NASA's Mars Global Surveyor May Be at Mission's End

NASA's Mars Global Surveyor.

NASA's Mars Global Surveyor has likely finished its operating career. The orbiter has not communicated with Earth since Nov. 2. Preliminary indications are that a solar panel became difficult to pivot, raising the possibility that the spacecraft may no longer be able to generate enough power to communicate.

"Mars Global Surveyor has surpassed all expectations," said Michael Meyer, NASA's lead scientist for Mars exploration at NASA Headquarters, Washington. "It has already been the most productive science mission to Mars, and it will yield more discoveries as the treasury of observations it has made continues to be analyzed for years to come." Its camera has returned more than 240,000 images to Earth.

The orbiter has not communicated with Earth since Nov. 2. Preliminary indications are that a solar panel became difficult to pivot, raising the possibility that the spacecraft may no longer be able to generate enough power to communicate. Engineers are also exploring other possible explanations for the radio silence.

"Realistically, we have run through the most likely possibilities for re-establishing communication, and we are facing the likelihood that the amazing flow of scientific observations from Mars Global Surveyor is over," said Fuk Li, Mars Exploration Program manager at NASA's Jet Propulsion Laboratory (JPL), Pasadena, Calif. "We are not giving up hope, though."

Efforts to regain contact with the spacecraft and determine what has happened to it will continue. NASA's newest Mars spacecraft, the Mars Reconnaissance Orbiter, pointed its cameras towards Mars Global Surveyor on Monday. "We have looked for Mars Global Surveyor with the star tracker, the context camera and the high-resolution camera on Mars Reconnaissance Orbiter," said Doug McCuistion, Mars Exploration Program director at NASA Headquarters. "Preliminary analysis of the images did not show any definitive sightings of a spacecraft."

The next possibility for learning more about Mars Global Surveyor's status is a plan to send it a command to use a transmitter that could be heard by one of NASA's Mars Exploration Rovers later this week.

Mars Global Surveyor launched on Nov. 7, 1996, and began orbiting Mars on Sept. 11, 1997. It pioneered the use of aerobraking at Mars, using careful dips into the atmosphere for friction to shrink a long elliptical orbit into a nearly circular one. The mission then started its primary mapping phase in April 1999. The original plan was to examine the planet for one Mars year, nearly two Earth years. Based on the value of the

science returned by the spacecraft, NASA extended its mission four times.

"It is an extraordinary machine that has done things the designers never envisioned despite a broken wing, a failed gyro and a worn-out reaction wheel. The builders and operating staff can be proud of their legacy of scientific discoveries and key support for subsequent missions," said Tom Thorpe, project manager for Mars Global Surveyor at JPL.

The spacecraft evaluated landing sites for the twin NASA rovers that landed in 2004 and sites for future landings of the Phoenix and Mars Science Laboratory missions. It monitored atmospheric conditions during aerobraking by newer orbiters. It served as a relay link for the rovers and provided mapping information about their surroundings.

"When we watched the launch 10 years ago, we wondered if we would make the specified mission length. We certainly were not thinking of a 10-year operating life," said JPL retiree Glenn Cunningham, who managed the Global Surveyor project through development and launch.

A few of the mission's many important discoveries about Mars include:

-- The spacecraft's camera found gullies cut into many slopes that have few, if any, impact craters. This indicates the gullies are geologically young. Scientists interpret this as evidence of action by liquid water, essentially in modern times.

-- The mineral-mapping infrared spectrometer found concentrations of a mineral that often forms under wet conditions, fine-grained hematite. This discovery led to selection of a hematite-rich region as the landing site for NASA's Mars Exploration Rover Opportunity.

-- Laser altimeter measurements have produced an unprecedented global topographic map of Mars. The instrument revealed a multitude of highly eroded or buried craters too subtle for previous observation, and mapped canyons within the polar ice caps.

-- The magnetometer found localized remnant magnetic fields, indicating that Mars once had a global magnetic field like Earth's, shielding the surface from deadly cosmic rays.

-- The camera found a fan-shaped area of interweaving, curved ridges interpreted as evidence of an ancient river delta resulting from persistent flow of water over an extended period in the planet's ancient past.

-- A long life allowed Global Surveyor to track changes through repeated annual cycles. For three Martian summers in a row, deposits of carbon-dioxide ice near Mars' South Pole shrunk from the previous year's size, suggesting a climate change in progress.

Source: NASA