United States General Accounting Office

GAO

Performance and Accountability Series

January 2003

Major Management Challenges and Program Risks

National Aeronautics and Space Administration

GAO-03-114

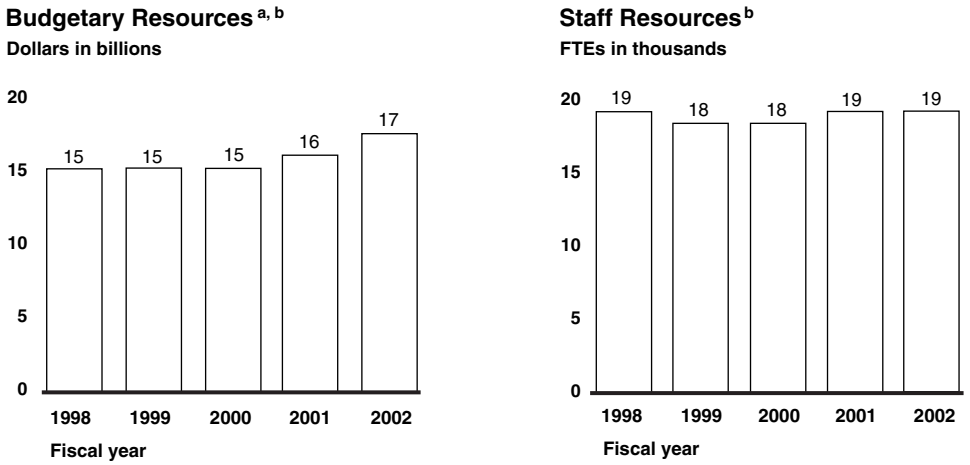
A Glance at the Agency Covered in This Report

The National Aeronautics and Space Administration'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 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 safety.

The National Aeronautics and Space Administration's Budgetary and Staff Resources



Source: Budget of the United States Government.

[a] Budgetary resources include new budget authority (BA) and unobligated balances of previous BA.

[b] Budget and staff resources are actuals for FY 1998-2001. FY 2002 are estimates from the FY 2003 budget, which are the latest publicly available figures on a consistent basis as of January 2003. Actuals for FY 2002 will be contained in the President's FY 2004 budget to be released in February 2003.

This Series

This report is part of a special GAO series, first issued in 1999 and updated in 2001, entitled the *Performance and Accountability Series: Major Management Challenges and Program Risks.* The 2003 Performance and Accountability Series contains separate reports covering each cabinet department, most major independent agencies, and the U.S. Postal Service. The series also includes a governmentwide perspective on transforming the way the government does business in order to meet 21st century challenges and address long-term fiscal needs. The companion 2003 *High-Risk Series: An Update* identifies areas at high risk due to either their greater vulnerabilities to waste, fraud, abuse, and mismanagement or major challenges associated with their economy, efficiency, or effectiveness. A list of all of the reports in this series is included at the end of this report.

January 2003

PERFORMANCE AND ACCOUNTABILITY SERIES

National Aeronautics and Space Administration

GAO Accountability • Integrity • Reliability

Highlights

Highlights of GAO-03-114, a report to Congress included as part of GAO's Performance and Accountability Series

Why GAO Did This Report

In its 2001 performance and accountability report on NASA, GAO identified important management, oversight, and workforce issues facing the agency. The information GAO presents in this report is intended to help sustain congressional attention and an agency focus on continuing to make progress in addressing these challenges—and others that have arisen since 2001—and ultimately overcoming them. This report is part of a special series of reports on governmentwide and agency-specific issues.

What Remains to Be Done

To make its improvement initiatives fully successful, GAO believes that NASA will need to

- move to a results-oriented culture and provide the sustained attention needed to make sure human capital reforms stay on track;
- overcome barriers facing implementation of its financial management system and transform its financial management organization so that it better supports NASA's core mission; and
- successfully follow through on planned oversight improvements so that costs and scheduling risks can be mitigated.

www.gao.gov/cgi-bin/getrpt?GAO-03-114.

To view the full report, click on the link above. For more information, contact Allen Li at (202) 512-4841 or lia@gao.gov.

What GAO Found

The National Aeronautics and Space Administration (NASA) continues to face challenges that threaten its ability to effectively run its largest programs. NASA is taking steps to address these challenges. But because they are rooted in NASA's culture and long-standing ways of doing business, NASA will need to make a major transformation.

- **Strengthening strategic human capital management.** NASA is facing shortages in its workforce, which could likely worsen as the workforce continues to age and the pipeline of talent shrinks. This dilemma is more pronounced among areas crucial to NASA's ability to perform its mission, such as engineering, science, and information technology. NASA is addressing this challenge through strategic planning, a new workforce planning and analysis system, and requesting additional personnel flexibilities, among other initiatives.
- **Controlling International Space Station costs.** Development costs for this premier project have soared to the point where NASA has had to cutback the program substantially, including reducing construction, the number of crew members, and scientific research. This has raised concern among NASA's international partners, who have a large stake in the scientific research to be performed on the station. NASA is instituting management and cost-estimating reforms. But it must still reach agreement with its partners on its planned cutbacks.
- **Reducing space launch costs.** NASA recognizes the need to reduce the costs of space launches and replace its aging space shuttle. The administration recently submitted an amendment to NASA's fiscal year 2003 budget request, which (1) extends the life of the space shuttle and enhances its reliability, (2) funds the development of a new vehicle for ferrying crew to and from the space station, and (3) alters the time frame for a shuttle replacement. Accomplishing these and other goals related to space launches will be difficult and risky in light of the technology advances NASA would like to pursue and the high degree of communication and coordination required among industry and government partners.
- **Improving contract management.** NASA spends most of its funds on acquisitions. Yet, for many years, it has been unable to oversee contracts effectively, principally because it lacked accurate and reliable information on contract spending and it placed little emphasis on end results, product performance, and cost control. NASA has addressed many acquisition-related weaknesses and is beginning to tackle one of its most formidable barriers to sound contract management—the lack of a modern, integrated financial management system. Considerable work remains to be done since NASA is only in the early stages of designing and implementing this new system, and NASA reported that it is already facing challenges in terms of cost, interoperability, and security.

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Accountability * Integrity * Reliability

Comptroller General of the United States

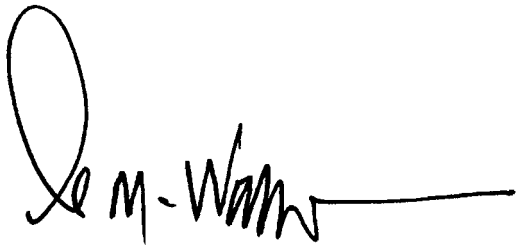
United States General Accounting Office
Washington, D.C. 20548

January 2003

The President of the Senate and the
Speaker of the House of Representatives

This report addresses the major management challenges and program risks facing the National Aeronautics and Space Administration (NASA) as it seeks to advance human exploration and development of space, advance and communicate scientific knowledge, and research and develop aeronautics and space technologies. The report discusses the actions that NASA has taken and that are under way to address the challenges GAO identified in its Performance and Accountability Series 2 years ago, and major events that have occurred that significantly influence the environment in which the agency carries out its mission. Also, GAO summarizes the challenges that remain, new ones that have emerged, and further actions that GAO believes are needed.

This analysis should help the new Congress and the administration carry out their responsibilities and improve government for the benefit of the American people. For additional information about this report, please contact Allen Li, Director, Acquisition and Sourcing Management, at (202) 512-4841 or at lia@gao.gov.



David M. Walker
Comptroller General
of the United States

Major Performance and Accountability Challenges

NASA is at a critical juncture. Since its inception, NASA has advanced space exploration and scientific knowledge and accomplished unparalled feats of engineering. But NASA now faces challenges, particularly in terms of maintaining a skilled workforce, controlling costs, and providing effective oversight for important projects. Recognizing the need for change, NASA's Administrator has recently articulated a new vision for NASA—one that is science-driven, not destination-driven. To put NASA on a better footing to fulfill this vision, the agency is taking on a major transformation aimed at eliminating stovepipes, becoming more integrated and results-oriented, and reducing risks while working more economically, efficiently, and effectively.

We have identified four performance and accountability challenges facing NASA. These include

- strengthening strategic human capital management,
- controlling International Space Station costs,
- reducing space launch costs, and
- improving contract management.

Collectively, these challenges seriously affect NASA's ability to effectively run its largest programs. With an aging workforce, for example, NASA is facing the loss of science and engineering expertise across its mission areas. Moreover, cost overruns have prevented NASA from achieving its original goals with the International Space Station and taken away resources from other programs. Weak contract management and financial controls pose additional risks across the agency. Therefore, we have placed this area on our high-risk list.

Since our last Performance and Accountability Series report,[1] issued in January 2001, NASA has been taking actions to address each of its challenges. For example, NASA has hired new staff, who helped address imbalances in some critical skill areas in the shuttle program, and it has also developed a strategic human capital plan to enhance its entire workforce. In an effort to control space station costs, NASA made substantial cutbacks in the space station program and is instituting management and cost-estimating reforms. NASA also took significant steps to improve contract management, including reducing its use of unnegotiated contract changes and beginning to implement a new integrated financial management system. However, we are continuing to categorize contract management as high risk since key actions remain to provide the oversight needed for the more than $12 billion NASA spends annually on its contracts.

Moreover, in our last report, we had identified NASA's faster-better-cheaper approach to space exploration as a major management challenge. However, since NASA decided to end this approach as a preference for managing its programs and projects, we removed this designation. We added reducing space launch costs as a challenge, given the wide range of complex and difficult tasks that need to be addressed for NASA's plans for future space travel to succeed.

While NASA is taking positive steps toward addressing management problems, its ultimate challenge will be in tackling the root problems impeding its major programs. This will require instituting a results-oriented culture that fosters knowledge sharing and empowers its workforce to accomplish programmatic goals; making sure that the agency adheres to rigorous and effective management controls to prevent cost overruns and scheduling problems; transforming the financial management organization so that it better supports NASA's core mission; and sustaining commitment to change.

[1]U.S. General Accounting Office, *Major Management Challenges and Program Risks: National Aeronautics and Space Administration*, GAO-01-258 (Washington, D.C.: Jan. 2001).

Strengthening Strategic Human Capital Management

Like many agencies, NASA is facing substantial challenges in attracting and retaining a highly skilled workforce. Left unchecked, for example, reductions in the space shuttle workforce could have jeopardized NASA's ability to safely support the shuttle's planned flight rate. NASA is taking comprehensive steps to address this problem across all mission areas, but implementing a strategic approach to marshaling, managing, and maintaining human capital represents a significant challenge.

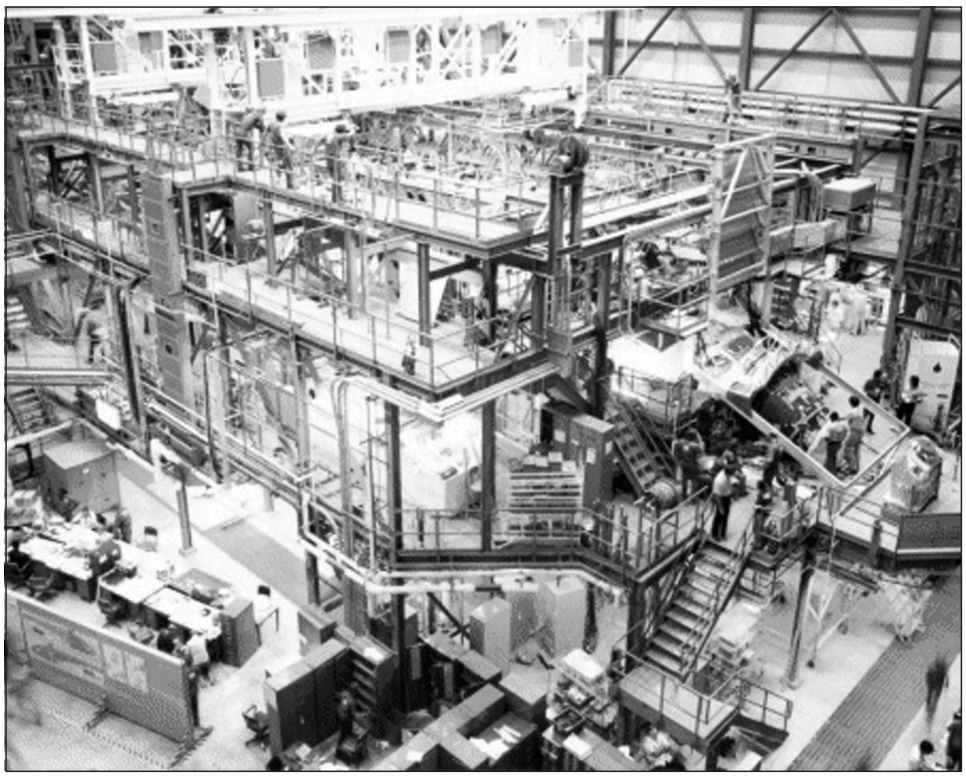
Leading public organizations here in the United States and abroad have found that strategic human capital management must be the centerpiece of any serious change management initiative and efforts to transform the cultures of government agencies. People are an agency's most important organizational asset. They define its culture, drive its performance, and embody its knowledge base. Because serious human capital shortfalls are eroding the ability of many agencies to effectively perform their missions, we designated strategic human capital management as a governmentwide high-risk area in January 2001 and continue to designate it as high risk today. Plainly, the problem is not federal employees. Rather, the problem is the lack of a consistent strategic approach to marshaling, managing,

and maintaining the human capital needed to maximize our government performance and ensure its accountability.

We reported in January 2001 that NASA's shuttle workforce had declined significantly in recent years to the point of reducing NASA's ability to safely support the shuttle program. Many key areas were not sufficiently staffed by qualified workers, and the remaining workforce showed signs of overwork and fatigue. To the agency's credit, NASA has recognized the need to revitalize the shuttle's workforce, discontinued its downsizing plans for the shuttle program in December 1999, and initiated efforts to hire new staff. In September 2001, we testified that NASA was hiring approximately 200 full-time equivalent staff and that it had focused more attention on human capital in its annual performance plan by outlining an overall strategy to attract and retain a skilled workforce. But even with these gains, there were still considerable challenges. For example, NASA's new staff would require considerable training, and the agency still needed to deal with critical losses due to retirements in coming years.

Data obtained from NASA since September 2001 show that these challenges have not been mitigated, and work climate indicators continue to reflect high levels of job stress. In addition, while new hires helped address staffing needs in some critical skill areas in the shuttle program, staffing shortages in many key areas still remain a problem. These areas include subsystems engineering, flight software engineering, electrical engineering, environmental control, and shuttle resources management. NASA's hiring posture for fiscal year 2003 will target areas where skill imbalances still exist in the shuttle program.

Figure 1: Shuttle Undergoing Inspection at the Kennedy Space Center



Source: NASA.

As we testified in July 2002, NASA believes that similar workforce problems affect the entire agency and that, as a result, its ability to perform future missions and manage its programs may be at risk. The average age of its workforce is over 45, and the agency is finding it particularly difficult to hire people with engineering, science, and information technology skills—fields critical to NASA missions. At this time, within the science and engineering workforce, the over-60 population outnumbers the under-30 population nearly 3 to 1. Currently, 15 percent of NASA's science and engineering employees are eligible to retire; within 5 years, about 25 percent will be retirement eligible. At the same time, the pipeline of people with science and engineering skills is shrinking, and competition for workers with those skills is intense. According to NASA's Inspector General, the agency also faces the loss of significant procurement expertise through the year 2007.[2] Coupled with these concerns, NASA has limited capability for personnel tracking and planning, particularly on an agencywide or programwide basis. Further, NASA acknowledges that it needs to complete and submit to the Office of Management and Budget (OMB) a transformation workforce restructuring plan, which it notes that, in conjunction with its strategic human capital plan, will be critical to ensuring that no skill gaps or deficiencies exist in mission critical occupations.[3]

NASA is taking steps to address its workforce predicament. For example, it is developing an agencywide integrated workforce planning and analysis system as part of its new financial management system. The new system is expected to track the distribution of NASA's workforce across programs, capture critical competencies and skills, determine management and leadership depth, and facilitate gap analyses. NASA already completed a pilot of an interim competency management system at one of its centers. The interim system will facilitate a gap analysis of human capital in terms of skills and competencies. NASA plans to implement the interim system agencywide in 2003, and integrate it with the new comprehensive workforce planning and analysis system in 2005. The new system should

[2]National Aeronautics and Space Administration, *Audit Report: Procurement Workforce Planning*, IG-01-041 (Washington, D.C.: Sept. 2001).

[3]As stated in *President's Management Agenda Action Plans For The National Aeronautics And Space Administration*, (Washington, D.C.: May 9, 2002). This document is an agreement between NASA and OMB on NASA's plans for addressing the governmentwide initiatives in *The President's Management Agenda*.

foster better management of the existing workforce and enable better strategic decisions about future workforce needs.

NASA also developed a strategic human capital plan, which identifies human capital goals, problems, improvement initiatives, and intended outcomes and incorporates strategies and metrics to support the goals.[4] The plan has been reviewed and approved by OMB and the Office of Personnel Management (OPM). According to NASA, the plan is based on OMB's scorecard of human capital standards and OPM's scorecard of supporting human capital dimensions, as well as our own model, which we published in March 2002.[5] Our model is designed to help agency officials effectively lead and manage their people and integrate human capital considerations into their daily decision making and the program results they seek to achieve. In doing so, the model highlights the importance of a sustained commitment by agency leaders to maximize the value of their agency's human capital and to manage related risks. Consistent with OPM's and OMB's views, our model of strategic human capital management embodies an approach that is fact-based, focused on achieving strategic results, and incorporates merit principles and other national goals.

Additionally, NASA has renewed attention to hiring applicants just out of college and intends to pursue this even more aggressively in coming years. It is undertaking a number of initiatives and activities aimed at acquiring and retaining critically needed skills, such as using the new Federal Career Intern Program to hire recent science and engineering graduates, supplementing the workforce with nonpermanent civil servants where it makes sense, and implementing a program to repay student loans to attract and retain employees in critical positions.

NASA has also incorporated a strategic objective and two performance goals and supporting indicators to address human capital in its fiscal year 2003 performance plan. The plan includes a goal to align management of the agency's human resources to best achieve its strategic goals and objectives along with a second goal to attract and retain a workforce that represents America's diversity at all levels and to maximize individual performance through training and development experiences. Recognizing

[4]NASA has also developed a companion strategic human capital implementation plan that contains detailed action plans for the improvement initiatives.

[5]U.S. General Accounting Office, *A Model of Strategic Human Capital Management*, GAO-02-373SP (Washington, D.C.: Mar. 15, 2002).

its human capital management challenge, NASA has included strategies in the plan that will focus on restructuring and revitalizing its workforce.

Further, the 107th Congress considered a series of legislative proposals developed by NASA to provide it with further flexibilities and authorities for attracting and retaining a skilled workforce. These included streamlining hiring procedures; making noncompetitive conversions of term employees to permanent positions; offering larger recruitment, relocation, and retention bonuses; expanding use of early retirement; and providing authority for permanent and enhanced buyouts. In testifying before Congress on the legislative proposals in July 2002, the NASA Administrator indicated that the provisions, taken together as an integrated package, form a strong nucleus in support of NASA's strategic human capital plan and *The President's Management Agenda* and will enable NASA to avert a serious human capital crisis.

During those same hearings, we testified that several of the NASA issues mirror aspects of other legislative proposals such as the Federal Human Capital Act of 2001 (S. 1603, 107th Cong., 2001),[6] and noted that while we had not performed a detailed analysis of the support behind NASA's legislative proposals, several points as outlined as follows were worthy of consideration:

- First, the addition of flexibilities and authorities alone will not solve workforce problems. Agencies need to undertake a wide array of initiatives to attract, retain, and motivate a top quality workforce. These include such actions as revitalizing recruiting and college relations efforts; conducting employee feedback surveys to set priorities and assess progress; conducting employee preference surveys so employees can be given the opportunity to work in areas that interest and energize them consistent with overall institutional needs; inventorying the skills and knowledge of existing employees; initiating professional development programs for newly hired staff to help them transition and progress; implementing modern, effective, and credible performance appraisal and management systems; redesigning training programs to directly link them to core competencies; and implementing employee-friendly benefits, such as day care centers, business casual dress, flextime, and public transportation subsidies.

[6]We testified on this proposed legislation in March 2002.

- Second, agencies need to make the most of current flexibilities and authorities already available. These flexibilities are identified by OPM in its guide, *Human Resource Flexibilities and Authorities in the Federal Government*. They include such things as the ability to use commercial recruiting firms to recruit for vacancies; customize merit promotion plans and performance systems; increase basic pay to attract and retain staff with unusually high or unique qualifications; and grant substantial cash incentive awards. Agencies should develop a sound business case for using these flexibilities by focusing on how a given flexibility will address human capital challenges and ultimately improve agency results. In tandem with exercising these flexibilities, agencies must learn to effectively balance their pay and incentive programs to encourage both individual and team contributions to achieve results. In our December 2002 report, we identified 6 key practices for the effective use of human capital flexibilities. These practices are (1) planning strategically and making targeted investments, (2) ensuring stakeholder input in developing policies and procedures, (3) educating managers and employees on the availability and use of flexibilities, (4) streamlining administrative processes, (5) building transparency and accountability into the system, and (6) changing the organizational culture.[7]

- Third, agencies need effective succession planning. NASA's workforce profile, particularly for science and engineering workers, points to the need for this. Faced with the same problems at GAO, we reinstated our Executive Candidate Development Program, under which candidates are selected through a rigorous competitive process and are prepared for assignments at the SES level. While the potential loss of expertise through retirements will be substantial, this turnover also affords NASA's Administrator the opportunity to change culture, skill mix, deployment locations, and other agency attributes. NASA will, however, need to leverage technology and enhance its training efforts to help make this transition and facilitate needed knowledge sharing initiatives.

- Fourth, agencies must ensure that strategic human capital plans are results-oriented and data-driven. This includes developing appropriate information on the number and location of employees and their key competencies and skills as well as data on the profile of the workforce,

[7]U.S. General Accounting Office, *Human Capital: Effective Use of Flexibilities Can Assist Agencies in Managing Their Workforces*, GAO-03-2 (Washington, D.C.: Dec. 6, 2002).

and performance goals and measures for human capital approaches. Further, this data must be used effectively to develop strategies that continually ensure they have the right mix of employees to meet future needs. A key to success in this area also will be NASA's ability to implement its new financial management system, since it will encompass the new workforce planning and analysis system.

We will continue to monitor NASA's progress in resolving its human capital problems, including how well its human capital initiatives and reforms and any new and existing flexibilities and authorities are helping to strategically manage and reshape its workforce.

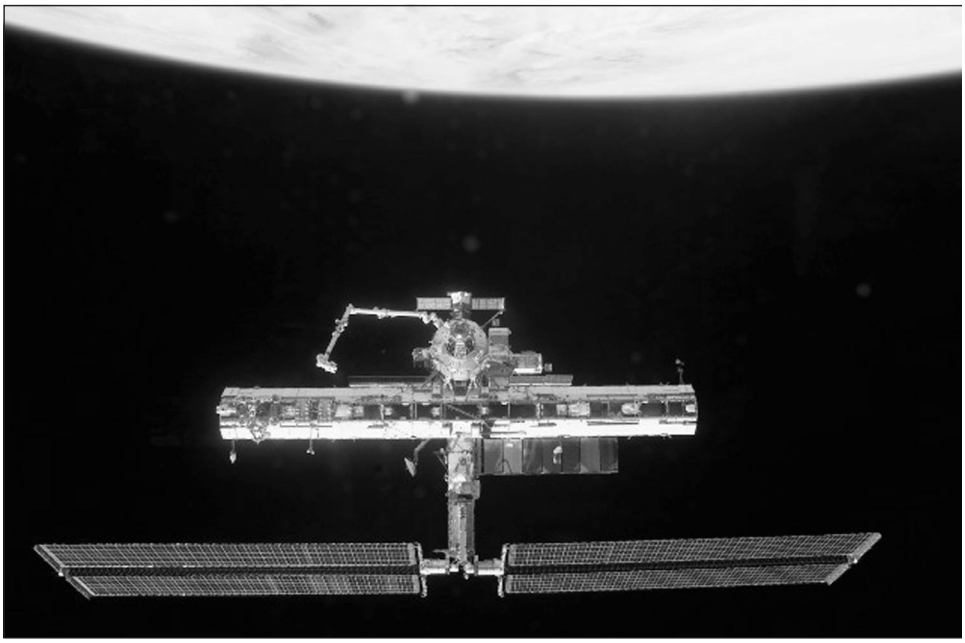
Controlling International Space Station Costs

The International Space Station is characterized as one of the most challenging engineering feats ever attempted. It also represents an important effort to foster international cooperation in scientific research and space exploration. But development costs for the International Space Station have soared to the point where NASA has had to make substantial cutbacks in the program. Specifically, the cost to complete assembly has mushroomed by about $5 billion to the current estimate of about $30 billion, and while assembly of the station was originally expected to be completed in 2002, NASA now expects it to be done in 2006. This has negatively impacted NASA's credibility with Congress and raised concern among international partners and the scientific community about the viability of the space station. NASA is taking action to keep costs in check, but its success in this area still faces considerable challenges.

NASA has had difficulty predicting and controlling costs and scheduling for the space station since its inception in 1984. In September 1997, we reported that the cost and schedule performance of the space station's prime contract, which showed signs of deterioration in 1996, had continued to worsen steadily and that the program's financial reserves for contingencies had deteriorated, principally because of program uncertainties and cost overruns. In our January 2001 Performance and Accountability Series report, we reported that the prime contract for the space station was initially expected to cost over $5.2 billion, and the assembly of the station was expected to be completed in June 2002. But by October 2000, the prime contractor's cost had grown to about $9 billion, of which $986 million was for cost overruns, and the station was not expected to be complete until April 2006. NASA's Office of Inspector General (OIG)

reported the same cost overrun in a February 2000 audit report, and based on recommendations in that report, NASA agreed to take several actions, including discussing the prime contractor's cost performance at regularly scheduled meetings and preparing monthly reports to senior management on the overrun status.

Figure 2: The International Space Station



Source: NASA.

Our July 2002 report on the International Space Station shows that the reasons for continued cost growth include an inadequate definition of requirements, changes in program content, and schedule delays and inadequate program oversight. NASA has controls in place that should have alerted management to the growing cost problem and the need for mitigation, but these were largely ignored because of NASA's focus on fiscal year budget management rather than on total program cost management.

The estimated cost growth is having a profound effect on the utility of the space station—with substantial cutbacks in construction, the number

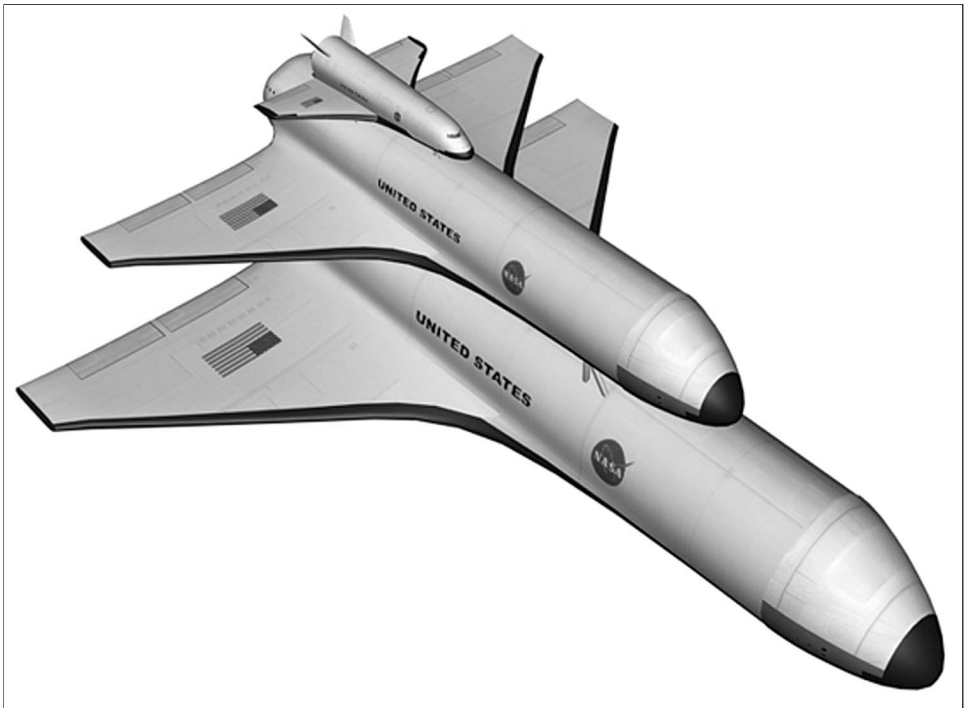
of crew members, and scientific research. As a part of the space station restructuring, further work and funding for the habitation module and crew return vehicle have been deferred, thus requiring the on-orbit crew to be reduced from seven to three members. This will limit the crew-member hours that can be devoted to research. Additionally, NASA has cut back from 27 to 20 the number of facilities available for research. This will eliminate some experiments, such as those relating to biotechnology. NASA's international partners and the scientific community are not satisfied with these and other reductions in capabilities and have raised concerns about the viability of the space station science program.

NASA is instituting a number of management and cost-estimating reforms. But there are significant challenges to their successful implementation. First, NASA is now preparing a life cycle cost estimate for the program based on a three-person crew. However, between now and submission of the fiscal year 2004 budget, NASA and OMB must agree on the estimate. Furthermore, NASA's financial management system used to collect required space station cost data has proven inadequate. Second, NASA must decide how research can be maximized with only a three-person crew. Third, NASA has not yet reached an agreement with its international partners on an acceptable on-orbit configuration and sharing of research facilities and costs. Thus, the capacity and capabilities of the space station, the scope of research that can be accomplished, and the partners' share of operating costs are unknown at this time. In addition to the reforms, NASA has requested additional funding for the space station program in its revised fiscal year 2003 budget request.

Reducing Space Launch Costs

Until last November, NASA was pursuing a $4.8 billion, 5-year program—known as the Space Launch Initiative (SLI)—to build a new generation of space vehicles to replace its aging space shuttle. This was part of NASA's broader plan for the future of space travel—known as NASA's Integrated Space Transportation Plan—which involved operating the space shuttle through 2020 and developing successive generations of transportation vehicles that would begin to be deployed around 2011. The primary goals for SLI were to reduce the risk of crew loss as well as substantially lower the cost of space transportation so that more funds could be made available for scientific research, technology development, and exploration activities. Currently, NASA spends nearly one third of its budget on space transportation.

Figure 3: NASA Illustration of Its Second Generation Transportation Vehicle



Source: NASA.

We reported in September 2002 that SLI was a considerably complex and challenging endeavor for NASA—from both a technical and business standpoint. For example, it would require NASA to develop and advance new technologies for the new vehicle, including (1) new airframe technologies that will include robust, low-cost, low-maintenance structure, tanks, and thermal protection systems, using advanced ceramic and metallic composite materials, and (2) new propulsion technologies, including main propulsion systems, orbital maneuvering systems, main engines, and propellant management. The program would also require NASA to carefully coordinate and communicate among industry and government partners since agreements need to be reached on what the basic capabilities of the new vehicle will be, what designs or architectures should be pursued, how development costs will be shared, and what individual partner responsibilities will be. Lastly, the SLI project would require careful oversight, especially in view of past difficulties NASA has had in developing the technologies for reusable launch vehicles to replace the space shuttle. These efforts did not achieve their goals primarily

because NASA did not develop realistic cost estimates, timely acquisition and risk management plans, or adequate and realistic performance goals.

Most important, however, we reported that NASA was incurring a high level of risk in pursuing its plans to select potential designs for the new vehicle without first making other decisions that would have a large impact on the SLI program. These included decisions on what DOD's role would be in the program; what the final configuration of the International Space Station would be; and what overall direction NASA's Space Transportation Plan would take. At the time, there were indications that NASA and DOD differed on priorities and requirements for the program. Also, NASA had yet to come to agreement with its international partners on space station issues that could dramatically impact SLI requirements, such as how many crew members would operate the station. Moreover, NASA was still in the process of reassessing its overall space transportation plans.

NASA agreed with our findings and took steps needed to refocus its space launch efforts. On October 21, 2002, NASA postponed its Systems Requirements Review (SRR) for SLI so that it could focus on defining DOD's role, determine the future requirements of the International Space Station, and firm up the agency's future space transportation needs.

In November 2002, the administration submitted to the Congress an amendment to NASA's fiscal year 2003 budget request to implement a new Integrated Space Transportation Plan. The new plan makes investments to extend the space shuttle's operational life for continued safe operations and refocuses the SLI program on developing an orbital space plane—which provides a crew transfer capability to and from the space station—and next generation launch technology.

We will continue to monitor NASA's progress in reducing launch costs and position ourselves to advise the Congress accordingly. As it proceeds forward with its revised plans, it will still be important for NASA to implement management controls that can effectively predict what the total costs of the program will be and minimize risks. These include cost estimates, controls designed to provide early warnings of cost and schedule overruns, and risk mitigation plans. With such controls in place, NASA would be positioned to provide its managers and the Congress with the information needed to ensure that the program is on track and able to meet expectations.

Correcting Weaknesses in Contract Management

Much of NASA's success depends on the work of its contractors—on which it spends the greatest part of its funds—$12.7 billion or 90 percent. But for many years, NASA has not been able to effectively oversee contracts, principally because it lacked accurate and reliable information on contract spending and it has placed little emphasis on end results, product performance, and cost control. NASA has addressed many acquisition-related weaknesses, but key tasks remain, including completing the design and implementation of a new integrated financial management system.

Since 1990, we have identified NASA's contract management function as an area at high risk due to its ineffective systems and processes for overseeing contractor activities. Our reports and testimonies since then have demonstrated just how debilitating these weaknesses in contract management and oversight can be to important space programs. Our July 2002 report on the International Space Station, for example, found that NASA did not effectively control costs or technical and scheduling risks, provide adequate oversight review, or effectively coordinate efforts with its partners. In other examples, we found that NASA lacked effective systems and processes for overseeing contractor activities and did not emphasize controlling costs.

In addition, NASA's ability to collect, maintain, and report the full cost of its projects and programs is weakened by diverse and often incompatible center-level accounting systems and uneven and nonstandard cost-reporting capabilities. The agency's financial management environment is comprised of decentralized, nonintegrated systems with policies, procedures, and practices that are unique to its field centers. For the most part, data formats are not standardized, automated systems are not interfaced, and on-line financial information is not readily available to program managers. Thus, it is difficult to ensure that contracts are being efficiently and effectively implemented and that budgets are executed as planned.

NASA's lack of a fully integrated financial management system also hurts NASA's ability to provide data required for external reporting purposes. For example, in March 2002, we testified that NASA was unable to provide us with detailed support for amounts that it reported to Congress as obligated against space station and related shuttle program cost limits as required by the National Aeronautics and Space Administration Authorization Act of 2000.[8] Furthermore, NASA's independent auditor, Pricewaterhouse Coopers, disclaimed an opinion on the agency's fiscal year 2001 financial statements and identified significant internal control weaknesses related to accounting for space station material and equipment and to computer security. This action is in contrast with the unqualified or "clean" audit opinions of its previous auditor for fiscal years 1996 through 2000. Also in contrast with NASA's previous auditor's opinion, Pricewaterhouse Coopers concluded that NASA's financial management systems do not substantially comply with the requirements of the Federal Financial Management Improvement Act of 1996[9] (FFMIA). FFMIA builds on previous financial management reform legislation by emphasizing the need for agencies to have systems that can generate timely, accurate, and useful information with which to make informed decisions and to ensure accountability on an ongoing basis.

In recent years, NASA made progress in addressing its contract management challenges. In July 1998, for example, we reported that NASA was developing systems to provide oversight and information needed to improve contract management and that it had made progress evaluating its field centers' procurement activities on the basis of international quality standards and its own procurement surveys. In January 1999, we reported that NASA was implementing its new system for measuring procurement-related activities and had made progress in evaluating procurement functions in its field centers.

NASA has also made progress reducing its use of undefinitized contract actions[10]—that is, unnegotiated (i.e., uncosted) contract changes. Both NASA's Office of the Inspector General and we have reported our concerns

[8]Section 202 of P.L. 106-391.

[9]Section 801 of P.L. 104-208.

[10]An undefinitized contract action means a unilateral or bilateral contract modification or delivery/task order in which the final price or estimated cost and fee have not been negotiated and mutually agreed to by NASA and the contractor. 48 CFR 1843.7001.

about NASA's frequent use of undefinitized contract changes. In 2000, we reported concerns about NASA's use of such actions, since this practice could result in contract cost overruns and cost growth in the International Space Station program. NASA's Office of the Inspector General is currently conducting a review of NASA's management of undefinitized contract actions. Data provided by NASA show significant reductions in the use of these actions. NASA officials attribute recent declines to increased management controls and emphasis by NASA centers on limiting undefinitized contract actions.

Moreover, NASA recognizes the urgency of successfully implementing a fully integrated financial management system. NASA is working on implementing such a system and expects a new system to be fully operational in fiscal year 2008. NASA has estimated the life cycle costs of this system to be $861 million.[11] This is NASA's third attempt toward implementing a fully integrated financial management system. NASA abandoned the first two efforts after 12 years and after spending $180 million. According to NASA, the agency's current approach focuses on learning from other organizations' successes in implementing similar projects, as opposed to revisiting its own failures. NASA has also abandoned its prior approach of attempting to acquire and implement the entire system all at once. Instead, the project is being broken down into manageable pieces. That is, it is being split into modules that NASA states it will implement individually, based on the availability of proven commercial-off-the-shelf (COTS) software products. NASA initially segmented implementation of the integrated financial management project into 14 modules, but has since reorganized the program into 8 modules. One of the first modules NASA plans to implement is the core financial module, which is expected to be fully operational in June 2003. According to NASA officials, the core financial module will provide NASA's program managers with timely, consistent, and reliable information for management decisions as well as the ability to tie all agency costs to major activities, including civil service personnel costs.

While NASA has made some progress, much work remains to strengthen contract oversight. First, NASA has encountered some difficulty in implementing its new financial management system. As we testified in

[11]Life cycle costs include implementation efforts through fiscal year 2008 and major upgrades, plus operation and support costs for each module for the first 2 years after the module goes live.

July 2002, a recent NASA review found that the total cost estimate for deployment of the core financial module at all NASA centers had grown considerably beyond the cost initially contemplated. The review also acknowledged that interoperability and security vulnerabilities exist within the current information infrastructure, although specific details were not provided. Furthermore, NASA reported that the agency's technical project resources are stretched to the point where the impact of any individual schedule mishap could have a systemwide effect. To address these continuing problems, the Administrator appointed an executive to provide leadership and accountability in the direction and operation of the new system. He also recently decided that the near-term focus of the program should be to ensure a successful and rapid deployment of the core financial module—the backbone of the system—and that the schedule of the remaining modules should undergo further risks assessments before moving forward. The keys to success as NASA moves forward in acquiring and implementing its new financial management system are to employ proven best practices, including (1) aligning its selection of commercial components of the system with a NASA-wide blueprint, commonly called an enterprise architecture; (2) analyzing and understanding the dependencies among these commercial components before acquiring and implementing them; (3) following an event-driven system acquisition strategy; (4) employing effective acquisition management processes, such as those governing requirements management, risk management, and test management; (5) ensuring that data existing in legacy systems are corrected before being loaded into the new system, so that data errors will not be perpetuated in the new system; and (6) proactively positioning NASA for the business process changes embedded in the new system by, for example, providing adequate formal and on-the-job training.

Second, NASA still needs to ensure that it has the right data to oversee its programs and contractors—specifically data to allow comparisons of actual costs to estimates, provide an early warning of cost overruns or other related difficulties, and monitor contract performance and make program requirement trade-off decisions. As we reported in August 2001 and again in March 2002, despite its past and current efforts, NASA does not track the actual costs of completed space station components, even though it often estimates costs at the component level for planning and budgeting purposes. Several factors contribute to this situation, including ineffective policies and procedures for updating cost estimates at each major design phase. NASA is also not yet able to uniformly ensure that contractors provide cost data at a level that will give managers the information they need to assess the validity of previous cost estimates,

fully monitor the work being performed, and appropriately identify cost drivers. NASA has begun taking actions to improve the type and detail of cost data available for some large programs, but these efforts are not yet complete.

Because more work is needed to demonstrate substantial progress in resolving the root causes of NASA's contract management weaknesses, we are retaining contract management as a major management challenge and a high-risk area. We are continuing to monitor NASA's progress in addressing contract management weaknesses. In response to a May 24, 2002, bicameral, bipartisan request from the Senate Commerce, Science, and Transportation Committee and the House Science Committee, we are currently assessing the extent to which NASA's management of the financial management system acquisition is in accordance with effective system acquisition practices and is designed to support NASA's decision-making needs and external reporting requirements.

Addressing the Challenges Requires Broader Steps

NASA's management challenges reflect a deeper need for broad cultural change within the agency. Particularly important is the need to shift its overall orientation from processes to results; stovepipes to matrixes; hierarchical to flatter and more horizontal structures; management control to employee empowerment; and reactive behavior to proactive approaches. Making such a shift will require redefining and communicating priorities and values, and a performance management system that will reinforce agency priorities. It will also require a fundamental reassessment of the organizational layers, levels, units, and locations and possibly realignment to support the agency's strategic plan and desired transformation.

NASA is hardly alone in this respect. Federal agencies generally need to reexamine their policies, programs, and operations in light of a number of trends, including the changing nature of the economy; rapidly evolving science and technology; dramatic shifts in the age and composition of the population; diverse, diffuse, and asymmetrical security threats; and long range fiscal challenges. Leading public and private organizations here in the United States and abroad have found that to successfully transform themselves, they must often change their culture. Leading organizations also understand that their people, processes, technologies, and environments are the key enablers that drive cultural change.

NASA's Administrator recognizes the scope of the transformation needed at NASA. In fact, in early 2002, he stressed that NASA must avoid getting distracted with challenges that call for simply incremental or marginal improvements and dedicate itself to overcoming its limits by finding entirely new ways to achieve its objectives. Moreover, to become a science-driven organization,[12] the Administrator called for a new commitment to fiscal responsibility and wise use of assets. The Administrator also underscored the need to eliminate stovepipes within the agency to build an integrated strategy that links human space flight and robotic space flight in a stepping stone approach to exploration and discovery. To make its transformation, NASA is primarily using the five major initiatives from *The President's Management Agenda* (strategic management of human capital, competitive sourcing, improved financial performance, expanded electronic government, and budget and performance integration) as a guide to enact management reforms within the agency.

The success of NASA's transformation will hinge on its ability to solve financial and contract management problems since these problems threaten the success of virtually every major program. While NASA's efforts to design and implement a new financial management system and other actions taken certainly move NASA forward in this area, other issues remain. Specifically, NASA is not yet able to uniformly ensure that contractors provide cost data at a level that will identify cost drivers, give managers the information they need to make trade-off decisions, and link back to cost estimates. Also, NASA has not yet shifted management attention away from yearly budgets to total costs or the need to adhere to controls that focus on reducing cost, scheduling, and performance risks. Overall, our reviews as well as NASA's show that finance is not viewed as intrinsic to NASA's program management decision process, nor does it focus on what "could" and "should" take place from an analytical cost-planning standpoint.

[12]Specifically, the Administrator would like the science of exploration and discovery to determine where NASA should go next and also to use technology to enable advances and to facilitate greater achievements.

To address these issues, NASA must transform its financial management operations so that it better supports NASA's core mission. Specifically, as discussed in our study of leading private sector and state organizations,[13] NASA must go beyond obtaining an unqualified audit opinion toward (1) routinely generating reliable cost and performance information and analysis, (2) undertaking other value-added activities that support strategic decision-making and mission performance, and (3) strengthening NASA's financial team to better support the agency's mission and goals. NASA must also view the implementation of its new financial management system as an opportunity to fundamentally change the way it does business. As we found in the same study, to reap the full benefit of a modern, integrated financial management system, these organizations reengineered their core business processes. In fact, productivity gains typically result from more efficient processes, not from simply automating old ones.

Lastly, to successfully implement its human capital plan, financial management, and other reforms, NASA will need sustained commitment from senior leaders. Changing an organization like NASA with its deep-seated culture and tradition is a massive undertaking that will take considerable effort and time to implement. Given the high stakes involved, it is critical that NASA's leadership provide the necessary direction, oversight, and sustained attention to ensure that reforms stay on track. In this regard, NASA's Administrator comes to the position with a strong management background and expertise in financial management. He has already made a personal commitment to change the workforce and the way NASA does business. Moreover, NASA has appointed a chief operating officer in order to provide sustained management attention to strategic planning, organizational alignment, human capital strategy, performance management, and other elements necessary for transformation success. The challenge ahead for NASA will be to achieve the same level of commitment from managers at NASA centers so that NASA can effectively use existing and new authorities to manage its people strategically and quickly implement the tools needed to strengthen management and oversight.

[13]U.S. General Accounting Office, *Executive Guide: Creating Value Through World-Class Financial Management*, GAO/AIMD-00-134 (Washington, D.C.: Apr. 1, 2000). Our executive guide was based on practices used by nine leading organizations—Boeing, Chase Manhattan Bank, General Electric, Pfizer, Hewlett-Packard, Owens Corning, and the states of Massachusetts, Texas, and Virginia.

GAO Contacts

Subjects covered in this report	Contact persons
Strengthening strategic human capital management	Allen Li, Director Acquisition and Sourcing Management (202) 512-4841 lia@gao.gov
Controlling International Space Station costs	
Reducing space launch costs	Gregory D. Kutz, Director Financial Management and Assurance (202) 512-9505 kutzg@gao.gov
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