

Will GOES-NEXT Go Next?

NASA's trouble-plagued weather satellite is about to face congressional review and a round of blame-fixing

JAMES GREAVES IS A NASA PROGRAM MANAGER. Like so many of his colleagues in recent years, he's just lived out a nightmare, one that goes something like this. In June, NASA was called before Congress to testify on the status of a new series of weather satellites his team is developing. Because the system is crucial for continuous weather coverage for the entire United States, the stakes were high. Greaves, however, was confident. Although many technical problems have delayed the program by more than 2 years, they finally seemed to be under control. So, on his assurances, his boss told Congress to count on a launch as planned in fall 1992.

Two weeks later, however, unexpected problems cropped up in two key instruments. Hammering them out could set back the entire program by several more months, or even a year. Coming as they do on top of a cost estimate that has ballooned to \$1 billion—more than double the original estimate made for this project in 1984—the latest problems have angered legislators, some of whom now charge that the space agency is virtually incapable of managing large projects. Why, they ask, should they believe the satellites will ever get off the ground? There are even whispers that the program may be killed altogether. Greaves, understandably, is feeling the pressure: "I am up to my armpits in crisis management," he says.

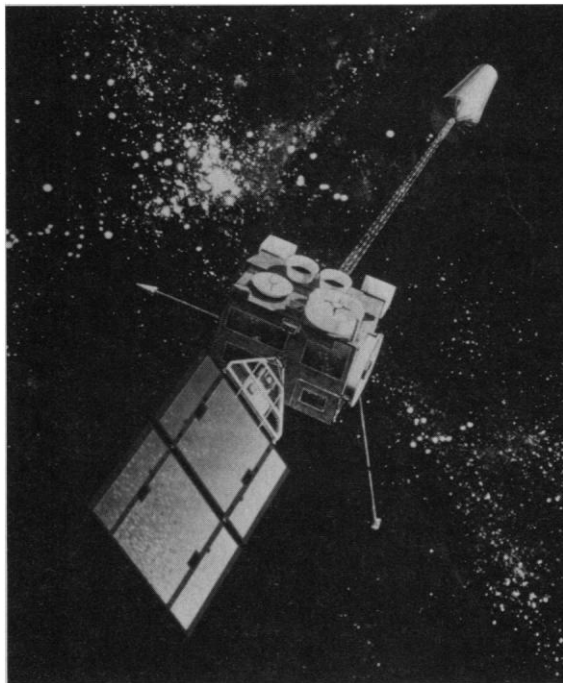
What went wrong? At first glance, Greaves' program, known as GOES-NEXT, appears to be a victim of overambitious design. Proposed in 1983, the five geostationary satellites of GOES-NEXT were intended to replace the earlier GOES (Geostationary Operational Environment Satellites) series, the last of which is set to expire early next year. Instead of simply upgrading the earlier satellite, however, NASA chose to revamp the design entirely—a decision that has created untold trouble. "It's just a question of going to a new system too fast," says oceanographer D. James Baker of Joint Oceanographic Institutions, Inc., a member of the National Research Council's Ocean Studies Board. Greaves admits the biggest lesson NASA has learned is that "one should not, when looking at a critical operational system, enter into a devel-

opment program in series with an existing chain of spacecraft."

NASA's major error lay in deciding to move precipitously from "spinners"—satellites that rotate some 100 times a minute—to "three-axis stabilized" satellites that point the same face toward the earth throughout their orbits. While it seems intuitively obvious that such a stabilized satellite would produce better data than a spinner, the task of actually designing such a satellite opened the door to a host of new thermal and stability problems. A spinner, for instance, operates in a state of thermal equilibrium, since its entire surface is exposed to the same intensity of sunlight. Stabilized satellites, on the other hand, experience thermal expansion and contraction as they slowly rotate with respect to the sun. Stabilized satellites are also more difficult to, well, stabilize—spinners are steadied by their angular momentum, while stabilized satellites "are always searching for the vertical," says Greaves.

These difficulties might have been anticipated, had NASA undertaken a set of "definitional" studies in 1983 to conceptualize the design and lay out hardware requirements. Under time and budget pressure, however, such studies were never done. "At

Forecast: Stormy weather on Capitol Hill.



the time, it made sense," says Greaves. "It's clear we underestimated the complexity of the job at hand." NASA officials ascribe most of the program's cost increase to such after-the-fact technical challenges. "I'm not suggesting that in the end the cost would have been lower, but we would have gone in knowing it was more difficult than we originally expected," says Greaves.

Recent technical problems, however, seem unrelated to the design complexity, and have raised more serious questions about the project management. Within the last 2 weeks, engineers have confronted a mysterious failure of five solid-state detectors used in the two main GOES-NEXT instruments: a "throughput" problem in the same two instruments, exhibited as a reduction in the strength of the received signal; and a reception problem in the satellite's video imager caused by a temperature-sensitive nickel wire whose resistance fluctuations distort the imager signal. Although fixes for all three problems are in sight—replacing all the detectors with substitutes manufactured by a different firm might solve the first two, while replacing the faulty wire or installing a feedback control loop could take care of the third—they will take precious time. Greaves estimates that repairs could take 1 to 2 months, or longer if it becomes necessary to replace the nickel wire.

Such delays make it virtually certain that the first GOES-NEXT satellite won't be launched until early 1993 at the earliest—and that's one reason GOES-NEXT has attracted the attention of two congressional committees. That long a delay in putting up the first GOES-NEXT satellite could create a gap in weather coverage for the United States, a situation officials at the National Weather Service have termed a national emergency.

With careful fuel conservation, the last GOES satellite just might hang on until its replacement arrives. In case it doesn't, weather service officials are preparing a number of contingency plans, including asking European nations or Japan for the part-time use of their satellites and restarting the GOES production line. But a staffer to the House oversight panel now examining the situation is skeptical of such solutions, and even less ready to believe that GOES-NEXT will be ready in time to avert a gap in coverage. "The way things stand, GOES-NEXT is looking like a poorer and poorer option." The oversight panel will hold a hearing on 25 July at which General Accounting Office investigators will report on what, other options, if any, might be available. ■ DAVID HAMILTON