

GAO

Report to the Ranking Minority
Member, Committee on Governmental
Affairs, U.S. Senate

July 2001

NASA

Status of Achieving
Key Outcomes and
Addressing Major
Management
Challenges



G A O

Accountability * Integrity * Reliability

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Accountability * Integrity * Reliability

United States General Accounting Office
Washington, DC 20548

July 31, 2001

The Honorable Fred Thompson
Ranking Minority Member
Committee on Governmental Affairs
United States Senate

Dear Senator Thompson:

As you requested, we reviewed the National Aeronautics and Space Administration's (NASA) fiscal year 2000 performance report required by the Government Performance and Results Act of 1993 (GPRA) to assess the agency's progress in achieving selected key outcomes that you identified as important mission areas for NASA.¹ We did not review NASA's fiscal year 2002 performance plan because it had not been issued by the time we completed our work. NASA was in the process of making substantive changes to the plan based on comments from the Office of Management and Budget and the NASA Advisory Council. Thus, we are unable to discuss NASA's fiscal year 2002 goals and strategies for the selected outcomes. Also, we could not compare NASA's fiscal year 2002 performance plan with its fiscal year 2001 performance plan for the selected outcomes. These are the same outcomes we addressed in our June 2000 review of the agency's fiscal year 1999 performance report and fiscal year 2001 performance plan to provide a baseline by which to measure the agency's performance from year-to-year.² These selected key outcomes are to

- expand scientific knowledge of the Earth system,
- expand the commercial development of space, and
- deploy and operate the International Space Station safely and cost effectively.

¹This report is one of a series of reports on the 24 Chief Financial Officers (CFO) Act agencies' fiscal year 2000 performance reports and fiscal year 2002 performance plans.

²*Observations on the National Aeronautics and Space Administration's Fiscal Year 1999 Performance Report and Fiscal Year 2001 Performance Plan* (GAO/NSIAD-00-192R, June 30, 2000).

As agreed, using the selected key outcomes for NASA as a framework, we (1) assessed the progress NASA has made in achieving these outcomes and the strategies the agency has in place to achieve unmet performance goals; and (2) compared NASA's fiscal year 2000 performance report with the agency's prior year performance report for these outcomes. Additionally, we agreed to analyze how NASA addressed its major management challenges, including the governmentwide high-risk areas of strategic human capital management and information security, that we and NASA's Office of Inspector General identified. Appendix I provides detailed information on how NASA addressed these challenges. (App. II contains NASA's comments on a draft of our report.)

Results in Brief

NASA reported mixed progress in achieving its key outcomes. In general, NASA's strategies for achieving unmet performance targets for these outcomes are clear and reasonable. As described below, NASA reported that it achieved most targets related to expanding knowledge of the Earth system. However, its progress in other areas was more limited.

- Planned outcome: Expanding scientific knowledge of the Earth system. NASA's performance report indicated that NASA made progress toward achieving this outcome. NASA reported meeting nearly all of its planned performance targets, which included developing models to use time-varying gravity observations for the first time in space and completing an initiative to reduce the size and weight of certain aircraft instruments. NASA's planned actions and time frames for achieving its unmet targets were clear and reasonable. The NASA Advisory Council, which independently evaluated the performance report, also generally found that good progress had been made with this outcome.
- Planned outcome: Expanding the commercial development of space. NASA's performance report indicated limited progress toward achieving this outcome. Over half of the performance targets that we assessed for this outcome were reported as having been met. But a number of targets were not achieved, including two that were associated with NASA's X-33 and X-34 programs. These programs, designed to develop and demonstrate technologies needed for future reusable spacecraft, were not competitively selected for additional funding. The NASA Advisory Council expressed concern that program efforts related to NASA's new Space Launch Initiative were elusive. NASA provided clear and reasonable explanations for targets that were not met. But it did not provide strategies and time frames for achieving its unmet target of pursuing the commercial marketing of space shuttle

payloads, even though it stated in the report that the target remained feasible.

- Planned outcome: Deploying and operating the International Space Station safely and cost-effectively. NASA's performance report showed that NASA made limited progress toward achieving this outcome. Most performance targets related to the space station effort were tied into a specific launch, which did not take place as planned in fiscal year 2000. NASA provided clear explanations for missing these targets, noting that delays were caused by Russian Proton failures and Service Module launch schedule slips. It also provided reasonable strategies and time frames for achieving them. NASA did not directly address the problem of continuing space station cost growth, despite the fact that this has been a long-standing problem. In fact, NASA now projects cost overruns to exceed \$4 billion.

NASA has made improvements in its fiscal year 2000 performance report in comparison to its fiscal year 1999 performance report. Specifically, NASA is describing its verification and validation efforts and disclosing its data sources for each performance target, providing greater confidence that the performance results are credible. Also, it has added discussions on why performance results are meaningful, and it is explaining why changes in performance targets are needed. However, NASA can still be more specific in addressing the outcome of deploying and operating the space station safely and cost-effectively and it needs to identify performance measures that directly address cost growth. NASA can also improve its discussions on data verification and validation by (1) more clearly identifying validation methods used for some targets, (2) highlighting data limitations, and (3) communicating these discussions in a less technical manner. Lastly, as we noted in our review of the fiscal year 1999 report, NASA still relies heavily on output measures. NASA's explanations of why performance results are meaningful help to better understand the linkage between the performance targets and results. However, we believe that continued use of output measures burdens NASA by requiring it to continuously demonstrate the linkages between program efforts and results and to make improvements to strengthen such linkages.

In assessing how NASA addressed major management challenges, we found that NASA's report partially addressed the governmentwide high-risk area of strategic human capital management but not the other area of information security. Addressing this issue is important since we have previously found that NASA lacks an effective agencywide security

program. We also identified three other challenges facing NASA. We found that NASA's report addressed two of these critical management challenges: (1) correcting weaknesses in contract management and (2) effectively implementing the faster, better, cheaper approach to space exploration projects. However, as mentioned above, it did not address the challenge of controlling space station costs.

In commenting on a draft of our report, NASA said that it had no issues with the report.

Background

GPRA is intended to shift the focus of government decisionmaking, management, and accountability from activities and processes to the results and outcomes achieved by federal programs. New and valuable information on the plans, goals, and strategies of federal agencies has been provided since federal agencies began implementing GPRA. Under GPRA, annual performance plans are to clearly inform the Congress and the public of (1) the annual performance goals for agencies' major programs and activities, (2) the measures that will be used to gauge performance, (3) the strategies and resources required to achieve the performance goals, and (4) the procedures that will be used to verify and validate performance information. These annual plans, issued soon after transmittal of the President's budget, provide a direct linkage between an agency's longer-term goals and mission and day-to-day activities.³ Annual performance reports are to subsequently report on the degree to which performance goals were met. The issuance of the agencies' performance reports, due by March 31, represents a new and potentially more substantive phase in the implementation of GPRA—the opportunity to assess federal agencies' actual performance for the prior fiscal year and to consider what steps are needed to improve performance, and reduce costs in the future.⁴

NASA's mission encompasses human exploration and development of space, the advancement and communication of scientific knowledge, and research and development of aeronautics and space technologies. Its activities span a broad range of complex and technical endeavors—from investigating the composition, evaluation, and resources of Mars; to working with its international partners to complete and operate the

³The fiscal year 2002 performance plan is the fourth of these annual plans under GPRA.

⁴The fiscal year 2000 performance report is the second of these annual reports under GPRA.

International Space Station; to providing satellite and aircraft observations of earth for scientific and weather forecasting purposes; to developing new technologies designed to improve air flight safety.

Assessment of NASA's Progress and Strategies in Accomplishing Selected Key Outcomes

This section discusses our analysis of NASA's performance in achieving its selected key outcomes and the strategies the agency has in place to achieve unmet performance goals and measures in the future. In discussing these outcomes, we have also provided information drawn from our prior work on the extent to which the agency provided assurance that the performance information it is reporting is credible.

Scientific Knowledge of the Earth System

The performance report indicated that NASA made progress toward achieving its key outcome of expanding the scientific knowledge of the Earth system. NASA reported that all performance targets for this outcome were met, except two. However, NASA provided reasonable explanations for not meeting them in fiscal year 2000. For example, NASA reported that a lack of science quality spectroradiometer ocean color data prevented one of the targets from being fully achieved,⁵ and difficulties with an international partner prevented the other target, "Launch the NASA-National Center for Space Studies Jason-1 mission," from being achieved.

The NASA Advisory Council provided an independent evaluation of NASA's fiscal year 2000 performance and the evaluation was included in the performance report. Its evaluation of performance related to this outcome was positive, indicating the failure to launch the Jason-1 spacecraft as the most significant shortfall. However, the Council concluded that many of the performance targets across all of NASA's Enterprises were too vague and did not sufficiently relate to the actual programs being implemented. The Council did not identify which targets it viewed as vague in its report, but it recommended that the targets be better written and that NASA communicate to the public the reason the metric or program is important. In response to the Council's

⁵That target stated that "Sensor Intercomparison and Merger for Biological and Interdisciplinary Oceanic Studies (SIMBIOS) will merge Moderate Resolution Imaging Spectroradiometer (MODIS) ocean color data into global ocean color time series, which began with Ocean Color Temperature Sensor and Sea-viewing Wide Field-of-view Sensor (SeaWiFs)."

recommendation, NASA added statements to performance targets that explain why the performance results are meaningful.

Regarding data credibility, NASA disclosed the methods used for verifying and validating the data and the data sources for each performance target associated with this outcome in the fiscal year 2000 report. This is an important step toward providing confidence that performance results are credible. However, for many performance targets, NASA did not discuss limitations in the data and steps it would take to correct them. A recent NASA Office of Inspector General (OIG) report states that beginning with the fiscal year 2002 final performance plan, NASA will discuss anticipated data limitations.⁶ Also, in some cases, NASA did not clearly address how the data was validated. For example, the verification and validation narrative for the performance target, “Continue the ocean color time with 60 percent global coverage every four days—a 35 percent improvement over fiscal year 1999,” reads as follows.

“The two-day coverage is required to account for the losses due to the tilt maneuver of the sensor and interorbit gaps. When clouds are taken into consideration, the coverage is reduced to 50-60 percent. The Sea-viewing Wide Field-of-view Sensor Project has increased the Global Area Coverage data beyond that expected by eight percent by collecting data to higher latitudes than planned on all orbits. However, pole-to-pole coverage each day is not possible since data at low Sun angles are not scientifically useful for ocean color research. The Moderate Resolution Imaging Spectroradiometer instrument aboard Terra is beginning to supply additional data to meet to meet the ocean color requirement.”

For some targets, NASA’s discussions were simply too technical to provide a good understanding of the approach used to verify and validate the data. For example, the verification and validation narrative for the performance target, “Develop remote-sensing instrument/technique for ocean surface salinity measurements from aircraft” is articulated as:

“Salinities in the ocean are typically 33-32 PSU. In 1998, they got +/- 1 PSU, so the target for a 10x improvement would be 0.1 PSU. Due to pointing error on the plane L-Band, radiometer accuracy is adversely affected. From a satellite sensor this error is much reduced. The airborne results coupled with theoretical studies now show that a monthly average of sea surface salinity, at a resolution of 1degree latitude x 1 degree longitude can be produced with an accuracy of <0.1-0.2 PSU, which will meet the target. Important to this

⁶*Validation And Verification Of Selected NASA FY 2000 Performance Data Related To The Government Performance And Results Act (GPRA)*, (IG-01-020, Mar. 30, 2001).

analysis is getting the sea surface temperature right, and also getting sea surface roughness from scatterometers. The monthly data product is suitable for ocean circulation studies. It will also be possible to produce a weekly data product, more for meteorological use.”

Regarding its plans for achieving the two unmet targets for this outcome, NASA established reasonable strategies and time frames. It reported that progress was significant in one of the performance targets (footnote 5) and that full achievement of that target, anticipated in fiscal year 2001, is dependent on the “availability of valid moderate resolution imaging spectroradiometer data.” The report noted that the planned delivery of new processing software in November 2000 was expected to improve data quality to a level sufficient for an initial merging of SeaWiFs and MODIS oceans products. Achievement of the other target, “Launch the NASA-National Center for Space Studies Jason-1 mission,” is also anticipated in fiscal year 2001.

Lastly, NASA credits the contribution of the other agencies for the successful achievement of performance targets related to this outcome. For example, for the achieved target, “Demonstrate the utility of spaceborne data for flood plain mapping with the Federal Emergency Management Agency (FEMA),” the report credits FEMA, the Army Corps of Engineers, and NASA for conducting cooperative demonstration projects to evaluate NASA and commercially provided digital topographic and image-based information products to re-map flood plains.

Commercial Development of Space

The performance report indicated that the agency made some progress toward achieving its key outcome of expanding the commercial development of space. Over half of the performance targets that we assessed for this outcome were reported as having been met. For example, NASA reported that it achieved its targets to (1) promote privatization and commercialization of space shuttle payload operations through the transition of payload management functions by fiscal year 2000 and (2) establish up to two new commercial space centers. NASA provided clear and reasonable explanations for targets that were not met. For example, NASA reported that its performance target to promote privatization of space shuttle operations and reduce civil service requirements for operations by 20 percent in fiscal 2000 was not met following the agency’s decision to hire additional staff to ensure that safety would not be compromised for space shuttle missions. In August 2000, we reported that several internal NASA studies had shown that the agency’s space shuttle

program's workforce had been affected negatively by NASA's downsizing, much of which occurred after 1995.⁷

NASA reported that its performance target to complete small payload focused technologies and select concepts for flight demonstration of a reusable first stage was not met because the agency decided to terminate this activity once it was clear that the cost objectives could not be met. Furthermore, the performance targets for the X-33 and X-34 programs—which sought to develop and demonstrate technologies needed for future reusable spacecraft in partnership with private industry—were not met since they were not competitively selected for additional funding.

The NASA Advisory Council had concerns about this outcome. In particular, the Council noted that efforts planned under the new Space Launch Initiative appear to be elusive, at best. The Council also stated that this highlights the time-lapse between definition and evaluation of specific (and critical) performance targets, but the Council did not provide further elaboration.

NASA did not provide strategies and time frames for achieving the unmet target of pursuing the commercial marketing of space shuttle payloads by working to allow the space flight operations contractor to target two reimbursable flights, one in fiscal year 2001 and one in fiscal year 2002. NASA stated the target remains feasible, but no reimbursable flights in fiscal 2001 and fiscal year 2002 are planned due to policy limitations impeding the marketing process. Regarding strategic human capital management, NASA set one related target to promote privatization of space shuttle operations and reduce civil service resource requirements for operations by 20 percent (from the fiscal year 1996 full-time equivalent levels) in fiscal year 2000. However, this target was not met since NASA had decided to end its downsizing efforts.

International Space Station Deployment, Operation, and Cost

The performance report indicated that NASA's progress toward achieving the key outcome of deploying and operating the space station safely and cost-effectively was limited with respect to achievement of the agency's planned performance targets. Since the key outcome is not included in the report as a specific goal or objective, we based our assessment of it on a

⁷*Space Shuttle: Human Capital and Safety Upgrade Challenges Require Continued Attention* (GAO/NSIAD/GGD-00-186, Aug. 15, 2000).

related objective in the report. The related objective is to deploy and operate the space station to advance scientific, exploration, engineering, and commercial objectives. All of the performance targets for this objective are associated with a NASA launch, except one, and none was achieved as planned for fiscal year 2000. The explanations for not achieving these targets were reasonable. For the launch-dependent targets, NASA reported that a schedule slip caused by Russian Proton failures and Service Module launch delays slowed down the entire space station assembly sequence. This, in turn, prevented NASA from achieving the launch-dependent targets in fiscal year 2000. NASA also reported that nonachievement for the one remaining target, “Complete the production of the X-38 first space flight test article in preparation for a Shuttle test flight in 2001,” was due to budget reductions.⁸ The NASA Advisory Council’s report indicated that the ISS program had a “productive year” after the schedule slip caused by the Russian Proton rocket failures, but it did not provide further elaboration.

In the fiscal year 2000 performance report, NASA identified reports that we and NASA’s OIG issued in fiscal year 2000 that addressed space station cost overruns and other issues. From the reports, NASA briefly summarized some of the concerns and corrective actions it agreed to take in relation to these issues, including space station cost growth. However, the agency did not set performance measures that more directly address cost growth, despite drastic increases in space station costs over the past several years and recent agency projections of potential cost overruns in excess of \$4 billion. Furthermore, the issue of space station growth has been a long-standing problem. Although the NASA Advisory Council did not comment on the issue of cost-control measures for the space station in its evaluation of NASA’s performance, we continue to believe—as we have reported in the past—that NASA should develop performance measures that directly address space station cost-control issues, including risk mitigation and contingency planning activities.⁹

⁸The X-38 is a prototype for a potential U.S. crew return capability from the International Space Station in case of an emergency.

⁹*Major Management Challenges and Program Risks: National Aeronautics and Space Administration* (GAO-01-258, Jan. 2001)., *Observations on the National Aeronautics and Space Administration’s Fiscal Year 1999 Performance Report and Fiscal Year 2001 Performance Plan* (GAO/NSIAD-00-192R, Jun. 30, 2000).

NASA's strategies and time frames for achieving the unmet targets were reasonable. For example, as of April 2001, NASA had launched four of the missions that were delayed in fiscal year 2000. The other two unachieved missions are also anticipated for launch in 2001. For the one target that was affected by budget reductions, "Complete the production of the X-38 first space flight test article in preparation for a Shuttle test flight in 2001," the report stated that it would be achieved in fiscal year 2001. The shuttle test flight that was planned for September 2001 was extended to mid-2002.

Comparison of NASA's Fiscal Year 2000 Performance Report With the Prior Year Report

For the selected key outcomes, this section describes major improvements or remaining weaknesses in NASA's fiscal year 2000 performance report in comparison with its fiscal year 1999 report. It also discusses the degree to which the agency's fiscal year 2000 report addresses concerns and recommendations by the Congress, GAO, NASA's OIG, and others.

Comparison of Performance Reports for Fiscal Years 1999 and 2000

NASA's portrayal of its verification and validation efforts applicable to all outcomes is an improvement over the fiscal year 1999 report, and it provides greater confidence that the performance results are credible. In our review of NASA's fiscal year 1999 report, we criticized NASA for not describing procedures used to verify and validate performance information and addressing data limitation issues in the data. Unlike the prior year report, the fiscal year 2000 report provides a description of the methods used for verifying and validating the data as well as the data sources for each performance target. However, NASA can further improve the usefulness of the performance information by highlighting the limitations in the data and including steps it will take to correct them. This can be done by adding a separate data limitations narrative for each performance target and by using terminology such as "none" where there are no limitations in the performance data. Additionally, for a few performance targets, the reliability and validity of the performance information would be strengthened if the related verification and validation narratives were conveyed in a manner that would more clearly (1) demonstrate actual validation of the performance and (2) identify the validation methods. This is particularly true for the Earth Science Enterprise. This can be done by writing the narratives in a more convincing tone and in less technical language to enhance understanding of the validation approach.

NASA's OIG report commended NASA for a significant improvement in the reporting of actual performance for fiscal year 2000. The OIG report found

weaknesses in the accuracy and reliability of reported performance for 4 of 23 selected performance targets it reviewed in the fiscal year 2000 performance report. (NASA's performance report includes a total of 211 performance targets). The OIG report indicated that based on OIG recommendations, NASA management made the necessary corrections or clarifications before issuing the fiscal year 2000 report.

For the most part, the performance targets continue to be output measures. Explanations are added to the performance targets as to why the performance results are meaningful. Generally, these explanations help to better understand the linkage between the targets and results. In our review of NASA's fiscal year 1999 performance report, we noted that the continued use of output measures burdens the agency by requiring it to continuously demonstrate the linkages between program efforts and results and to make improvements to strengthen such linkages. Moreover, in its evaluation of NASA's fiscal year 2000 performance, the NASA Advisory Council asked NASA to portray its performance in a way that is more understandable to the public. As previously mentioned, NASA's fiscal year 2000 report adds explanations of why the performance results are meaningful. NASA acknowledges that developing annual outcome-related performance metrics for multiyear research and development programs is particularly challenging since these programs may not be mature enough to deliver outcome results for several years. The report notes that the stated objectives of programs within the agency are long-term in character. However, NASA also states in the report that it would continue to strive to meet the challenge of developing science and technology metrics that are outcome-oriented and useful in demonstrating how these outcomes benefit the public.

Lastly, in our review of the fiscal year 1999 report, we suggested that NASA document in its performance plans and reports the rationale for newly established performance targets to clarify the reasons for such targets. We had noted that while many of NASA's performance targets were new each year, there was no stated basis for the changes. In its fiscal year 2000 report, NASA provides the rationale that in many cases, new targets are developed in response to program changes or as a result of experience gained in the performance planning process. NASA also includes charts at the end of each Enterprise and Crosscutting Process section that provide a trend assessment when a fiscal year 2000 target has a corresponding fiscal year 1999 target. Newly developed targets that have no corresponding fiscal year 1999 target to facilitate an assessment are characterized as "new target."

NASA's Efforts to Address its Major Management Challenges Identified by GAO

GAO has identified two governmentwide high-risk areas: strategic human capital management and information security. NASA's performance report does not fully explain NASA's progress in resolving human capital challenges. The report states that NASA has begun to focus on workforce renewal and revitalization, but it does not elaborate on strategies for undertaking this effort or address human capital challenges in other key areas. In addition, the report does not address the challenge of information security. Doing so is important for NASA. In 1999, we reported that the agency lacked an effective agencywide security program and that tests we conducted at one of NASA's 10 field centers found that mission-critical information systems were vulnerable to unauthorized access.¹⁰

In addition, we have identified three major management challenges facing NASA: (1) correcting contract management weaknesses, (2) controlling International Space Station costs, and (3) effectively implementing the faster-better-cheaper approach to space exploration projects. We found that NASA's report addresses the problems of contract management and implementing the faster-better-cheaper approach. With respect to contract management, it is important to note that until NASA's Integrated Financial Management System—which is central to providing effective management and oversight over its procurement dollars—is operational, performance assessments relying on cost data may be incomplete, and full costing will be only partially implemented.

As we discussed under outcomes, NASA did not address the challenge of controlling space station costs. As we reported in January 2001, the International Space Station program continues to face cost-control challenges. As with contract management, until NASA's Integrated Financial Management System is operational, NASA may lack the cost information needed to control space station costs.

Scope and Methodology

As agreed, our evaluation was generally based on the requirements of GPRA, the Reports Consolidation Act of 2000, guidance to agencies from the Office of Management and Budget (OMB) for developing performance plans and reports (OMB Circular A-11, Part 2), previous reports and evaluations by us and others, our knowledge of NASA's operations and programs, our identification of best practices concerning performance planning and reporting, and our observations on NASA's other GPRA-

¹⁰*Information Security: Many NASA Mission-Critical Systems Face Serious Risks (GAO/AIMD-99-47, May 20, 1999).*

related efforts. We also discussed our review with NASA officials and with NASA's OIG. The agency outcomes that were used as the basis for our review were identified by the Ranking Minority Member of the Senate Committee on Governmental Affairs as important mission areas for NASA and do not reflect the outcomes for all of NASA's programs or activities. The major management challenges confronting NASA, including the governmentwide high-risk areas of strategic human capital management and information security, were identified in our January 2001 performance and accountability series and high risk update, and by NASA's OIG in December 2000. We did not independently verify the information contained in the performance report, although we did draw from other GAO work in assessing the validity, reliability, and timeliness of NASA's performance data. We conducted our review from April 2001 through June 2001 in accordance with generally accepted government auditing standards.

Agency Comments

In written comments on a draft of our report, NASA said that it had no issues with the report. NASA stated that as it develops its next performance plan, it is looking into the decreased use of output metrics, so as to focus more on outcomes. NASA also stated that it is reviewing its coverage of such areas as the International Space Station and information security in the performance plan. NASA's comments are reproduced in appendix II.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies to appropriate congressional committees; the NASA Administrator; and the Director, Office of Management and Budget. Copies will also be made available to others on request.

If you or your staff have any questions, please call me at (202) 512-4841. Key contributors to this report were Richard J. Herley, Shirley B. Johnson, Charles W. Malphurs, Cristina T. Chaplain, John de Ferrari, Diane G. Handley, and Fannie M. Bivins.

Sincerely yours,

A handwritten signature in black ink that reads "Allen Li". The signature is written in a cursive style with a large, looping initial "A" and a distinct "Li" at the end.

Allen Li
Director, Acquisition and
Sourcing Management

Appendix I: Observations on NASA's Efforts to Address Its Major Management Challenges

The following table identifies the major management challenges confronting NASA, including the governmentwide high-risk areas of strategic human capital management and information security. The first column of the table lists the management challenges that we and/or NASA's Office of Inspector General (OIG) have identified. The second column discusses what progress, as discussed in its fiscal year 2000 performance report, NASA made in resolving its challenges. We found that NASA's performance report discusses the agency's progress in resolving many of its challenges but does not discuss progress in resolving the governmentwide challenge of information security. In addition, the report does not address the major management challenge: The Need to Control International Space Station Development and Support Costs.

Table 1: Major Management Challenges

Major management challenge	Progress in resolving major management challenges as discussed in the fiscal year 2000 performance report
<p>GAO-designated governmentwide high risk</p> <p><u>Strategic Human Capital Management:</u> GAO has identified shortcomings at multiple agencies involving key elements of modern human capital management, including strategic human capital planning and organizational alignment; leadership continuity and succession planning; acquiring and developing staffs whose size, skills, and deployment meet agency needs; and creating results-oriented organizational cultures.</p> <p>In August 2000, we reported that several internal NASA studies had shown that the agency's space shuttle program's workforce had been affected negatively by NASA's downsizing, much of which occurred after 1995. We also reported that NASA had begun taking actions to address its shuttle workforce problems.^a</p> <p>In January 2001, we also reported the need to implement a human capital approach in NASA's workforce management strategies as a major management challenge.^b</p>	<p>The report does not directly address agencywide key elements of modern human capital management, including strategic human capital planning and organizational alignment; leadership continuity and succession planning; acquiring and developing staffs whose size, skills, and deployment meet agency needs; and creating results-oriented organizational cultures.</p> <p>The report states that NASA's performance targets to (1) reduce the civil service workforce level to below 18,200 and (2) promote privatization of space shuttle operations and reduce civil service resource requirements for operations by 20 percent (from the fiscal year 1996 full-time equivalent levels) in fiscal year 2000 were overtaken by events. In December 1999, NASA declared an end to downsizing, based on key indicators and recommendations from the NASA Advisory Council that the agency had gone too far in downsizing, particularly at the Office of Space Flight Centers. In January 2000, NASA began focusing on workforce renewal and revitalization. NASA's full-time equivalent budget ceiling was changed in the fiscal year 2001 congressional budget for fiscal year 2000 to 18,622. Furthermore, the report states that NASA achieved its performance target to maintain a diverse NASA workforce throughout the downsizing efforts.</p>
<p><u>Information Security:</u> Our January 2001 high-risk update noted that the agencies' and governmentwide efforts to strengthen information security have gained momentum and expanded. Nevertheless, recent audits continue to show federal computer systems are riddled with weaknesses that make them highly vulnerable to computer-based attacks and place a broad range of critical operations and assets at risk of fraud, misuse, and disruption.</p> <p>In 1999, we reported that NASA lacked an effective agencywide security program that includes improvements in five areas: assessing risks and evaluating needs, implementing policies and controls, monitoring compliance with policy and effectiveness of controls, providing computer security training, and coordinating responses to security incidents. The need for such a framework was serious; tests we conducted at 1 of NASA's 10 field centers found that mission-critical information systems were vulnerable to unauthorized access. We successfully penetrated several of these systems, including one responsible for calculating detailed positioning data for earth orbiting spacecraft and another that processes and distributes scientific data received from these spacecraft.</p>	<p>The report provides no specifics to judge whether progress has been made in improving information technology security.</p>
<p>GAO-designated major management challenges</p> <p><u>The Need to Correct Weaknesses in NASA's Contract Management:</u> We have reported that NASA's contract management is a continuing area of high risk. Implementation</p>	<p>The report states (1) NASA failed to meet its target to begin the implementation of the Integrated Financial Management System at NASA installations; and (2) extended system testing demonstrated</p>

**Appendix I: Observations on NASA's Efforts
to Address Its Major Management Challenges**

Major management challenge

of the financial management system and its integration with full cost accounting have been delayed. Until the Integrated Financial Management System is operational, performance assessments relying on cost data may be incomplete. We have also reported that NASA is continuing to rely on undefinitized change orders—that is, contract changes initiating new work before NASA and the contractor agree on a final estimated cost and fee—to complete work on its largest space station contract. We stated that this is a risky way of doing business because it increases the potential for unforeseen cost increases and scheduling delays.

The Need to Control International Space Station (ISS) Development and Support Costs: We have reported that the ISS program continues to face cost-control challenges.^c NASA's OIG also reported that the ISS program continued to experience cost overruns and scheduling delays.

The Need to Effectively Implement the Faster-Better-Cheaper Approach to Space Exploration Projects: We have reported that NASA faces significant challenges as it attempts to create highly reliable missions and foster open communications under the budget constraints of the agency's faster-better-cheaper space exploration strategy. In addition, real success will require a comprehensive integration of lessons learned from failures on an agencywide basis. Until NASA resolves these problems, its financial resources are vulnerable to inefficient use.

This was designated as a new major management challenge in January 2001.

Progress in resolving major management challenges as discussed in the fiscal year 2000 performance report

that the software was not ready for deployment and would not meet NASA's needs, so NASA terminated the contract. NASA then reformulated the program, breaking implementation into individual software modules and recently selected a contractor for the Core Financial System (CFS). The report states NASA will begin the CFS Agency Design Phase in fiscal year 2001, complete pilot center activities in fiscal year 2002, and implement the system at the remaining centers in fiscal year 2003.

The report does not directly address the ISS cost control issue and contain performance measures that address ISS cost control issues. This challenge is discussed in detail in the outcomes section of this report.

The report states NASA failed to achieve its performance target for the Mars Climate Orbiter. The spacecraft was lost during orbit insertion in fiscal year 1999. The report states NASA failed to achieve its performance target to successfully land the Mars Polar Lander (MPL) on Mars in December 1999 and to operate its science instruments for the 80-day prime mission with at least 75 percent of planned science data returned. However, related to this management challenge, the report states (1) NASA achieved its performance target to release an announcement of opportunity (AO) for the next Discovery mission; (2) NASA's Discovery program of lower-cost, highly focused scientific spacecraft represents the implementation of NASA's vision of planetary missions that are "faster, better, cheaper;" and (3) three highly successful discovery spacecraft have completed their missions. The report also states that NASA failed to achieve its performance target to capture a set of "best practices/ lessons learned" from each program. However, the report states that NASA expects all programs will provide lessons learned in fiscal year 2001.

OIG-designated major management challenges

Safety and Mission Assurance: NASA's OIG has reported that safety and mission assurance has become a serious challenge for NASA. Key considerations to ensure safety in future NASA operations include (1) ensuring an appropriate level of training for staff who conduct safety reviews and evaluations; (2) maintaining adequate safety reporting systems; (3) ensuring variances to standard safety procedures are appropriately justified, reviewed, and approved; (4) maintaining an effective emergency preparedness program; (5) ensuring NASA and contractor compliance with safety standards and regulations; (6) ensuring product safety and reliability; and (7) ensuring the space shuttle and the ISS maintain crew safety.

The report discusses several safety-related targets. The report states that NASA set a target for ontime successful space shuttle launches, but NASA management concluded that the indicator might compromise safety; failed to achieve its performance target to have in place an aggressive shuttle program that ensures the availability of a safe and reliable shuttle system; decided to hire additional staff to ensure that safety would not be compromised for space shuttle missions; and did not achieve its performance target to flight-demonstrate a conceptual aircraft flight deck integrated with evolving ground-based runway incursion avoidance technologies installed at a major airport. The report also states NASA achieved its performance targets to (1) achieve seven or fewer flight anomalies on average for missions flown and (2) (a) develop medical protocols and test the capability of the Crew Health Care System; (b) evaluate and develop for flight testing a minimum of three major research protocols intended to protect bone, muscle, and physical work capacity and prepare a minimum of 10 biomedical research experiments to study human responses

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to the gravitational environment; (c) complete the first phase of the Advanced Life Support System Integration Test Bed facility; (d) provide training to the appropriate NASA supervisors to prevent injury and illness on-the-job, increase employee participation in the wellness program by at least 25 percent over the fiscal year 1997 baseline and achieve a 10-percent reduction in workers' compensation claims over the fiscal year 1998 baseline; and (e) reduce the number of lost workdays by 5 percent from the fiscal year 1994-96 3-year average. Furthermore, the NASA Advisory Council states management needs to focus attention on the Shuttle Safety Upgrades Program until it is properly defined and proper cost estimates are developed.

International Space Station: NASA's OIG has reported that the ISS is a significant management challenge due to significant problems related to ISS cost, contingency planning, and the X-38/Crew Return Vehicle. Key considerations for continued ISS assembly and operation are (1) managing the political, financial, technical, and safety challenges presented by an international partnership; (2) overcoming technical challenges inherent in manufacturing, assembling, and testing complex hardware and software components provided by different nations and integrated in space; (3) safely maintaining, upgrading, and operating a structure as complicated as the space station; and (4) maximizing the beneficial use of the space station for scientific research and technology development.

NASA OIG's description of the ISS major management challenge is more broadly focused than our related management challenge. (See discussion under GAO-designated major management challenge, the need to control ISS development and support costs.) The report states that NASA made excellent progress on its objective to deploy and operate the ISS to advance scientific, exploration, engineering, and commercial objectives and that more than 90 percent of the prime contractor's development work has been completed. The report states several ongoing issues continued to constrain the ISS program and prevent achievement of the fiscal year 2000 performance targets such as deploying and activating the U.S. Laboratory Module to provide a permanent on orbit laboratory capability, the Canadian-built space station remote manipulator system, and the Airlock to provide an ISS-based extravehicle activity capability. Others include (1) conducting operations with a three-person human presence on the ISS; (2) delivering to orbit the first of three Italian built multi-purpose logistics modules; (3) completing preparations for the initial ISS research capability through the integration of the first rack of the human research facility; and (4) completing the production of the X-38 first space flight test in preparation for a shuttle test flight in 2001. The Russian Proton failures and Service Module launch schedule delayed the entire assembly sequence into fiscal year 2001. The report states: (1) outyear propulsion ISS contingency planning included plans to augment Russian and logistics capabilities with the space shuttle and development of a permanent U.S. propulsion module and (2) a new design approach has been selected, and a formal decision to proceed will be reviewed in the spring of 2001. The report briefly addresses concerns related to space station cost overruns by listing GAO and NASA OIG reports issued in fiscal year 2000.

Information Technology: NASA's OIG has reported that information technology has become a serious challenge for NASA. Key considerations for an effective information technology program include (1) ensuring data security, integrity, and application controls; (2) protecting operations and communications with spacecraft; and (3) monitoring and evaluating the streamlining of operations through outsourcing information technology operations for cost efficiencies, dependency on the vendor for technological direction, vulnerability of strategic information to outsiders, and

The report states that NASA met all agency IT customer satisfaction and cost performance targets in fiscal year 2000 and improved performance of agencywide IT support while maintaining customer ratings of "satisfied" to "very satisfied."

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dependency on the viability of the vendor.

NASA's OIG reported that during fiscal year 2000 NASA continued to have a fragmented information technology (IT) security program without clear lines of authority, policies, guidelines, or enforcement. The OIG reported that audits of several mission critical information systems disclosed that NASA had not implemented adequate basic controls in areas such as system access, protection of critical files, system backup and restore procedures, privileged operations controls, and system audit and monitoring capabilities.

(See discussion under governmentwide high-risk challenge: information security for additional details.)

Procurement: NASA's OIG has reported that procurement is an ongoing challenge for NASA. Key considerations for effective procurement at NASA include (1) ensuring proper levels of staffing to perform contracting requirements; (2) providing sufficient controls over and monitoring both prime and subcontractors; (3) implementing or increasing the use of innovative procurement procedures such as earned value management and performance incentive fees; and (4) ensuring costs billed to NASA cost-type contracts, due to the changing industry environment, are reasonable and allowable.

Fiscal Management: NASA's OIG has reported that fiscal management continues to be a significant challenge for NASA. Key considerations to improved fiscal management include: (1) monitoring contractor performance of financial statement audits to ensure that the statements are properly prepared and thoroughly reviewed; (2) ensuring adequate integration and testing of newly developed automated accounting modules or capability; and (3) ensuring that NASA continues to properly account for and record financial transactions as new capability is implemented.

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The report states that NASA failed to meet its target to begin the implementation of the Integrated Financial Management System at NASA installations following the completion of system testing. The report states that NASA achieved its performance targets of having funds available for performance based contracts (PBC), maintaining PBC obligations at 80 percent; achieving at least the congressionally mandated 8-percent goal for annual funding to small disadvantaged businesses; and competitively awarding 80 percent or more of the available research resources in these programs based on peer review for selecting and funding/conducting research and analysis and core technology projects, the Space Science Enterprise, the Earth Science Enterprise and the Life and Microgravity Science and Applications program. However, the report does not directly address (1) ensuring proper levels of staffing to perform contracting requirements; (2) providing sufficient controls over and monitoring of both prime and subcontractors; (3) implementing or increasing the use of innovative procurement procedures such as earned value management and performance incentive fees; and (4) ensuring costs billed to NASA cost-type contracts, due to the changing industry environment, are reasonable and allowable. However, the report lists and describes fiscal year 2000 GAO and NASA OIG reports that identify ISS concerns related to prime contract changes and contractor cost overruns and cost control. Furthermore, the report states that NASA's management is in general agreement with these reports.

The report states that NASA achieved its performance target to cost 70 percent or more of available resources by using NASA's Financial and Contractual Status (FACS) reports. However, at the same time, NASA failed to meet its target of implementing the Integrated Financial Management System at NASA installations. This system is key to producing accurate and reliable information for full-cost accounting. Until the system is operational, performance assessments relying on cost data may be incomplete and full costing will be only partially implemented. Measuring costs is key to measuring performance in terms of efficiency and cost-effectiveness. The lack of relevant and reliable cost information affects NASA's ability to make economic choices, and to estimate and control cost increases.

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Program and Project Management: NASA's OIG has reported that NASA faces significant challenges in program and project management. Key considerations to effectively managing NASA programs include (1) improving planning to enable NASA to accomplish its missions in the face of budget and human capital issues; (2) eliminating duplication in programs and improving coordination with other research and development organizations; (3) ensuring that programs and projects accurately assess their progress and successfully achieve their goals; and (4) effectively using technology developments to increase NASA productivity.

Launch Vehicles: NASA's OIG reported on challenges in (1) ensuring the availability of small expendable launch vehicles to ensure schedule milestones and cost-effectiveness of NASA missions; (2) evaluating whether NASA is providing the majority of developmental funds and assigning technology rights to its industry partners in the development of the new reusable launch vehicles in the best interest of the government; and (3) ensuring that plans are in place and are effectively implemented to address shuttle systems obsolescence, logistics support, technical/safety upgrades, and funding.

Although we did not identify the X-33 advanced technology demonstrator as a major management challenge, we have reported and testified that the program must overcome key technological challenges before the development of launch vehicles.³

Technology Development: NASA's OIG has reported that technology development has become a serious challenge for NASA. Key considerations to effective technology development include (1) achieving a balance between scientific research and technology development and demonstration projects; (2) continuing to refine the technology transfer process to ensure that U.S. industry achieves the maximum benefit from the new technologies identified; (3) determining if NASA's organizational structure effectively supports technology development and transfer; (4) forming innovative partnership arrangements with U.S. industry to share both the risk and costs of technology demonstration and commercialization; (5) ensuring that NASA technology demonstrations do not unfairly distort the marketplace; (6) ensuring that adequate controls exist on cooperative technology development programs; and (7) ensuring adequate protection of NASA-developed technology.

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The report states NASA failed to achieve its performance target to meet schedule and cost commitments by keeping the development and upgrade of major scientific facilities and capital assets within 110 percent of cost and schedule estimates, on average, and capture a set of "best practices/lessons learned" from each program. This element materially affects the improvement of NASA's program/project management. The report also states that NASA achieved its performance target to dedicate the percentage of NASA's budget that is established in the fiscal year 1999 process to commercial partnerships. The percentage of NASA's research and development budget dedicated to commercial partnerships affects integrated technology planning and development with NASA partners. According to the report, NASA achieved its performance target to increase the amount of leveraging of the technology budget with activities of other organizations, relative to the fiscal year 1999 baseline that is established during the process development, and two of the three performance targets for objective 2 (Plan and set priorities) of the Generate Knowledge Crosscutting Process.

The report states that the X-33 and X-34 advanced technology demonstrators are part of NASA's ongoing efforts to pave the way for commercial development of reusable launch vehicles that will dramatically reduce cost and increase the reliability of space transportation. NASA states that it failed to achieve its performance target to conduct the flight testing of the X-33 vehicle. The report acknowledges the X-33 project experienced a significant setback as a result of the X-33 hydrogen tank failure in November 1999. NASA did not achieve its performance target to complete vehicle assembly and begin the flight test of the second X-34 vehicle. NASA does not explain how it determined how much funding and what data rights to give to its industry partners in the X-33 and X-34 programs. Thus, it is difficult to assess the extent cost-effectiveness was achieved. However, the report states that NASA determined if additional government funds were to be provided for the programs, these programs would be subject to a competitive proposal process. The selection process did not result in either program being selected for additional government funding.

The report states NASA (1) met the three performance targets for the earth science objective to develop and transfer advanced remote-sensing technologies; (2) achieved its performance target to complete the development and initiate the implementation of a comprehensive technology investment strategy to support future human exploration; (3) did not achieve its performance target for the objective to invest in enabling high-leverage exploration technologies; (4) failed to achieve its performance target to complete and deliver a technology development plan for the Terrestrial Planet Finder mission by June 2000; (5) did not achieve two of the three performance targets for the space science enterprise objective to develop innovative technologies for enterprise missions and for external customers; and (6) met or exceeded 8 of the 16 targets to measure progress toward the 10 specific objectives of the aerospace technology enterprise. Three targets were not fully accomplished, but they are projected to be

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<p><u>International Agreements:</u> NASA's OIG reported that international agreements are needed to ensure effective and efficient programs. Key considerations include (1) program and project vulnerability to schedule delays and cost overruns that require diplomatic rather than contractual solutions; (2) security controls on technology that impacts national security; (3) controls to assure the quality and timeliness of the goods and services provided; (4) mechanisms to assure a balance between program needs and national considerations; (5) plans with specific critical paths and planned alternative courses of action to maintain program/project continuity; and (6) proper controls over access to NASA facilities by foreign national visitors.</p>	<p>met during fiscal year 2001; the remaining five targets not achieved involved recovery plans with projected completion beyond fiscal year 2001. The report also states NASA (1) did not achieve the one performance target for the objective to capture and preserve engineering and technological process knowledge to continuously improve NASA's program/project management; (2) achieved the two performance targets for the objective to focus on integrated technology planning and development in cooperation with commercial industry and other NASA partners and customers; and (3) achieved its performance target to increase new opportunities to transfer technology to private industry from 19,600 to 19,800.</p>
<p>Although we did not identify this issue as a major management challenge, in November 1999, we recommended measures to enhance NASA's ability to oversee and implement its export controls of ISS-related technologies.⁶</p>	<p>The report states (1) in fiscal year 2000, NASA and its international partners passed a major test in the assembly of the ISS; (2) the STS-99 was the Shuttle Radar Topography Mission, which was part of an international project spearheaded by the National Imagery and Mapping Agency and NASA, with participation from the German Aerospace Center; (3) NASA Medical Informatics and Technology Applications Consortium has established a memorandum of understanding in telemedicine with MEDES, a French research consortium, which has laid the groundwork for the development of an international telemedicine program; (4) NASA and the Canadian Space Agency signed an agreement for basic imaging coverage plus additional interferometric mapping; (5) NASA supports both American and international scientific teams that examine Earth and its environment and foster dialogs among researchers that conduct sound scientific research and explore new scientific frontiers; and (6) the Rosetta project delivered the electrical qualification models for the four U.S.- provided instruments to the European Space Agency in May 2000 for integration with the Rosetta Orbiter. The report states NASA achieved other performance targets associated with making significant contributions to international scientific assessments and cooperation, including: providing the first global, regional, and country-by-country forest cover inventory in support of national and international needs of research, operational, and policy communities; and launching three spacecraft and delivering two instruments for international launches within 10 percent of budget on average. However, NASA failed to achieve its target of conducting the first regional international assessment in South Africa to quantify the effects of climate variability and management practices on the environment.</p>

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Environmental Management: NASA's OIG reported that environmental management is a significant management challenge. Key considerations include: (1) prioritizing and addressing environmental obligations; (2) developing consistent procedures under an agencywide policy; and (3) negotiating cost-sharing agreements for environmental cleanup with previous government and private sector tenants that are also responsible parties.

Progress in resolving major management challenges as discussed in the fiscal year 2000 performance report

The report states that NASA significantly exceeded its performance target to demonstrate, in a laboratory combustion experiment, an advanced turbine-engine combustor concept that will achieve up to a 70-percent reduction of oxides of nitrogen emissions based on the 1996 International Civil Aviation Organization standard and achieved its performance target to validate the technologies to reduce noise for large commercial transports by at least 7 decibels relative to 1992 production technology. However, the report does not address three key management actions: (1) ranking and addressing liabilities; (2) developing consistent procedures under NASA policy; and (3) negotiating cost-sharing agreements for environmental cleanup with previous government and private sector tenants that are also responsible parties.

^aSpace Shuttle: Human Capital and Safety Upgrade Challenges Require Continued Attention (GAO/NSIAD/GGD-00-186, Aug. 15, 2000).

^bMajor Management Challenges and Program Risks: National Aeronautics and Space Administration (GAO-01-258, Jan. 2001).

^cGAO-01-258, Jan. 2001.

^dSpace Transportation: Status of the X-33 Reusable Launch Vehicle Program (GAO/NSIAD-99-176, Aug. 11, 1999); Space Transportation: Progress of the X-33 Reusable Launch Vehicle Program (GAO/T-NSIAD-99-243, Sept. 29, 1999); and Space Transportation: Critical Areas NASA Needs to Address in Managing Its Reusable Launch Vehicle Program (GAO-01-826T, Jun. 20, 2001).

^eExport Controls: International Space Station Technology Transfers (GAO/NSIAD-00-14, Nov. 3, 1999).

Appendix II: Comments From the National Aeronautics and Space Administration

National Aeronautics and
Space Administration
Office of the Administrator
Washington, DC 20546-0001



JUL 24 2001

Mr. Allen Li
Director, Acquisition and Sourcing
Management Team
United States General Accounting Office
Washington, DC 20548

Dear Mr. Li:

NASA appreciates the opportunity to comment on your draft report entitled "Status of Achieving Key Outcomes and Addressing Major Management Challenges (GAO-01-868)" that was prepared for Senator Thompson.

We are pleased that your assessment recognized an improvement in our performance report, especially in increased data validation and discussion of the meaningfulness of the measures. As we develop the next performance plan we are looking into the decreased use of output metrics, so as to focus more on outcomes, and reviewing our coverage of such areas as Space Station and information security.

NASA would like to thank the General Accounting Office for the professional manner in which this review was conducted by your staff. NASA has no issues with the report.

Sincerely,

A handwritten signature in black ink, appearing to read "Daniel R. Mulville".

Daniel R. Mulville
Associate Deputy Administrator

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