ASTRONOMY

A Scheme for a High-Flying Scope

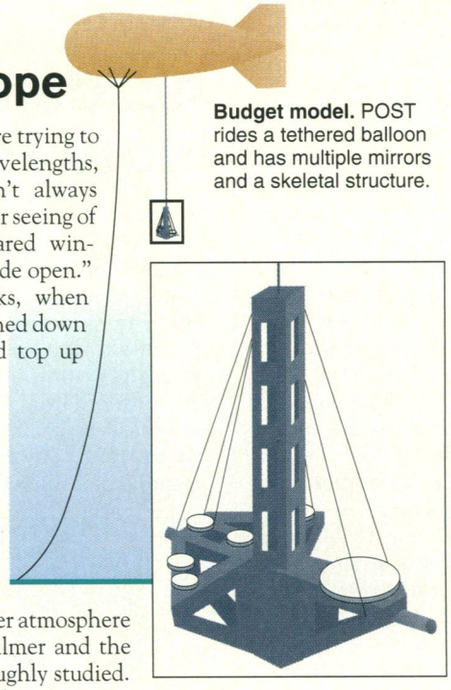
In the expansive 1980s, astronomers planning a successor to the Hubble Space Telescope envisioned the Next Generation Space Telescope (NGST), with a 10-meter mirror and a price tag of $4 billion. In the chintzy 1990s, astronomers still want a bigger telescope above the atmosphere, but they are going downscale. In that spirit comes a proposal made this week at the American Astronomical Society meeting in Washington, D.C., by Holland Ford of Johns Hopkins University and the Space Telescope Science Institute (STScI) and Pierre Bely of the European Space Agency (ESA) and STScI. Their candidate for a Hubble successor is a 6-meter telescope—still more than twice the size of Hubble—slung beneath a tethered balloon. Ford and Bely need to do further design studies before submitting a proposal to the National Aeronautics and Space Administration (NASA), but they estimate that the setup could cost as little as $60 million.

A balloon may sound like a drastic comedown from space, but Ford and Bely point out that "space"—and the sharp seeing it brings—starts well below the space telescope's 600-kilometer orbit. That's especially true at the poles, where the atmosphere sags and the changes in temperature and wind speed that blur ground-based telescopic images ease off above about 8 kilometers. Accordingly, Ford and Bely would like to attach their gargantuan telescope to a 747-sized aerostat, or tethered balloon, stabilize it with gyroscopes, and fly it at an altitude of about 13 kilometers near Fairbanks, Alaska.

Called the Polar Stratospheric Telescope, or POST, the telescope should yield sharper pictures than the Hubble and also test technologies that might fly in some future space telescope. "It's a marvelous idea," says Garth Illingworth of the Lick Observatory, who helped plan the NGST. "It's a great test-bed and it'll do some wonderful science."

POST itself would depend on some new technology. A practical aerostat can't lift a single 6-meter mirror, so POST would gather light with seven smaller mirrors, spaced irregularly over a 6-meter-wide area: one 1.8-meter mirror and six 0.6 meter mirrors. The mirrors would adjust to form a single—if interrupted—surface, which would create a single image. Seven smaller mirrors can't gather as much light as a single mirror with a larger total surface area. But because POST's mirrors span 6 meters, its images would still have 2.5 times the detail of Hubble's, and reveal objects 2.5 times fainter.

Sitting in the cold polar stratosphere, POST would be able to do infrared as well as optical astronomy because, as Ford explains, the telescope "won't glow at the same [infrared] wavelengths you're trying to see at." At optical wavelengths, the stratosphere won't always permit the crystal-clear seeing of space, but "the infrared window," says Ford, "is wide open." And every few weeks, when POST would be winched down so that workers could top up the balloon's helium, new instruments could be installed. Eventually, the telescope could be moved to the South Pole, where working conditions are more challenging than in Fairbanks but the upper atmosphere is even colder and calmer and the skies are not as thoroughly studied.



Budget model. POST rides a tethered balloon and has multiple mirrors and a skeletal structure.

SOURCE: FORD ILLUSTRATION: C. FABER SMITH

But Ford and Bely have more in mind than high-resolution astronomy. "[Hubble] won't be the last optical space telescope flown," says Ford. "Someone, maybe not the United States, will fly a 6-meter, a 10-meter. But it won't look like the one we've got." Ford and Bely see POST as a test-bed for lightweight, cheap mirrors and structures that could make a larger space telescope practical.

None of this, says Bely, "requires breakthroughs, nothing that couldn't be done yesterday." If all goes well, he says, POST could be fully operational within 5 years; the Hubble, from proposal to launch, took 30. POST's bargain-basement price tag should attract NASA, he and Ford hope, as should its international appeal. Australian and French astronomers have already expressed interest, Bely says, and "we should approach ESA. With international collaboration, it becomes *cheap*."

And if, like the space telescope, POST turns out to be marred by an unexpected defect, Ford and Bely don't foresee the anguish, expense, and delay that came with the space telescope's troubles. "This doesn't have to work the first time or the second or the third," says Ford. "We'll just keep pulling it back down until we get it right."

–Ann Finkbeiner

Ann Finkbeiner is a science writer in Baltimore.

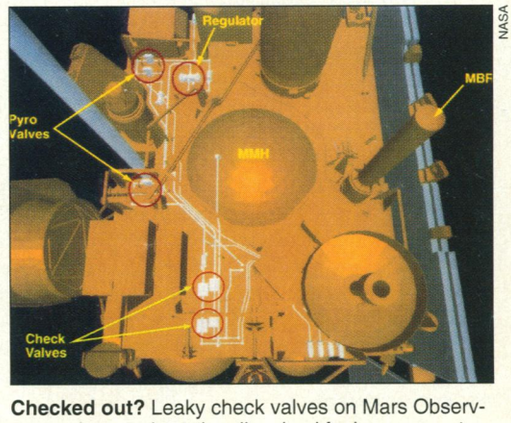
MARS OBSERVER

Management Faulted in Postmortem

Officials at the National Aeronautics and Space Administration (NASA) had barely finished celebrating last month's apparently successful Hubble Space Telescope repair mission when they were brought back down to earth by a new report criticizing the agency for a past mishap. The rebuke came last week from an external review panel charged with investigating the loss of contact with the Mars Observer space probe on 21 August 1993 (*Science*, 9 September 1993, p. 1264).

The panel acknowledged that no one will probably ever know exactly what happened to the spacecraft. But it listed the most probable failure scenarios, highlighting one in which a ruptured propulsion system could have led to a wildly spinning—and mute—Observer. The comments about mission management, however, contained few qualifiers. The panel, headed by Timothy Coffey, director of the Naval Research Laboratory, delivered a sharply worded list of admonishments ranging from overall mishandling of the $950 million mission to poor quality control and sloppy workmanship.

These problems were so significant that Coffey told reporters that "if you reflew Mars Observer and did nothing different, there's a high probability you would lose it again." The report "will certainly provide ammunition for critics of NASA's management style and also support [agency chief Daniel] Goldin's thrust for changes," comments space



NASA

Checked out? Leaky check valves on Mars Observer may have unintentionally mixed fuel components.