

# MARINER VENUS / MERCURY 1973

## STATUS BULLETIN

# Mariner 10 Approaches Mercury II Rendezvous

On 29 March 1974, six weeks after its visit to Venus on 5 February, the Mariner 10 became the first spacecraft to explore Mercury, the Solar System's innermost planet. During that period thousands of detailed photographs were transmitted to Earth with resolution as small as 100 meters (300 ft). An unexpected planet-related magnetic field was discovered in the shadowed region behind Mercury. A very slight but measurable atmosphere was also found composed largely of helium, and streams of high energy electrons and protons were detected on the dark side.

*And now* Mariner 10 has concluded its 176 day orbital circuit around the sun which coincided with two of the planet Mercury's revolutions of 88 days, each permitting Mariner 10 to overtake the planet and yield Mercury II.

The approach on 29 March was on the dark side with a point of closest approach at 703 km (450 miles). The second approach will occur at 13:59 PDT on Saturday, 21 September 1974.

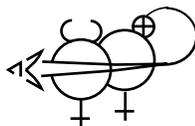
A bright side pass at a miss distance of some 50,000 km (30,000 miles) was selected to extend photographic coverage at good viewing angles from 25% of the entire Hermean surface to better than 37%. Further observation of the tenuous He atmosphere will be obtained by the UVSA. This coverage will enable us to test and verify the important scientific conclusions from the Mercury I photographic observations.

The fields and particles experiments will continue to gather interplanetary data and search for subtle upstream effects at encounter.

More than 500 science photographs will be taken with an additional 460 frames from an optical navigation experiment and system verification test.

The pictures will be taken from Goldstone with an array of three antennas, the 210-ft and two 85-ft antennas. This array will permit reception of pictures from the spacecraft of one photograph each 42 seconds. (117,000 bits per second.)

These pictures will yield further important information regarding the planet Mercury.



Loss of Mariner 10's on-board tape recorder in late August, 1974 has necessitated an extensive revision of the television sequence during the second encounter with Mercury on September 21. Without the spacecraft recorder, all pictures will be transmitted from Mariner as they are taken by the TV cameras (one every 42 seconds).

Picture data can be transmitted from Mariner at two rates— 117,600 bits per second (high rate) and 22,050 bps (edited picture). The high rate, which provides full resolution pictures, will be used only while the Goldstone Station of the NASA-JPL Deep Space Network is receiving. On September 21, while the prime encounter TV data is being taken,

three Goldstone antennas will be arrayed to provide a high-quality, low-noise composite signal.

The 22 kbps-rate delivers every fourth picture element, or a medium resolution picture. The lesser rate will be used for optical navigation sequences and a low resolution mosaic of Mercury four days before encounter. The DSN station in Australia and Spain, as well as Goldstone, will receive the 22 kbps telemetry. Partial resolution picture sequences are identified with an asterisk (\*). All others are at the high rate.

All of the following times are earth-receive time and are stated in Pacific Daylight Time (PDT):

Second Mercury Encounter  
September, 1974—Schedule of Events

9/13	9:44 AM - 9:00 PM	Update spacecraft computer with automatic sequence.
9/16	8:40 AM	Turn on TV cameras and UVSAG.
9/16	10:00 AM - 4:30 PM	High rate telemetry and GDS TEST (117 kbps).
9/17	12:39 AM	*Start optical navigation experiment. TV cameras will make long exposures to obtain image of known star in same frame with Mercury. Pictures will be taken at intervals until 9:30 AM. Total frames: 98.
9/17	1:40 - 2:37 PM	*Fifty-seven TV pictures transmitted in the edit mode (every fourth picture element). Resolution: 73 kilometers (45 miles).
9/17	2:28 - 2:37 PM	Ultraviolet spectrometer scans of Mercury.
9/17	3:09 PM	*Continue optical navigation experiment until 9:30 AM.9/18. Total frames: 289.
9/18	12:23 - 4:18 PM	Photometric calibration of TV cameras (various combinations of filters and exposures). Total frames: 357.
9/18	4:19 - 4:28 PM	Ultraviolet spectrometer scans of Mercury .
9/19	1:40 - 2:41 PM	Sixty-four TV frames for calibration of camera system using planet Jupiter. The planet will appear only as a bright point source.
9/19	2:44 - 2:54 PM	Ultraviolet spectrometer scans of Mercury.
9/20	1:41 - 2:48 PM	Incoming far-encounter television. Twelve 6-picture mosaics of Mercury. Total frames: 84. Resolution: 20 kilometers (12 miles).
9/20	4:00 PM - 05 AM 9/21	UVS Step and Drift.
9/21	9:14 - 10:20 AM	UVS scans.
9/21	10:56 - 11:12 AM	Incoming near encounter television. One 18-picture mosaic. Resolution: 2.7 kilometers (1.7 miles).
9/21	11:34 - 11:40 AM	UVS scans.
9/21	12:01 - 4:14 PM	Prime encounter television. Approximately 330 pictures received at JPL, about half of which will be displayed on monitors in real time. Resolution at start and finish will be about 1.5 kilometers (one mile). Resolution at closest approach will be about one kilometer (.6 mile).
9/21	1:59 PM	Closest approach to Mercury. Range to Mercury: 50,000 kilometers (30,000 miles). Range to Earth: 170 million kilometers (105 million miles).
9/21	4:32 - 4:40 PM	UVS scans.
9/21	5:08 - 5:15 PM	UVS Step and Drift.
9/21	5:16 - 5:29 PM	Outgoing near encounter television. One 18-picture mosaic. Resolution: 2.7 kilometers (1.7 miles).
9/21	5:30 - 6:11 PM	UVS scans.
9/21 9/22	7:02 PM - 8:03 AM 9/22 1:29 - 2:40 PM	Outgoing far encounter television. Twelve 6-picture mosaics. Total frames: 84. Resolution: 20 kilometers (12 miles).
9/22	6:10 - 8:28 PM	*Optical navigation pictures. Total frames: 81.

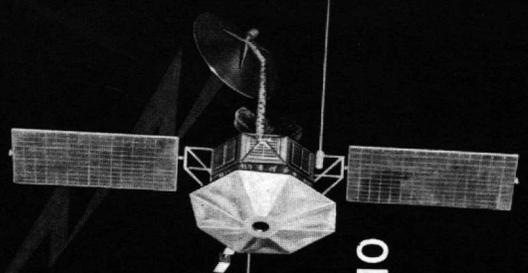


# MARINER 10 RE-ENCOUNTER WITH MERCURY

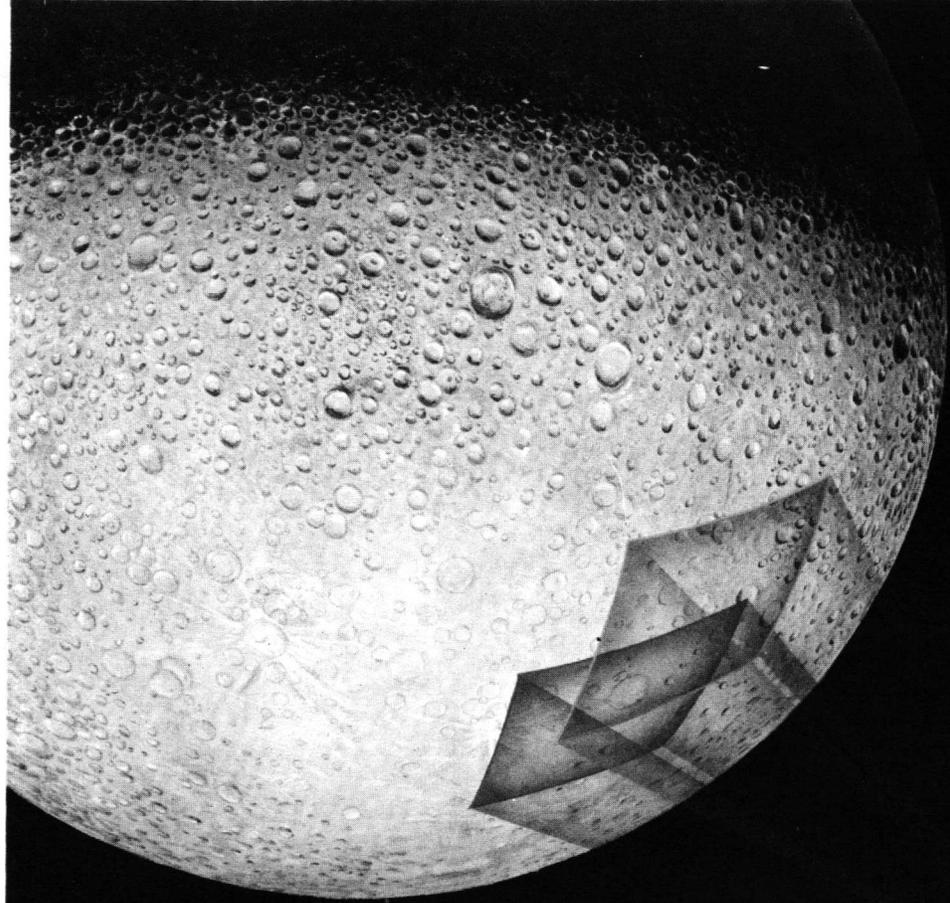


EARTH

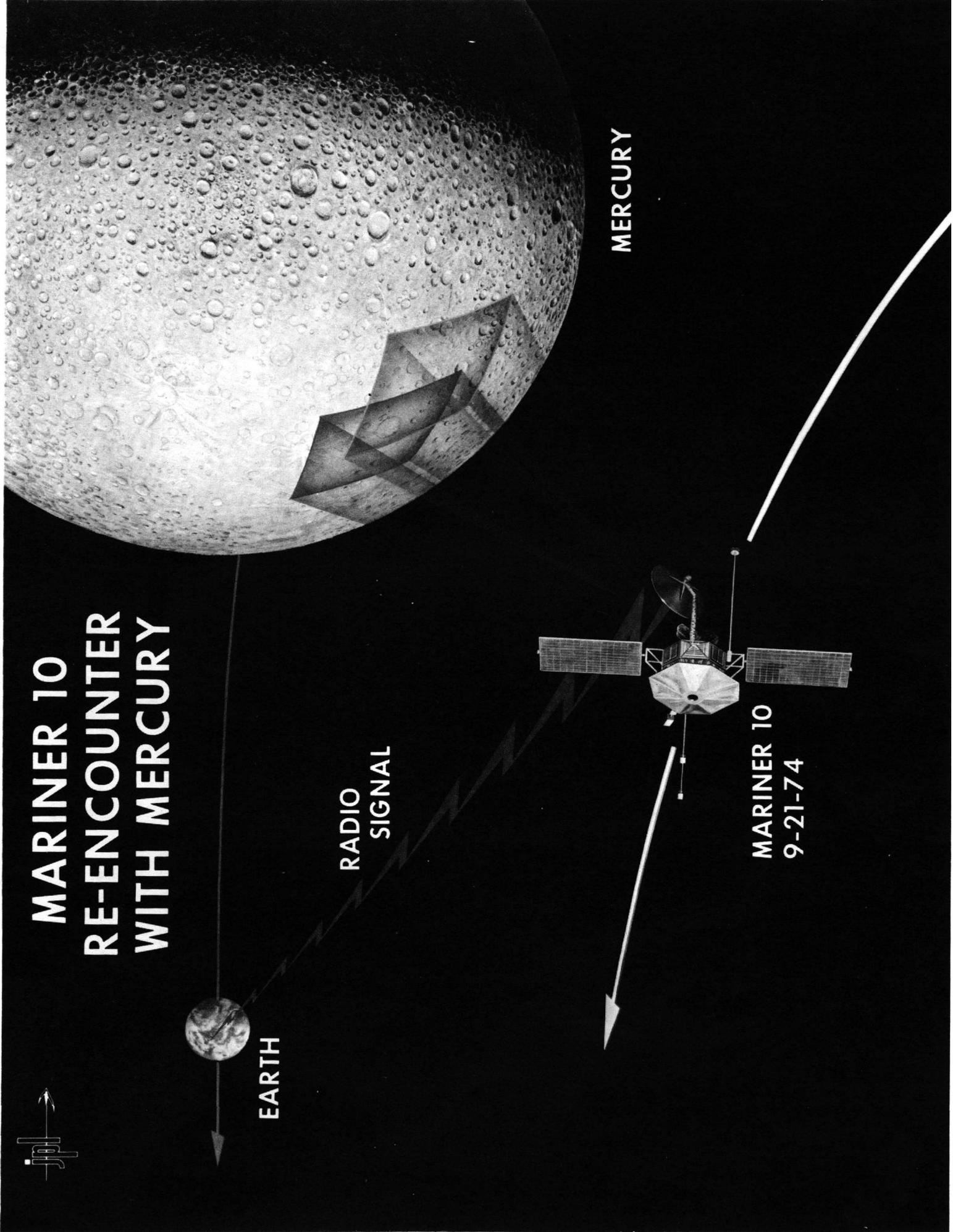
RADIO  
SIGNAL

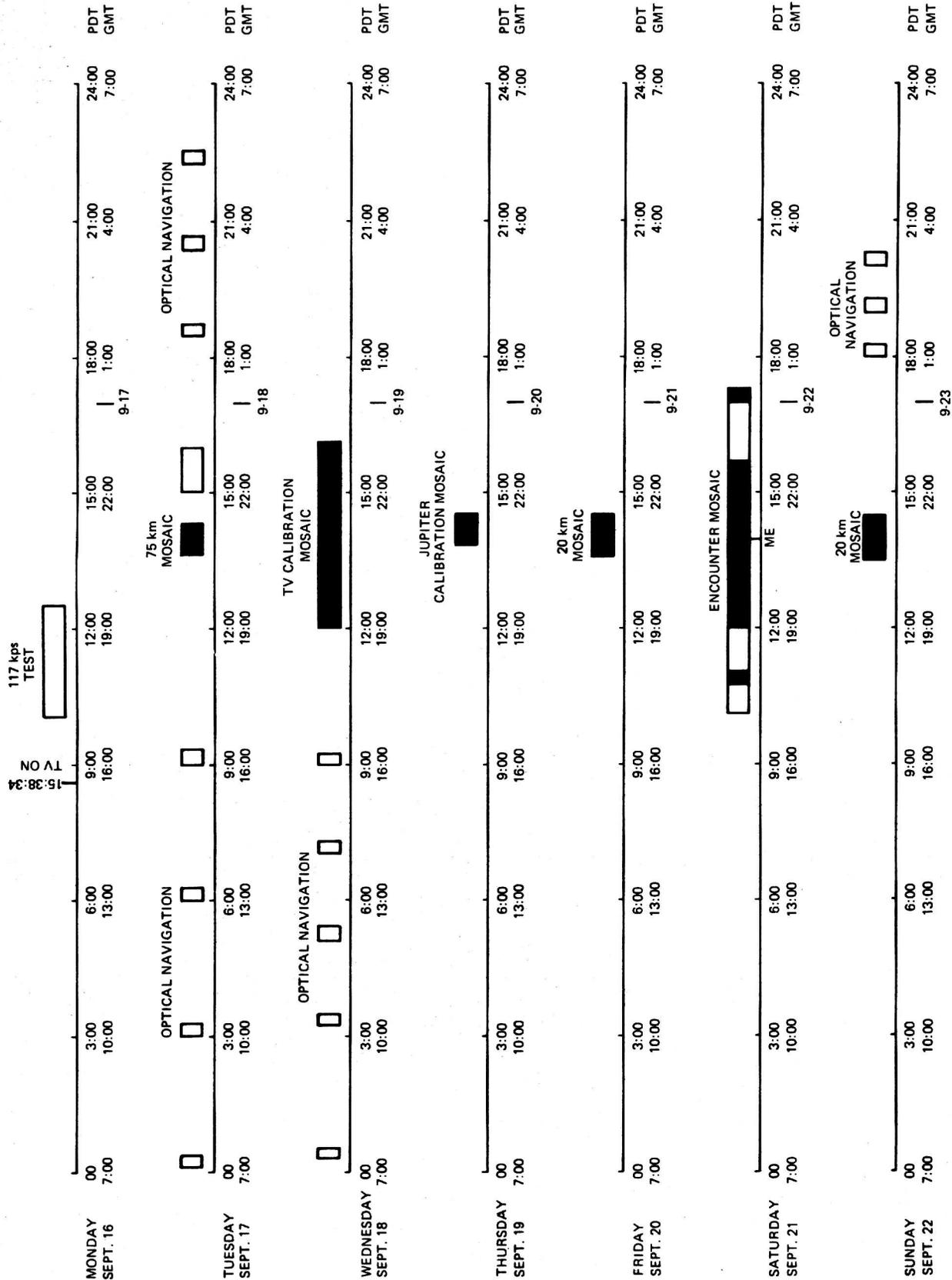


MARINER 10  
9-21-74



MERCURY





MARINER VENUS/MERCURY 1973 IMAGING BAR CHART

