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The Honorable Howard Wolpe
 Chairman, Subcommittee on
 Investigations and Oversight
 Committee on Science, Space,
 and Technology
 House of Representatives

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Dear Mr. Chairman:

This report responds to your request that we determine whether the National Aeronautics and Space Administration (NASA) implemented an advisory committee's recommendation to strengthen NASA's independent cost estimating capability. Congress and the executive branch need accurate cost estimates in deciding whether to undertake or continue space programs which often cost millions or even billions of dollars. In December 1990, the Advisory Committee on the Future of the U.S. Space Program found that initial estimates of required resources too often have been understated. The Committee recommended that NASA establish an independent cost analysis group to advise the Administrator on estimates being provided to Congress and the Office of Management and Budget.

Results in Brief

NASA's actions to implement an independent cost estimating function did not meet the intent of the Advisory Committee's recommendation. NASA recently announced plans that may be more responsive. NASA's initial actions were deficient because:

- results of formal cost reviews were reported to program officials rather than directly to the Administrator;
- advice provided to the Administrator on cost estimates was informal and undocumented;
- cost estimates were reviewed only at the start of new initiatives, not at all major decision points over a program's life; and
- the cost analysis group did not have adequate staff to perform independent estimates at all major decision points

In September 1992, we briefed NASA's Chief of Staff on the results of our review. Soon after, the Administrator announced that he intended to establish a new independent cost assessment group and staff it with sufficient resources to function as envisioned by the Advisory Committee.

Background

The Advisory Committee on the Future of the U.S. Space Program was established in 1990 to advise the NASA Administrator on overall approaches to implementing the U.S. space program. The Committee was specifically tasked to (1) review the future of the civil space program, including both management and program content; (2) assess alternative approaches; and (3) make recommendations for implementing future civil space goals. Advisory Committee members included individuals with backgrounds in industry, academia, military, and NASA, including one former Administrator. The Committee's findings were submitted to the NASA Administrator and then to the Vice President, in his capacity as Chairman of the National Space Council.

The Advisory Committee's December 1990 report¹ included several findings on cost estimating. The report stated that the space program must provide at the outset realistic estimates of needed resources. It also stated that more accurate cost information and comprehensive congressional debate before making significant commitments could result in greater program stability. However, the Committee concluded that initial estimates of required resources too often had been understated. The Committee also found that margins needed to provide confidence in maintaining cost, schedule, and performance were often minimal or absent.

The Committee concluded that the causes for inaccurate cost estimates were well understood and included initiating programs before enabling technology was proven, overselling on the part of program advocates both in government and industry, and failing to include all relevant program costs. The Committee also attributed the disparity between initial and revised estimates to the tendency for programs to grow in complexity and size as they evolve, demanding more resources than originally foreseen.

With programs becoming ever more costly and complex, the Advisory Committee concluded that the Administrator should have access to a highly skilled and independent cost estimating and analysis capability. The Committee recommended that an independent cost analysis group be formed to serve the Administrator and the Administrator's staff. This group would be responsible for advising the Administrator on all significant cost estimates provided to the Congress or the Office of Management and Budget. According to the Committee, this group should use modern approaches for assessing the costs of complex advanced technology systems under a variety of management and business strategies.

¹Report of the Advisory Committee on the Future of the U.S. Space Program. U.S. Government Printing Office, December 1990.

In a March 1991 action plan, NASA concurred with the recommendation to establish an independent cost analysis group. NASA stated in a September 1991 briefing to the Advisory Committee on actions taken in response to the Committee's report, that it was enhancing the cost analysis capability of the Cost and Economic Analysis Branch within the Office of the Comptroller, which reports directly to the Administrator. The branch would increase from four to eight personnel. In addition to analyzing cost estimates, the branch would work to improve data collection and cost model development.

Before the Advisory Committee's recommendation, the Cost and Economic Analysis Branch was responsible for reviewing estimates as part of NASA's procedures for authorizing the start of new programs. The branch performed its review of costs during NASA's non-advocate review process. The non-advocate review is an evaluation of a program's planning, including cost estimates, by a team of experts not directly associated with the program. According to NASA Management Instruction 7120.3, the non-advocate team is selected by and reports to the associate administrator responsible for the program. The non-advocate cost team includes staff from the Comptroller's office and staff detailed from NASA centers not directly involved in the program. After considering the team's findings, the program associate administrator presents the new initiative to the Administrator for approval.

Advisory Committee's Recommendation Was Not Fully Implemented

Our review indicated that NASA's actions to implement an independent cost analysis group did not satisfy the Advisory Committee's recommendation. In effect, nothing had changed from the way the estimating process worked before the Advisory Committee's recommendation. The same group was doing the same reviews, reporting through the same channels, and functioning with fewer staff.

Reporting to the Administrator Is Indirect and Advice Is Undocumented

Estimates and advice provided to the Administrator by the cost analysis group need to be independent in fact and appearance so that the group's opinions, conclusions, and recommendations will be impartial and viewed as impartial by third parties. According to the Advisory Committee Chairman, the independent cost analysis group in NASA should have no responsibility for advocating the initiation of new programs or the continuation of existing programs. However, the Cost and Economic Analysis Branch's review of program costs continued to be performed as

part of the non-advocate review process, with the results of the review reported to the program associate administrator.

Because associate administrators are responsible for particular programs and compete with other associate administrators for limited agency resources, they may be viewed as program advocates. Having the analysis of costs controlled by a program associate administrator gives at least the appearance that the independence of the estimates may be compromised. For comparable Department of Defense major acquisition programs, 10 U.S.C. 2434 requires that independent estimates be prepared by an entity not under the supervision, direction, or control of the unit that is directly responsible for carrying out the development or acquisition of the program.

NASA's Cost and Economic Analysis Branch chief stated that her branch also reports non-advocate review results to the Comptroller, who provides advice directly to the Administrator when he believes it necessary. However, the advice provided by the Comptroller is for the most part informal and undocumented. The Chairman of the Advisory Committee told us that the independent recommendations to the Administrator on cost estimates should be documented as part of a formal decision process. Documenting the independent advice to the Administrator is important because it provides a record of information used in making key decisions and improves accountability in the decision-making process. Documenting the advice provided to the Administrator is also important for assessing the effectiveness of the independent cost analysis group over time.

Cost Estimates Are Not Independently Reviewed at Major Milestones

The Advisory Committee recommended that the independent cost group advise the Administrator on all significant estimates. According to the Cost and Economic Analysis Branch chief, NASA interpreted "all significant estimates" to include only estimates at the start of new programs. Consequently, the branch continued to be responsible for reviewing estimates only during the initial program approval process. The Chairman of the Advisory Committee believed the group should provide an independent assessment of costs not only at the start of new programs, but at all major decision points and milestones.

After a new program is approved, there are several points in its life cycle where an independent estimate is needed. A program's technical progress, schedule, and cost are formally evaluated at preliminary and critical design reviews that occur a few years into a program when it is better defined and

more precise estimates can be prepared. Independent analysis of cost estimates are needed to support important decisions on the direction of the program that are made at these reviews.

Another point where an independent estimate is needed is when a program undergoes a major restructuring in terms of objectives, cost, schedule, or design. For example, estimates for the Earth Observing System program were reviewed by an independent team during the non-advocate review for the program in 1989. After being approved by the Administrator and Congress as a new initiative for fiscal year 1991, the program was substantially restructured due to funding limitations. The revised program involves reduced scientific objectives and different size and number of spacecraft, instruments, and launch vehicles. Because these changes significantly altered the costs for the program, an independent review of the revised estimate is needed.

Cost Analysis Branch Is Not Adequately Staffed

The Advisory Committee's report estimated that as many as 20 highly qualified personnel would be needed to carry out the independent cost estimating function. According to the Advisory Committee Chairman, the group would need to have sufficient resources to independently generate its own estimates rather than simply review the estimates prepared by others. The Cost and Economic Analysis Branch chief said that her branch was only authorized eight positions because it was to only review estimates for new programs, and few new programs were expected to start because of the tight budget environment. The branch chief agreed that she did not have enough staff to independently review estimates at important milestones for all major programs.

The number of personnel actually working in the branch has decreased since NASA announced it was planning to increase the staff. When the Advisory Committee recommended strengthening the independent cost function, the branch had four employees. Shortly after NASA decided to increase the number of positions in the branch, two staff members left, leaving only two of the original four. When we completed our evaluation in September 1992, only two of the eight allocated positions were filled, and NASA was not actively recruiting to fill the vacant positions. The branch chief stated that positions had not been filled because it was difficult to recruit experienced estimators.

Recommendations

To establish an independent cost estimating function, we recommend that the NASA Administrator

- ensure that the cost analysis group operates with the independence that the Advisory Committee intended, with results of cost reviews being reported directly to the Administrator;
- require that the advice on cost estimates provided to the Administrator by the cost analysis group be formally documented;
- direct the independent cost analysis group to review program estimates at all major milestones, decision points, or other significant events such as a major program restructuring; and
- strengthen the independent cost analysis staff with sufficient personnel to generate independent estimates at all major milestones.

The precise staffing level of this group should be evaluated and adjusted over time as the work load dictates.

Views of NASA Officials

As requested, we did not obtain official agency comments on a draft of this report. However, on September 9, 1992, we briefed the NASA Chief of Staff on our findings and recommendations. She agreed that NASA's actions in response to the Advisory Committee recommendation had not been adequate and indicated that corrective action would be taken. In a September 17, 1992, speech, the Administrator acknowledged that NASA had not acted on the Advisory Committee's recommendation and announced a new initiative to establish and adequately staff an independent cost estimating group.²

Scope and Methodology

To determine what actions NASA had taken to implement an independent cost analysis group as recommended by the Advisory Committee, we reviewed NASA's policies on cost estimating and discussed the cost estimating issue with current and former NASA officials involved in preparing and reviewing program estimates. We also reviewed the report of the Advisory Committee on the Future of the U.S. Space Program and discussed the report with the Chairman of the Advisory Committee.

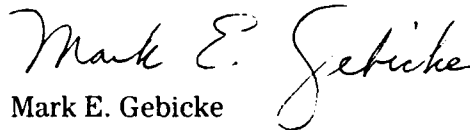
We conducted our review from February to September 1992 in accordance with generally accepted government auditing standards.

²The NASA Team—Delivering on the Promise, Remarks by NASA Administrator Daniel S. Goldin to the American Institute of Aeronautics and Astronautics, Washington, D.C., September 17, 1992

Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time we will send copies of this report to interested parties upon request.

Please contact me on (202) 275-5140 if you or your staff have any questions concerning this report. Other major contributors to this report are listed in appendix I.

Sincerely yours,



Mark E. Gebicke
Director, NASA Issues

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