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Panel Says Computer Error Felled Mars Orbiter

By **KENNETH CHANG**
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Although it circled Mars longer than any other spacecraft, the Mars Global Surveyor did not die a death of old age last November, a review board assembled by [NASA](#) announced yesterday.

Instead, an errant computer command five months earlier had been placed in the wrong location of the computer memory for the spacecraft. That, in effect, implanted a fatal defect in the spacecraft, disabling a safety feature to prevent the solar panels from rotating too far and mangling its ability to communicate with [Earth](#) in case of a mishap.

Last Nov. 2, a run-of-the-mill command to the Global Surveyor set off the latent time bomb. Because the safety feature had been disabled, the solar panels rotated as far as they could, causing the spacecraft to “think” erroneously that the panels had jammed.

In its last 13-minute contact, the Global Surveyor reported numerous alarms to mission controllers but gave no indication that it was in immediate danger.

As the spacecraft tried to recover, it ended up in an orientation such that the Sun was shining directly on a battery, causing it to overheat. The Global Surveyor misinterpreted that signal, sensing that it had overcharged the battery and stopped charging its other battery, as well.

Meanwhile, because the June error caused the craft’s antenna to point in the wrong direction, mission controllers on Earth could not get in touch with the craft again.

“It was a sort of unfortunate concatenation of events,” said Dolly Perkins, deputy director-technical of the NASA Goddard Space Flight Center in Greenbelt, Md., who was chairwoman of the review board.

Within half a day, the Global Surveyor batteries drained dead.

The chain of events leading to the craft’s doom started in September 2005 on a routine technical update. For redundancy, the information was copied to two separate locations in the computer memory, but at different times with slightly different values. That led to a slight inconsistency, and when the engineers tried to repair that in June, they caused the bigger problem.

The review board said that the mission team had properly followed its procedures, but that the procedures were inadequate and that more thorough checks of its commands could have found the errors before they were sent to the spacecraft.

The Mars Global Surveyor was launched in 1996 and arrived at Mars 10 months later. After gradually moving into a circular orbit, its science mission started in March 1999 and was to last one Martian year, or 687 Earth days, until January 2001. But the spacecraft

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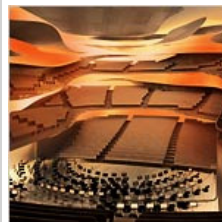


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