Soviet Failure at Mars a Reminder of Risks

The apparent loss of a second Soviet spacecraft circling Mars points up contrasting U.S. and Soviet approaches to space

THE NEWS IN LATE MARCH that Soviet controllers had lost contact with the Phobos 2 spacecraft stunned and grieved the international space research community. Following the loss of Phobos 1 last September, this second disaster could cause a far-reaching reevaluation by the Soviets of their approach to risk reduction, just as the loss of Space Shuttle Challenger did for the American space program. Such losses have not deterred the Soviets from their planetary goals in the past, and most observers doubt that they will now. But for the first time such a reevaluation would likely be conducted in public, in keeping with the Soviet Union's new-found openness, or glasnost.

The apparent loss of Phobos 2 came on 27 March as the spacecraft turned from its normal alignment with Earth to image the tiny Martian moon of Phobos that was the primary mission target. When it came time for the spacecraft to turn itself and its antenna automatically back toward Earth, nothing was heard. A few hours later, a weak transmission was received, but controllers could not lock onto the signal. Nothing was heard during the next week. In the case of Phobos 1 last September, a controller sent a faulty command to the spacecraft that caused it to lose its proper orientation. That broke its radio link with Earth and prevented the proper exposure of its solar panels to the sun. Before contact could be reestablished, its batteries had run down (*Science*, 16 September 1988, p. 1429).

The Soviet loss elicited sympathy and disappointment from American researchers. Larry Esposito of the University of Colorado is a coinvestigator on an infrared instrument that scanned Mars after entering orbit. He says he became involved in the mission because the Soviets have been able to move more quickly in planning, assembling, and launching planetary missions than is possible in the United States. "This style has some drawbacks," he notes. "When you don't take the time to cross all the t's and dot all the i's, you have more chance of disaster."

James Head of Brown University was to specialize in Phobos itself, so he lost out almost completely, but he is undeterred. "This is a high risk venture with a high payoff. You have to ask what is the cause and press on. We had the same kinds of growing pains in the 1970s as the Soviets are having, yet we have a viable program."

Opportunities to participate in future Soviet missions do not look as good now, Esposito concedes, but he is still keen to be on the Mars lander mission that had been planned for a 1994 launch. As Geoffrey Briggs of the planetary exploration program office of the National Aeronautics and Space Administration (NASA) notes, "Sometimes the risk pays off handsomely, sometimes not. But between the United States and the Soviet Union, it's the only game in town" for planetary scientists.

Planetary scientists may still be ready for close, scientist-to-scientist U.S.–Soviet cooperation, but on an intergovernmental level NASA may have other ideas. The psychological damage from the Phobos losses is substantial, says Roger Bourke of the Jet Propulsion Laboratory, who is involved in the long-range planning for a U.S. mission to return samples from the Martian surface. "Confidence in the Soviets being able to perform in any way that is critical to our own mission has taken a hit. That's going to make a fundamental difference in how we do our own mission planning." Until recently, Bourke says, he and his associates in the NASA planning process had been moving in the direction of assuming a more substantial contribution from the Soviets, but their thinking has changed abruptly. "The attitude now is—don't put yourself in series with something the Soviets would provide. Let their results be complementary."

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Of course there are political considerations inherent in any U.S. decision to remain independent of the Soviets, but it would also reflect an incompatibility in the U.S. and Soviet approaches to risk. "We go to extreme lengths to prevent failures," says Bourke. Such efforts have paid off with the two Voyager spacecraft, for example. Both are still operating after 12 years in space and a total of five encounters with planets of the outer solar system, and Voyager 2 is poised for a flyby of Neptune this August.

On the other hand, "the Soviets have an uncanny ability to throw things together at the last minute," says Bourke. That worked well with the two Vega spacecraft, which dropped two instrumented balloons into the atmosphere of Venus as they whipped by on their way to a successful rendezvous with Comet Halley. "But we are always aghast at the level of risk they are willing to incur. The loss of Phobos 1 was incredible. There were a half dozen ways that it would have been stopped in a U.S. spacecraft."

Both approaches have had their ups and downs. One-third of the United States' launches toward Mars and Venus during the 1960s and early 1970s failed, mostly due to launch failures. All the in situ sensors on the main probe of the 1978 Pioneer Venus mission failed 12 kilometers above the surface. On the other side, the Soviets have an enviable record of landing and operating instruments on the inhospitable surface of Venus, something U.S. scientists have never dreamed of attempting.

Tallying up wins and losses reveals no obvious winner. "If you integrate their experience over the past 20 years," says Briggs, "I'd dare say their batting average is not too different from ours." Costs are also comparable. "It's not clear whether one approach is cheaper than another," says Bourke.

Most observers agree that the key to deciphering the future direction of U.S.–Soviet cooperation, as well as Soviet planetary exploration itself, will be a specific explanation for the loss of Phobos 2 and the Soviet response in the coming months. The design of the Phobos spacecraft is a new one, replacing the tried and true design used in a long line of missions ending with the Vegas. The Soviets may make adjustments just as they have in the past when they failed following what amounted to flight testing of new designs. But with new fiscal restraints, glasnost, and a taste of free elections in the Soviet Union, times have changed. The Soviets also have made unprecedented commitments to foreign scientists to carry their experiments. Whether the traditional slapdash approach that thrived under close secrecy will persist is unclear at this point. Some evolution toward greater risk reduction and thus fewer testings of political will in the aftermath of disaster might well occur.

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