

This Day in History... March 29, 1974

Mariner 10 Makes First Fly By of Mercury

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NASA launched the Mariner program in 1962 to build and send probes to investigate Mars, Venus, and Mercury. Prior to the launch of Mariner 10, earlier missions explored Mars and Venus.

Because Mariner 10 was destined to orbit Mercury, the planet closest to the sun, scientists faced new challenges in its design. The probe would have to withstand 4.5 times more solar radiation than when it departed Earth, requiring extra shielding to protect it. Mariner 10's designers installed thermal blankets and a sunshade on the main body and made the solar panels adjustable so they wouldn't overheat.

Mariner 10 was also the first spacecraft to use an interplanetary gravitational slingshot maneuver. In doing so, it would use Venus' gravitational pull to bend its flight path into Mercury's orbit. This would also put Mariner 10 in an orbit that would repeatedly bring it back to Mercury. In order for this to work, Mariner 10 couldn't change its trajectory more than 120 miles, so mission planners stocked the probe with three times the amount of fuel as previous models. This would also allow it to make two additional flybys.



Issued for the 1991 National Stamp Collecting Month with the theme, "Journey to a New Frontier... Collect Stamps."

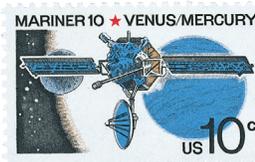
Mariner 10 was supposed to reach Mercury. The probe was launched that day at 12:45 a.m.

After a partial orbit of Earth, Mariner 10 was set on its path toward Venus. In its first week in space, Mariner 10 took five photomosaics of Earth and six of the Moon. It provided some of the best photos up to that time of the Moon's North Pole region.

The journey to Venus was filled with technical malfunctions. According to one NASA scientist, "It seemed as if we were always just patching Mariner 10 together long enough to get it on to the next phase and next crisis." Flaking paint repeatedly interrupted tracking and the on-board computer frequently reset itself. Mariner 10 approached Venus on February 5, 1974. Though several other probes had reached the planet before, Mariner 10 was the first to successfully send images back to Earth. The probe then dropped its velocity, setting it on course to orbit Mercury.



Pictures an enhanced image of Mercury from the MESSENGER (MErcury Surface, Space ENvironment, GEochemistry and Ranging spacecraft) mission.



Stamp issued shortly after the mission ended in 1975.

The probe was fitted with a number of instruments to gather information to send back to Earth. These included several cameras, which used more power than all the other instruments combined. There was also an infrared radiometer to detect infrared radiation given off by both planets, which would help scientists to calculate their temperatures. Ultraviolet spectrometers were included to test whether Mercury had an atmosphere and to study the interstellar background radiation of Earth and Venus. Plasma detectors were added to study gases in the solar wind and observe Mercury's magnetic field. However, a part of the probe didn't open correctly, so not all of this information was collected. There were also charged particle telescopes and Magnetometers, both of which studied Mercury's magnetic field.

Construction on Mariner 10 was completed in June 1973, after which it underwent testing. After Mariner 10 completed its testing, NASA had a one-month window to launch it. They selected November 3, as it would provide the best imaging conditions when

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The MESSENGER mission revealed that Mercury has water ice in permanently shadowed craters, a surprisingly volatile-rich composition, and a planet-wide magnetic field offset from its center—reshaping understanding of the innermost planet.

Although it experienced difficulties along the way, Mariner 10 finally reached Mercury on March 29, 1974. It was the first of three flybys (the others on September 21, 1974, and March 16, 1975) that revealed a wealth of information about the planet. Photographs revealed that Mercury looked a lot like our moon, with bare ground and lots of craters. It differed from the moon, though, by the presence of "scarps", markings which suggest that the planet's crust had shrunk at some point in its history. The probe's tests also revealed that Mercury has a small magnetic field – about 1/60th as strong as Earth's. Mariner 10 also detected a faint helium atmosphere and a large iron-rich core. The probe's findings estimate that Mercury has a nighttime temperature of -297° Fahrenheit and a daytime temperature of 369° Fahrenheit. Because of its orbit, Mariner 10 photographed the same side of Mercury on each flyby, so the 2,800 photos only capture about 40-45% of the planet's surface.

On March 24, 1974, shortly after Mariner 10's final flyby of Mercury, its transmitters were turned off. Though the probe has run out of fuel, scientists believe it could still be orbiting the Sun today. The information gathered by Mariner 10 led to even more questions, many of which were answered with the launch of the MESSENGER probe in 2004.

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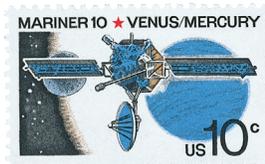
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