SPACE SCIENCE

Mars 2001 Mission Hits the Wall

PASADENA, CALIFORNIA—NASA's exhortation to design and build "faster, cheaper, better" space missions may be losing its incantatory power. There are signs that the phrase might turn out to be a recipe for a one-time-only step change in the cost of single missions rather than a way of continually improving whole programs, especially those that need new technologies. Last month researchers gathered here* learned that NASA's Mars program is starting to have real difficulties with the mantra and that the Mars mission for 2001 is in serious trouble.

The idea of faster, cheaper, better was a reaction to multibillion-dollar planetary missions that took decades from conception to data analysis. The early results looked good. In the past few years, NASA Administrator Dan Goldin has touted the accomplishments of the first three launches in NASA's Discovery program of small planetary missions: Mars Pathfinder, Lunar Prospector, and the Near Earth Asteroid Rendezvous mission. Last month's meeting showcased some of the results, along with information on a dozen upcoming missions of similar scale. "It's great to see graduate students working with data that's 12 weeks old, not 12 years," said Wes Huntress, NASA's outgoing associate administrator for space science.

Yet recent problems have focused attention on the limits of Goldin's philosophy. The Earth-observing Lewis spacecraft failed in orbit last year, while its sister satellite Clark was canceled this winter because of cost overruns and schedule delays (*Science*, 6 March, p. 1443). And 3 weeks ago, technical problems forced NASA to delay by 3 months the scheduled July launch of Deep Space One, the first of the New Millennium program missions intended to try out groundbreaking technologies in the course of flying past an asteroid, a comet, and Mars.

Now problems have struck the Mars program, still basking in last year's spectacular performance by Mars Pathfinder. The proposed 2001 mission, budgeted at $400 million for 15 instruments on three vehicles—orbiter, lander, and rover—is in trouble. One major snag is delays in completing the rover on time and within budget: It's bigger and needs a more robust power source than Sojourner, Pathfinder's rover, as well as a drilling arm to collect samples. As a result, there is talk of dropping it from the mission altogether. "Our commitments on the 2001 mission have got out of line with the resources available for it," says Carl Pilcher, NASA's head of solar system exploration.

NASA/JPL

Bumpy path. Fiscal and technical problems could ground rover planned for Mars 2001 mission.

Earlier parts of the program met their cost goals by using existing technology, says Donna Shirley, who ran the Pathfinder rover program and now manages the team implementing NASA's Mars strategy at the Jet Propulsion Laboratory in Pasadena. She notes that Mars Global Surveyor, launched in 1996 at a cost of $260 million, was able to take advantage of its inheritance from the last of the old-style missions, the $980 million Mars Observer, which was carrying seven instruments when it apparently exploded during its approach to Mars in 1993. And this year's two Mars missions, delivering 10 instruments including a pair of nifty little 4-kilogram penetrators produced by the New Millennium program for less than $300 million, are using commercial technology, as well as taking advantage of spares from the recently launched Cassini mission to Saturn. At the same time, says Shirley, the 2001 mission is as technically demanding as the much higher priced Cassini or the Galileo mission to Jupiter.

There are various initiatives under way at NASA to develop new technologies, but none will be ready by 2001. In any case, says Shirley, unmet technology needs are a symptom, not a cause, of the problems with the Mars program. The Mars program was conceived as a set of missions meant to culminate in a sample-return mission in 2005, she notes, not as a way to deliver as much science as possible at every opportunity. "Yet each mission is [viewed as] the last ship out of port, and everybody wants to jump on it," she says. "You end up having to redesign your spacecraft after you get your instrument payload." The way out of the problem, say Shirley and Pilcher, is to sacrifice individual gratification for the common good.

A faster, cheaper, better program cannot be all things to all people, any more than a single Discovery mission can. But it may be that the right management can apply the lessons of the Discovery missions—define your ambitions clearly and create a tight-knit team with the authority to make trade-offs in its pursuit—to whole programs. If so, then there should be life in faster, cheaper, better yet.

–Oliver Morton

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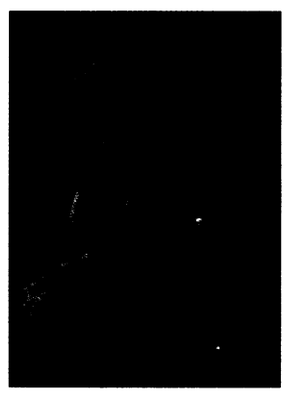
* The third International Academy of Astronautics' meeting on low-cost planetary missions, 27 April–May 1, California Institute of Technology.

U.S. FOREIGN POLICY

State Department Sees S&T Weaknesses

India has more scientists and engineers than any other country in the world, and its decision this week to test three nuclear weapons (see p. 993) underscores its importance in global affairs. Yet last year, as part of a cost-cutting move, the U.S. State Department eliminated the position of science and technology counselor at its embassy in New Delhi. That action, combined with a major reorganization last year seen by some as downgrading the status of science in the department's bureaucracy, epitomizes what many scientists say is a chronic lack of concern for the role of science and technology (S&T) in shaping the country's foreign policy.



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Sorry state. Albright is trying to remedy past neglect of science by the State Department.

After years of rebuffing such complaints, State Department officials now acknowledge there are shortcomings. They have asked the National Academy of Sciences (NAS) for suggestions on how to raise science's visibility, a step that veteran science hand William Golden calls a "breakthrough." But department officials warn that a continuing budget crisis may limit their ability to put more emphasis on science.

U.S. researchers have long complained that State fails to support international R&D efforts adequately. A 1992 report by the Carnegie Commission on Science, Technology, and Government concluded that science too often is used as "a bargaining chip