Polar Lander's silence deals NASA a setback

On Dec. 3, Mars Polar Lander likely became the first spacecraft to land in the harsh polar landscape of another world—but no one knows for sure. Numerous attempts to contact the craft and its two experimental probes have failed. NASA scientists now say they have little hope that the $165 million mission will ever phone home.

Coming soon after the demise of Lander's sister craft, the Mars Climate Orbiter (SN: 10/9/99, p. 229), this loss appears to have dealt the space agency a critical setback in its decade-long campaign to study the Red Planet and bring back surface samples by 2008.

"These two failures have given us a wake-up call," NASA chief scientist Edward J. Weiler told reporters on Dec. 7. "We are going to take a major rethinking of our Mars . . . program."

Although he said the program's science goals would remain the same, the agency will reevaluate its current strategy of launching an orbiter and a lander to the Red Planet every 2 years, when Mars and Earth are at their closest. "Maybe we were a little too aggressive," Weiler suggests.

NASA had slated its next Mars mission for launch in 2001, but that could be cancelled or delayed. Weiler says, "Right now, I have no confidence that that will be a successful mission." He noted the need for better information on landing sites and improved communication between Mars missions and Earth, including the capability of craft to report their status while they're descending through the Martian atmosphere.

Because of weight and cost constraints, Lander did not have a transmitter with that capability. That's making it difficult to determine exactly why the craft fell silent. It has also prompted some critics to question the space agency's motto of "faster, better, cheaper."

"People are going to start asking whether or not the pendulum has swung too far to the cheaper," says space-policy analyst Marcia S. Smith of the Congressional Research Service in Washington, D.C.

"Given the resources, we basically did the best we could," says Lander scientist David Crisp of NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif. He adds that Lander featured the last weather station NASA has planned for Mars. "In my view, it would be foolhardy to think that we're going to be able to safely land spacecraft on the face of Mars" without more climate information, Crisp says.

Lander was also to have taken the first close-up images of Martian soil and searched for underground ice deposits. A robot arm would have scooped up samples and dumped them into tiny ovens that can detect water and carbon dioxide.

NASA admitted likely defeat early on Dec. 7, minutes after Mars Global Surveyor, flying over Lander's presumed resting spot near the Red Planet's south pole, failed for a second time to detect a signal from the craft's ultra–high-frequency antenna. "The Mars Polar Lander flight team played its last ace," project manager Richard Cook of JPL told reporters.

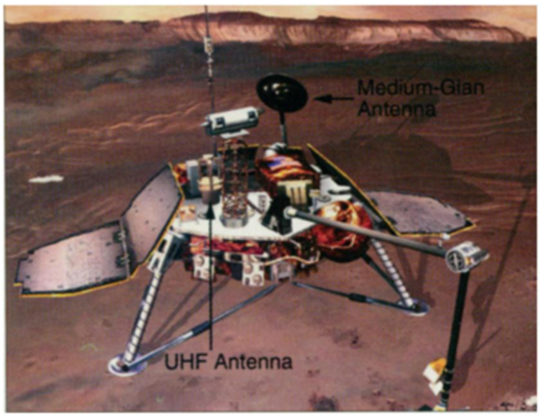
Combined with multiple attempts from Earth to coax a signal from Lander, these efforts appear to rule out two of the simplest explanations for Lander's silence—that the craft's main antenna was not pointed at Earth and that the craft had placed itself in temporary hibernation.

Lander carried two probes designed to separate from the craft and plunge without a parachute into the Martian surface. JPL scientists now calculate that these experimental devices, which can transmit signals on their own for a few days, are likely to have plowed into a crater. Landing in such rugged terrain could have damaged the transmitters or interfered with communication.

Exploring the climate of the Red Planet's forbidding south pole "was literally a once-in-a-lifetime opportunity," says Crisp.

He told Science News that he won't give up all hope of hearing from the craft for a few more weeks. According to instructions previously programmed, Lander was to have automatically shifted to a second radio transmitter on Dec. 9. A few days later, it was to have switched to a backup computer. This could make a difference in the craft's ability to contact its home planet, Crisp says. —*R. Cowen*

NASA/JPL



Artist's drawing of Mars Polar Lander.

Simplicity makes for superfast computing

A radically new approach to computer design promises to deliver a supercomputer 500 times faster than any available today. Such a high-performance machine would be capable of performing more than 1 quadrillion operations per second.

This week, IBM Research in Yorktown Heights, N.Y., announced a $100 million, 5-year exploratory research initiative to build such a computer. Nicknamed Blue Gene, it would be used initially to model how proteins fold themselves into the correct shapes to perform specific biological functions (SN: 3/6/99, p. 150).

"The IBM announcement of its new research project is very exciting and important to high-end computing," says Thomas Sterling of the California Institute of Technology's Center for Advanced Computing Research in Pasadena. The project highlights innovative computer architecture (SN: 4/15/95, p. 234) as being crucial for rapid advances in computational power, he adds.

The proposed machine would consist of about 1 million processors, which would share the computational load.

Simplicity is key to the supercomputer's anticipated speed. "We use an ultraminimalist architecture for the processor design," says IBM's Monty M. Denneau.

Processors in today's computers typically carry several hundred built-in commands. Most of those instructions, however, aren't actually used in many types of scientific computations.

The IBM design cuts the number of instructions per processor down to a considerably more manageable 57. Moreover, each processor would be able to handle eight tasks at once instead of having to complete one task before going on to the next.

"Our goal was to reduce the size of the individual processor to almost nothing but to have a large number of them," Denneau says.

Each of the computer's 32,000 microchips would hold 32 processors and 32 high-performance memory units for storing information and sharing it among processors. Keeping memory and processor close together should speed data access and greatly reduce power requirements.

Even so, the computer, which would cover an area roughly the size of a tennis court, would consume about 1 megawatt of power and require a sophisticated cooling system.

Denneau and his coworkers have also developed an innovative scheme for monitoring computations, checking for processor failures, and if necessary, redistributing the workload among still functioning processors on a chip. However, "it's going to take a couple of years to work out all the details," Denneau notes.

"It's a very interesting, revolutionary architecture," comments David V. Chudnovsky of the Institute for Mathematics and Advanced Supercomputing at the Polytechnic University in Brooklyn, N.Y.

Even though fewer instructions are available, the simplicity should make the computer easier to program for applications ranging from modeling protein folding to performing fluid-dynamics calculations (SN: 2/27/99, p. 136), Denneau says. —*I. Peterson*