

## Director's Perspective

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The announcement on January 16, 2004, that NASA would cancel all further servicing missions to the Hubble Space Telescope came as a shock to those who have followed Hubble's achievements, including millions of interested citizens. Hubble is at the height of its scientific powers, and it has been NASA's most productive mission for ten years. Mindful While mindful of the difficulties that the return to flight would bring to NASA, we in the Hubble community felt certain that the next servicing mission, SM4, was too important to the agency to be eliminated. We scientists were lulled by years of good fortune.

Mr. O'Keefe explained his decision as driven by a variety of factors, not a single reason, although he ~~has~~ stressed astronaut safety as the primary concern. Nevertheless, a close examination of the costs to keep the shuttles flying suggests instead that the over-riding difficulty is money to support an aging shuttle fleet. The Government Accounting Office recently reported that in absence of a new vehicle, NASA would have to rely on the current fleet of three shuttles for the next two decades, to service the space station and carry out its other heavy-payload launches. The Columbia Accident Investigation Board recommended that NASA ~~must~~ recertify the shuttle fleet in by 2010 if it wants to continue flying shuttles thereafter, a process that will be enormously expensive, especially if it complies with all the Board's other recommendations ~~of the Columbia Accident Investigation Board. Looking toward modernization,~~ NASA chose to develop a new spacecraft rather than to maintain the aging shuttle fleet, which ~~has never fulfilled its early promise for frequent, low-cost access to space. That decision~~ makes 2010 a hard deadline to complete all work requiring the shuttles.

NASA Current estimates ~~are~~ that about 25 shuttle flights are needed to complete the space station, as ~~awhich is~~ requirementd to fulfill ~~our~~ international agreements, ~~meaning.~~ This means five flights per year for the next five years, assuming a return to flight in 2005. The flight schedule is so demanding that every non-station flight would put NASA at risk of missing the deadline to stop flying shuttles if the fleet is not recertified. ~~With these constraints, a mission to Hubble would be possible only if a constraint is relaxed. out of the question. To create~~ Creating a new vehicle for human spaceflight while simultaneously completing construction of the station ~~will~~ would require either new investments at a time of record-high federal deficits or the reduction or elimination of other NASA programs.

SM4 would be possible only if some constraint is relaxed.

Ironically, NASA's new vision ~~is to~~ involves redirecting its energies for human spaceflight from the station to the Moon and Mars. Because President Bush's budget gives NASA the expectation of only a 5% annual budget increase for the next five years, the agency will have to squeeze its other programs in any case to pay for the new development costs. Funding for the Explorer program has been delayed by one year,

LISA and Constellation-X by one to two years, and the much-heralded Einstein Probes have no budget in NASA's current plan. The agency will save several hundred million dollars by ending the Hubble mission early.

~~The irony is that As a further irony, Administrator O'Keefe's refusal to risk-aversion the Hubble shuttle flight to Hubble decision displays an aversion to known risks just when its future vision depends on taking, where the stakes benefits scientific and educational benefits are widely understood to be enormousvalenormousuable, contrasts sharply is in sharp contrast with his embrace of the huge risks to travel to the Moon and Mars-dubio, where the motivations are nebulous and the benefits advantages unclearus scientific rationaleeasons, -armchair risks~~

~~large unknown risks with human life. There are no safe havens on the way to the Moon or Mars. To maintain public support for the broad new program of human exploration, NASA will need to convince the public that the benefits are worth the risks, and they will have to maintain that support in the face of inevitable future tragedies in the space program. Hubble is NASA's most popular program right now. If keeping it alive with proven technology is too risky, how can we expect to set out for the Moon with unproven vehicles?~~

~~You should expect to see belt tightening in the Hubble program over the next few years, especially in support groups at Goddard Space Flight Center and the Institute.~~

Public reaction to NASA's new course has been not been favorable. Indeed, the outcry against the cancellation of SM4 has been overwhelming. Months after the announcement, newspapers around the world continue to carry editorials critical of the SM4 decision, including two in one week in the New York Times. We have received thousands of e-mail messages supporting a continuation of Hubble's mission, and petitions circulate asking NASA to reinstate SM4. ~~Although the "S" in NASA may not stand for science, sScience is nevertheless one of the most successful-and-popular things NASA does-right now, and Hubble leads all other missions in popularity.~~

Continued media attention has given Hubble's supporters a ray of hope that SM4 could still be reinstated. Congressman Mark Udall, D-Colorado, introduced a resolution to the House of Representatives, [H. Res. 550](#), calling for an independent review of the decision to terminate Hubble early. [Senators Barbara Mikulski and Sam Brownback introduced a similar resolution in the Senate, S. Res. 324. Congress recognizes the enormous benefit Hubble provides to the public, and they question the decision through these resolution. Nevertheless, the difficulties of returning the shuttle to flight and retiring the fleet before 2010 loom large.](#)

Scientists around the world continue to use Hubble to [make greatproduce unparalleled](#) discoveries. We have ~~two~~ to four years left by our best estimates. Hubble is at the height of its powers, still capable of making crucial inroads on the most important

problems in astronomy: the nature of dark energy, the structure of galaxies from the time of their formation, and the composition of extrasolar planets, to name just three.

~~You should expect to see belt tightening in the Hubble program over the next few years, especially in support provided by Goddard Space Flight Center and the Institute.~~ ~~It~~ ~~Nevertheless~~ ~~However~~ ~~It~~ is premature to mourn the impending loss of Hubble, especially when we have so much more good work to do.