the cameras were left off to avoid the possibility of the camera heaters turning off again. Mariner has warmed up enough as it approached closer to the Sun so that those heaters are no longer needed.

1. SIGNIFICANT MISSION EVENTS/TIMES, 15 - 21 January 1974

CC&S U6.0 Update	**09:42 PDT (D015) Tuesday**	**15 January**
HG Antenna Calibration	**10:43 PDT (D015) Tuesclay**	**15 January**
X-Band Telemetry Experiment	**13:30 PDT (D015) Tuesday**	**15 January**
Kohoutek Nucleus Passes UVSA	**18:58 PDT (D016) Wednesday**	**16 January**
Hydrogen Corona Scan by UVSA	**07:03 PDT (D017) Thursday**	**17 January**
Gyro Turn-on Sequence	**08:47 PDT (D017) Thursday**	**17 January**
CC&S U6.4 Update	**13:39 PDT (D017) Thursday**	**17 January**
CC&S U6.5 Update	**09:41 PDT (D018) Friday**	**18 January**
Enable TCM-2	**09:41 PDT (D018) Friday**	**18 January**
CC&S U6.6 Update	**16:45 PDT (D018) Friday**	**18 January**
TCM-2 Performed	**12:14 PDT (D021) Monday**	**21 January**

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

23 JANUARY 1974
BULLETIN NO. 14

SCIENCE ACTIVITIES, 10—21 January 1974

From 10 to 16 January, the Mariner 10 Ultraviolet Airglow Spectometer (UVSA) continued to observe Comet Kohoutek's tail in the extreme UV 30-166 nm wavelength range. Figure 1 shows a photograph of the instrument partly disassembled, and Fig. 2 is a cutaway view. On 13 January, the hydrogen Lyman alpha (122 nm) intensity starting 20 degrees from the comet's nucleus began to climb exponentially and then rose even more rapidly as the comet's nuclear region drifted toward the UVSA view field, as shown in Fig. 3. At about 7 p.m. PDT on 16 January, the nucleus of Kohoutek was scanned. On 19 January, the TV cameras attempted to take pictures of the comet (see Fig. 4), but a preliminary examination of the frames indicated that Kohoutek was too dim to yield useful imaging data. (Figures 3 and 4 were inadvertently omitted from Status Bulletin 13.) The planned UVSA scans of the comet will be continued on 22 and 24 January even though no further attempts to obtain TV images will be made.

Except for the Scanning Electrostatic Analyser (SEA), all Science instruments continued to perform acceptably. On 10 January, a calibration of the Charged Particle Telescope (CPT) was conducted with good results. Because of the unexpected switchover from the main to the standby power chain, a Roll Galibration Maneuver (RCM-6) was cancelled to avoid having to turn on the gyros. RCM-7 will, however, be conducted as planned on 28 January since the gyros have been left on following the 21 January Trajectory Correction Maneuver (TCM-2). Weekly Magnetometer outboard sensor flip sequences have been implemented to provide partial calibration data even though RCM-6 had been cancelled.

ULTRAVIOLET AIRGLOW SPECTROMETER (UVSA)

To provide the greatest amount of information obtainable with remote sensing devices of a possible atmosphere and interaction with the solar wind of Mercury and Venus, Mariner 10 carries twice as many Science instruments as any previous Mariner spacecraft. All instruments were derived from proven off-the-shelf hardware, and all are being monitored by Investigators who have previously flown similar experiments in space.

The Principal Investigator for the two ultraviolet spectrometers is A. Lyle Broadfoot of Kitt Peak Observatory. One UV spectrometer (UVSO) points directly toward the Sun and will be turned on only to scan Mercury's limbs during the solar occultation as Mariner 10 enters and exits the planet's shadow. The other UV Spectrometer (UVSA) remains turned on throughout the flight to map the airglow of the celestial sphere in the extreme 30-166 nanometer UV wavelength range with emphasis on the hydrogen Lyman α 122-nm band. Evidence for the presence of helium, argon, oxygen, neon, and carbon compounds in the atmospheres of Mercury and Venus will also be obtained if detectable amounts are present.

Since UVSA is mounted on the scan platform, to the right of the TV cameras, it cannot look any closer than 53 deg from the Sun. As shown on the cutaway drawing (Fig. 2), this instrument has an array of collimating baffles at its entrance whose slits restrict the view field to a 3.6 x 1.2 deg rectangle. At the instrument's opposite end, a concave diffraction grating reflects and spreads the UV spectrum out across 12 detectors situated below the entrance to measure the relative intensities arriving at the critical frequencies radiated by the gases and ions being sought. During Venus encounter, the UVSA instrument will scan the atmospheric layers in spectral regions that have not been observed before. These data will provide new information regarding the composition of the Venus atmosphere. In preparation for the Venus and Mercury encounters, UVSA was calibrated by scanning Earth and Moon for several days after launch last November. Valuable new information about the Gum Nebula and its quasar was also obtained during celestial scans last December.

Preliminary results of the UVSA scans of Comet Kohoutek have revealed a very large neutral hydrogen corona with a diameter of about 20 million kilometers. A very high peak intensity for hydrogen was measured at the nucleus. Evidence was also found for the presence of carbon in the nucleus. Further analysis of the data is required to determine whether or not the signal in the argon channel was due to argon or some other source.

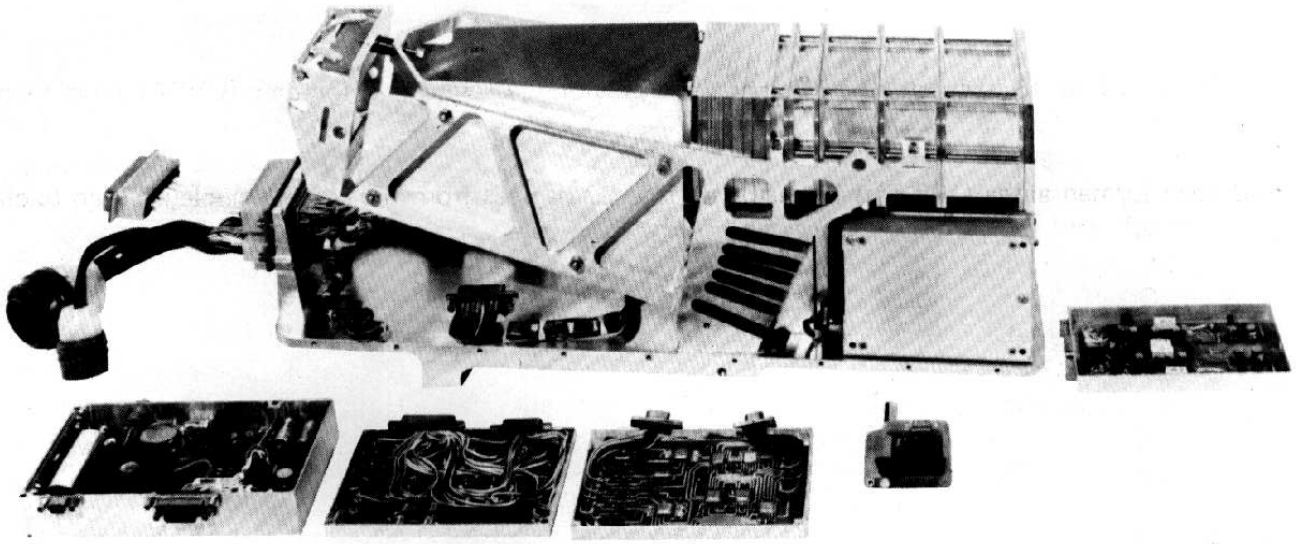

Fig. 1. Mariner 10 Airglow UV Spectrometer

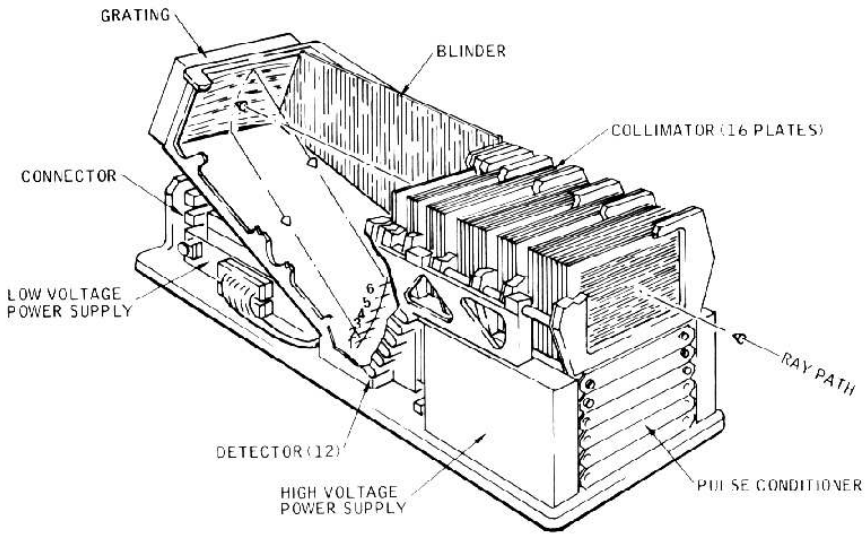

Fig. 2. Cutaway View of Airglow UV Spectrometer

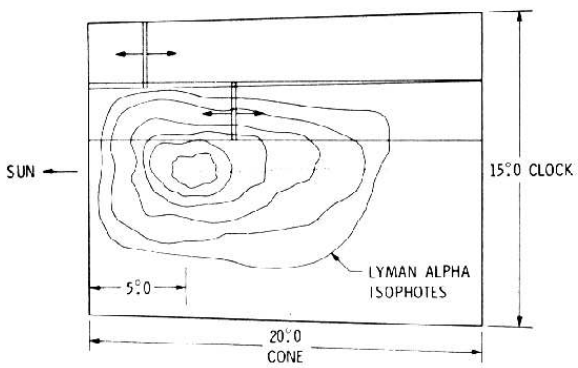

Fig. 3. Airglow UV Spectrometer Scan Pattern of Kohoutek's Hydrogen Corona

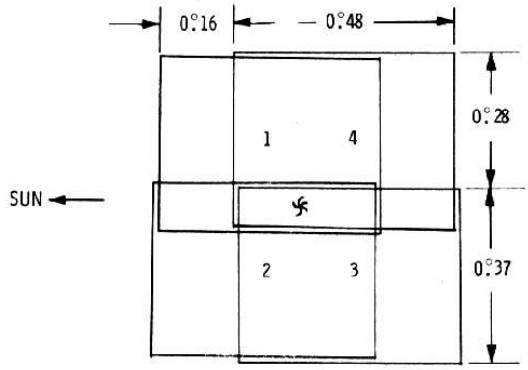

Fig. 4. Mariner 10 TV Frame Mosaic of Kohoutek's Nucleus