



November 13, 2009

**TO: Administrator**

**FROM: Acting Inspector General**

**SUBJECT: NASA's Most Serious Management and Performance Challenges**

As required by the Reports Consolidation Act of 2000, this memorandum provides our views of the most serious management and performance challenges facing NASA and is to be included in the Agency's Performance and Accountability Report for fiscal year 2009.

In determining whether to report an issue as a challenge, we consider the significance of the issue in relation to the Agency's mission; its susceptibility to fraud, waste, and abuse; whether the underlying problems are systemic; and the Agency's progress in addressing the issue. We provided a draft copy of our views to Agency officials and considered all comments received.

Through various Agency initiatives and by implementing recommendations made by the Office of Inspector General (OIG) and other evaluative bodies, such as the Government Accountability Office, NASA is working to improve Agency programs and operations. However, challenges remain in the following areas:

- Transitioning from the Space Shuttle to the Next Generation of Space Vehicles
- Managing Risk to People, Equipment, and Mission
- Financial Management
- Acquisition and Contracting Processes
- Information Technology Security

During FY 2010, the OIG will continue to conduct work that focuses on NASA's efforts to meet these challenges as part of our overall mission to promote the economy and efficiency of the Agency and to root out fraud, waste, abuse, and mismanagement.

We hope that you find our views helpful. Please contact me if you have questions.

signed  
Thomas J. Howard

Enclosure:  
NASA's Most Serious Management and Performance Challenges

## NASA's Most Serious Management and Performance Challenges

### Transitioning from the Space Shuttle to the Next Generation of Space Vehicles

NASA's greatest challenge continues to be maintaining the critical skills and capabilities required to safely and effectively fly the Space Shuttle until its retirement while transitioning to the next generation of space vehicles. In 2004, the "President's Vision for U.S. Space Exploration" caused a substantive reorganization of NASA's strategic priorities, established a timeline for the retirement of the Space Shuttle, established the completion date for the International Space Station (ISS), and set the goals of returning to the Moon and reaching Mars. However, fiscal realities and technical challenges have hampered NASA's efforts to effectively implement the Vision.

**Space Shuttle Program.** The primary mission focus of the Space Shuttle Program between now and retirement is to launch and assemble U.S. and international components for the ISS while sustaining logistics and science support to ISS crews. Successful completion of the Space Shuttle Program's planned manifest, currently scheduled for completion by the end of fiscal year (FY) 2010, is key to meeting NASA's strategic goals of supporting the safe operation of the Space Shuttle to complete assembly of the ISS by the Space Shuttle's planned retirement.

NASA continues to fund and plan for completion of the remaining Space Shuttle flight manifest, which is required to complete the ISS, by September 30, 2010. However, indications from historical flight rates, the presidentially directed Review of U.S. Human Space Flight Plans Committee (the Augustine Committee), internal NASA evaluations, and work by the NASA Office of Inspector General (OIG) show that this goal is not likely to be achieved by the end of FY 2010. If NASA is required to extend the Shuttle's flight schedule, the Agency will need to reevaluate the adequacy of funding and plans for the sustainability of the Shuttle's workforce and infrastructure while preserving the robust process for voicing safety and engineering concerns.

**Constellation Program.** NASA began the Constellation Program in 2005 to facilitate the President's Vision for return to the Moon and the human exploration of Mars. However, reviews of various components of the Program have concluded that allotted resources are not sufficient for stated requirements.

The largest expenditure of funds within the Constellation Program—\$10 billion—has been for the development of the Ares I crew launch vehicle and the Orion crew exploration vehicle. Yet, according to the Government Accountability Office (GAO), NASA cannot confidently determine total costs until technical challenges have been overcome. Engineers working on the Ares I Project continue their efforts to understand and mitigate the impact of rocket thrust oscillations that some critics contend could threaten the health of astronauts and survivability of the Orion vehicle. To improve cost and schedule confidence, NASA has modified Orion's baseline configuration for initial missions, reducing the number of astronauts the vehicle will transport

from six to four. To accommodate the resolution of these and other technical issues, project milestones have rightfully been delayed. NASA's meticulous application of a disciplined approach for each life-cycle phase review will help ensure that complete, timely, and essential information is provided for informed decision making.

Unity of effort is essential for executing a program as complex as Constellation within the fiscal resources provided while ensuring the safe, efficient, and effective implementation of its projects, such as Orion. Over the past year, the Constellation Program has been the subject of multiple studies and analyses. In addition to internal life-cycle reviews associated with standard program management, reviews conducted by the Agency for the President, OIG, GAO, and the Augustine Committee have all examined and reported on the progress of various components of the Constellation Program. Each review noted that allotted resources did not match stated requirements, which resulted in the modification of requirements and the delay of significant milestones.

**Managing the Transition.** NASA faces several transition challenges, among the greatest are the gap period between the last planned Shuttle flight in 2010 and the first planned Ares I and Orion flight in 2015, the sustainment of the ISS after the last Space Shuttle mission, and the effective management of civil service and contractor personnel assigned to the Space Shuttle Program and the Constellation Program.

Over the past year, at the request of Congress and the Administration, NASA has provided various options for extending Shuttle operations and closing the gap between the planned retirement of the Space Shuttle and the first piloted space flight of the Constellation Program's Orion crew exploration vehicle. While each option is technically feasible, each option results in a higher cumulative safety risk because each involves an increased number of Space Shuttle flights, and additional funding would be required to avoid negatively impacting implementation of the next generation of space vehicles.

Two plans that NASA developed—one for an extension of the Shuttle Program to 2012 and another for extension to 2015—would cost an estimated \$4.7 billion and \$14 billion, respectively. These costs would have to be taken out of other NASA programs unless they were provided as an addition to the baseline budget. Each plan would require close coordination with the Constellation Program to avoid negatively impacting the development and implementation of the Program. In addition, the Columbia Accident Investigation Board recommended in 2003 that, as part of a Service Life Extension Program, NASA should recertify the Shuttle at the material, component, system, and subsystem levels prior to operations beyond 2010. Additional challenges to any plan to extend the Shuttle Program include recertifying suppliers who have already begun retooling efforts and reversing recent contract workforce layoffs.

The Augustine Committee presented eight options to address the gap in U.S. space flight capability; six of the options included extending ISS operations from 2015 to 2020, potentially making ISS sustainment more challenging. Providing for the sustainment of ISS is crucial to realizing the scientific research potential of the ISS and protecting the extensive U.S. and foreign investments in the ISS. NASA plans to rely on international partners and commercial providers for logistics support and crew rotation necessary to sustain and operate the ISS during the gap

period of 2010 through 2015. However, while viewed by Agency officials as unlikely, there are various ISS components that can only be carried to orbit by the Space Shuttle should they have to be replaced. In addition, NASA plans to rely on the commercial sector to develop space vehicles for the bulk of cargo delivery required to maintain an ISS crew of six. However, a recent GAO report stated that although the commercial providers have made some progress in meeting established milestones, demonstration flights of their vehicles have been delayed due to engine development challenges. Significant delays in the availability of these commercial vehicles could threaten sustainment of the ISS.

Workforce issues during the gap period of 2010 through 2015 include maintaining the critical skills now present in the Shuttle workforce throughout the Shuttle's remaining flights while placing additional emphasis on defining and cultivating the skill sets needed by the Constellation Program, especially those that will be needed at Kennedy Space Center. Although other NASA Centers are engaged in development and production activities for the new vehicles, the primary focus of the Kennedy workforce is launch operations and ground processing—activities that will not be needed at levels similar to current capacity until the new crew exploration vehicles are ready for flight. Determining the appropriate balance to operate the Space Shuttle safely and sustain that program through retirement while incentivizing talented people to prepare for the future requirements of the Constellation Program demands the optimization of all human resource management assets.

Recognizing the significance of the transition being properly managed, various NASA councils (e.g. Program Management Council, Operation Management Council, and Strategic Management Council) routinely review the Space Shuttle retirement plan and progress, to include transition metrics, decisions, and impact on facilities. In addition, in July 2009, NASA published the third edition of the "NASA Workforce Transition Strategy," which detailed civil service and contractor Shuttle and Constellation workforce projections and requirements at NASA's individual Centers. As the Shuttle Program is retired and the Constellation Program enters the implementation phase of development, such efforts should entail greater detail and transparency to enable informed decision making.

## **Managing Risk to People, Equipment, and Mission**

Ensuring the success of NASA's mission is the goal of effective risk management. Safety and mission assurance controls are key to supporting robust and reliable operations in the context of very challenging launch and mission schedules. NASA program managers are constantly confronted with risks introduced by fiscal realities, schedule demands, and ever-changing priorities. In addition, the NASA OIG has investigated instances involving damaged, counterfeit, or inferior parts purchased by NASA as a result of questionable or even criminal actions of suppliers. Technical challenges, competition for scarce resources, and U.S. economic constraints add risk to international and commercial partnerships. Close scrutiny by NASA management of adherence to the fundamentals of project and program management, risk identification and mitigation, and proven acquisition strategies is beneficial toward the accomplishment of Agency goals.

**Technical Challenges.** Although there is evidence of a continued, strong engineering and safety focus, technical issues continue to challenge the Shuttle Program and add risk to mission success. Specifically, NASA most recently has been troubleshooting hydrogen gas leaks and valve concerns and continued addressing the risk posed by the shedding of foam insulation from the external fuel tank. Undoubtedly, there will be unforeseen technical challenges that will need to be addressed as long as the Space Shuttle continues operations. The stress added to schedules and budgets in an effort to meet these technical challenges is compounded by stress generated in trying to maintain the Constellation Program's development and acquisition schedule.

Ongoing technical challenges and failures in the Science Mission Directorate portfolio add to Agency stress and increase the cost of NASA programs and projects. NASA's next high-profile mission to Mars, the Mars Science Lab, suffered a major setback resulting in a missed launch opportunity in 2009, a \$400 million cost increase, and a 2-year schedule delay due to technical challenges. These challenges threaten the viability of the project, and cost increases and schedule delays may significantly impact the entire Mars Exploration Program. In addition, the Orbiting Carbon Observatory, a satellite important to the monitoring and understanding of the Earth's changing climate, suffered an undetermined technical failure on launch, resulting in the loss of the \$209 million satellite and arguably creating a gap in NASA's execution of the recommendations and intent of the National Research Council's Earth Science Decadal Survey. NASA is also continuing to work on resolving technical issues that threaten to further delay implementation of the Stratospheric Observatory for Infrared Astronomy Program, which is now 10 years behind schedule with costs exceeding 200 percent of the initial cost estimate.

Sound program and project management principles, technical and safety risk identification, and sound mitigation strategies are paramount to successfully developing and operating programs and projects that push the envelope of technological advancement. In the past year, the OIG dedicated considerable resources to reviewing the Agency's risk management efforts at the program and project levels. Although the management of risk generally appeared sound, life-cycle reviews needed to remain focused on ensuring appropriate maturity of design and emphasis was needed on ensuring the adequacy of benefit-cost analyses to provide required information for informed decision making. Our focus will continue to include monitoring NASA's implementation of requirements detailed in the NASA Policy Directive 7120 series on program and project management as well as NASA's implementation of GAO best practices and OIG recommendations.

**Budgetary Challenges.** Aside from the tremendous schedule and technical challenges associated with the complex science, aeronautics, and space exploration projects undertaken by NASA, accomplishment of those missions is susceptible to budgetary revisions imposed through the appropriations process. The implications associated with this budgetary reality add ever-increasing risk to an organization responsible for leading the Nation in space and aeronautics research and development and whose programs are designed to operate over several decades.

Budget revisions and the emphasis on implementing the President's Vision, National Academy of Sciences recommendations, and other stakeholder priorities also influence operations within the NASA Directorates not directly involved in the Space Shuttle or Constellation Programs. While the major space exploration and operational program challenges continue to be a difficult

balancing act, other Mission Directorates within NASA, such as the Aeronautics Research Mission Directorate (ARMD) and the Science Mission Directorate, certainly feel the impact. Shifting priorities and inconsistent funding levels have delayed the development and implementation of the Landsat Data Continuity Mission and Global Precipitation Measurement projects. Decreasing budget allocations have influenced decisions throughout the ARMD portfolio, including research and development activities for the Next Generation Air Transportation System.

NASA is required to operate within the fiscal boundaries afforded and supported by the public interest. Although NASA's programs have advanced the Nation's knowledge in science and technology, the many issues facing the country have led to questions about the cost and benefits of space exploration. The debate will likely intensify as the Administration and Congress weigh the options presented by the Augustine Committee.

**Key Partnerships.** In light of NASA's budgetary realities, international and commercial partnerships are vital to not only implementing the President's Vision, but also improving the viability of future inter-planetary and deep-space exploration. Such partnerships involve risks that include changes in U.S. foreign relations policy and economic constraints.

The President's Vision directed NASA to pursue opportunities for international partnerships in support of the Nation's exploration goals. The Augustine Committee reaffirmed the benefits of engaging international partners in future space exploration endeavors, stating that many nations have aspirations for space exploration and U.S. leadership "could strengthen geopolitical relationships, leverage global resources, and enhance the exploration enterprise." In addition to NASA's traditional partners (Canada, France, Japan, etc.), other countries (e.g., China) that have not traditionally been considered as partners for various reasons are developing space programs, which could prove to be an asset in the future to NASA in attaining its goals.

The looming gap in U.S. human space flight capability makes engagement, cooperation, and consideration of alternatives a must for the viability of the ISS. NASA is facing significant challenges to its plan to honor its commitments to deliver cargo to the ISS. Delays in the Commercial Orbital Transportation Services Program and the likely unavailability of U.S.-made crew vehicles increase the likelihood that NASA will be forced to rely solely on international partners to transport cargo and crew to the ISS.

## **Financial Management**

Over the past year, NASA continued to make progress in improving its internal control over financial reporting by executing its Continuous Monitoring Program (CMP). The CMP assesses and evaluates internal controls, compliance with generally accepted accounting principles, and evidence used to support that balances and activity reported in NASA's financial statements are accurate and complete by requiring Centers to perform a set of control activities. Throughout FY 2009, the CMP has operated as designed. NASA has identified exceptions through the execution of the control activities and has generally tracked and resolved those exceptions in a timely manner.

Although much progress has been made in developing policies, procedures, and controls to improve NASA's financial processes and systems, challenges remain. Specifically, during FY 2009, NASA management and Ernst & Young LLP (E&Y) continued to identify deficiencies in the Agency's system of internal control, which impair NASA's ability to timely report accurate financial information. The most severe deficiency involves NASA's internal control over legacy property, plant, and equipment (PP&E). As shown in the following table, this deficiency has been reported as a material weakness for several years.

| Internal Control Deficiencies  |   |                        |                   |                   |                   |                      |
|--|---|------------------------|-------------------|-------------------|-------------------|----------------------|
| Fiscal Year  |   | 2009                   | 2008              | 2007              | 2006              | 2005                 |
| Independent Public Accountant  |   | E&Y                    | E&Y               | E&Y               | E&Y               | E&Y                  |
| Audit Opinion  |   | Disclaimer             | Disclaimer        | Disclaimer        | Disclaimer        | Disclaimer           |
| Internal Control Deficiencies  | Property, Plant, and Equipment                            | material weakness      | material weakness | material weakness | material weakness | material weakness    |
|  | Financial Statement Preparation Process and Oversight     | —                      | material weakness | material weakness | material weakness | material weakness    |
|  | Environmental Liability Estimation <sup>a</sup>           | significant deficiency | —                 | —                 | —                 | reportable condition |
|  | Federal Financial Management Improvement Act <sup>b</sup> | significant deficiency | —                 | —                 | —                 | —                    |
|  | Fund Balance with Treasury                                | —                      | —                 | —                 | —                 | material weakness    |
| <sup>a</sup> The deficiency cited for Environmental Liability Estimation was included in the Financial Statement Preparation Process and Oversight weakness for FYs 2006–2008.<br><sup>b</sup> The deficiency cited for Federal Financial Management Improvement Act was included in the Financial Statement Preparation Process and Oversight weakness for FYs 2005–2008. |   |                        |                   |                   |                   |                      |

**Property, Plant, and Equipment.** To address the PP&E material weakness, NASA implemented a PP&E capitalization policy and procedures for assets procured on or after October 1, 2007. The policy and procedures are intended to ensure that the value and completeness of capitalized assets, whether Government-held or contractor-held, will be accurate. For contracts with effective dates on or after October 1, 2007, contractors are required to report the cost of each capitalized asset as a separate item on required contractor cost reports. NASA also designed a process to reconcile the monthly contractor cost reports and the capitalized PP&E amounts recorded in NASA's Contractor-Held Asset Tracking System (CHATS) and the Core Financial module. However, given that NASA had no new contracts that fell into this category during FY 2009, E&Y could not test the effectiveness of NASA's controls surrounding those reconciliations for contractor-held property.

Currently, the weakness in PP&E is focused primarily on controls over legacy assets that flow from contracts executed prior to October 1, 2007. The most significant of these legacy assets are the ISS and the Shuttle. For several years, audits of these legacy assets have identified serious

weaknesses in internal controls over the completeness and accuracy of the value of the assets. As a result, Agency management and E&Y have been unable to obtain sufficient evidentiary support for the amounts presented in the financial statements.

On October 14, 2009, the Federal Accounting Standards Advisory Board issued an accounting standard clarifying that reasonable estimates of historical cost may be used to value general PP&E. The standard clarifies that Federal entities should report their general PP&E based on historical cost in accordance with the asset recognition and measurement provisions of the earlier property accounting standards. However, the standard allows for reasonable estimates of historical cost to be used to value general PP&E assets. The proper and effective implementation of the new accounting standard will be important in remediating this deficiency regarding legacy capital assets.

In preparation for the issuance of the new accounting standard, NASA performed an analysis of costs that were capitalized for major components of the ISS and Shuttle. NASA undertook a similar effort when it changed its accounting policy for PP&E in FY 2007 and reclassified almost \$13 billion of costs previously categorized as general PP&E to research and development costs.

During its analysis in FY 2009, NASA changed its capitalization policy for Integration and Operations costs associated with the ISS after it was placed into service on September 30, 2001. NASA also changed its policy for capitalizing Shuttle launch service costs associated with the ISS. These policy changes resulted in the reclassification of approximately \$11 billion of ISS costs that were previously capitalized. Many of the adjustments affected prior periods and are recorded as a correction of an error in the financial statements.

Due to the volatility of the property balances and the increased risk of recording estimates for property, PP&E remains a significant management challenge. Ongoing efforts by NASA management to develop a robust and rigorous review process that both validates and challenges the adequacy of estimation techniques used and the sufficiency of documentation supporting those conclusions will serve NASA management well in preparing for the audit of these estimates in the future.

**Environmental Liability Estimation.** Over the past several years, NASA has taken proactive measures to improve its financial statement preparation processes and oversight. As a result, this issue is no longer reported as a material weakness for FY 2009; however, NASA has challenges estimating its unfunded environmental liability (UEL). These challenges include establishing an Agency-wide policy and ensuring consistent implementation of the policy across the Agency.

During FY 2009, NASA changed the timeframe it uses to estimate its environmental liability to clean-up contaminated sites. NASA now limits the length of the remediation period included in the UEL accrual estimates at 30 years as of the Balance Sheet date. According to NASA, beyond a 30-year horizon, UEL estimates have not proven to be reliable for presentation in the financial statements. While NASA's guidance regarding UEL estimates is under continued revision, NASA has articulated that reliable engineering estimates beyond the 30-year period

will be taken into consideration while developing the accrual. However, no amounts in the FY 2009 accrual relate to periods past the 30-year horizon.

NASA developed a policy in September 2009 to capture cleanup costs for removing, containing, and/or disposing of hazardous waste from property or material associated with the permanent or temporary shutdown of a program. The Federal accounting standard that requires agencies to capture this information when applicable property is placed into service has been in effect since FY 1998; however, in September 2009, NASA made its first attempt to estimate and disclose those costs in the financial statements. In addition, E&Y found that NASA does not apply mark-ups (i.e., percentage increases applied to environmental liability estimates to account for contingencies) consistently to remediation projects from year to year, thus creating large variances in the UEL estimate when no other factors had changed. Generally, contingencies should not be changed from year to year unless there is appropriate justification. All of these issues contributed to NASA not having a stable and auditable UEL estimate.

## **Acquisition and Contracting Processes**

One of NASA's long-standing management challenges relates to systemic weaknesses identified in its acquisition and contracting processes. GAO first identified NASA's contract management as a high-risk area in 1990, citing NASA's undisciplined cost-estimating processes in project development, the project managers' inability to obtain information needed to assess contract progress, and persistent cost growth and schedule slippage in the majority of its major projects. GAO noted improvements to NASA's processes in its most recent update to the high-risk areas, "High Risk Series: An Update" (GAO-09-271, January 2009), that included the development of a plan to address systemic weaknesses while noting that "it will take several years to fully implement these initiatives and transform the agency into an organization that delivers the kind of analysis and forward-looking information needed to effectively manage its many complex programs." During 2009, the OIG also noted NASA's continued emphasis on monitoring this challenge and implementing disciplined acquisition management processes. However, both GAO and OIG audits and investigations continue to reveal systemic weaknesses in the areas of acquisition and procurement, to include awards as part of the Small Business Innovation Research (SBIR) Program.

**Cost Estimates.** In recent reviews of selected NASA programs, the OIG found that NASA still lacks the disciplined cost-estimating processes and financial and performance management systems needed to establish priorities, quantify risks, and manage program costs. Our review of the Stratospheric Observatory for Infrared Astronomy Program found that initial cost estimates were inaccurate and continuously increased as the Program progressed, and our review of the FY 2008 budget request for the Constellation Program found that cost estimates could have been better documented. Given that NASA programs and projects have historically experienced cost overruns, improvements in cost estimating with detailed, empirical data that explain the rationale for decisions could help minimize the risk of cost overruns by providing additional assurance that budget requests are adequate to achieve program and project goals.

GAO has also reported that NASA faces disparate challenges in estimating the cost to retire the Space Shuttle and transition to the Constellation Program. Although NASA continues to budget and manage the launch schedule to retire the Shuttle in 2010, it has yet to decide which facilities and equipment will transition to the Constellation Program and which will be sold, demolished, or preserved for historic value. Proper estimation of the cost to transition and dispose of its facilities and assets are critical to the long-term financial planning for the Constellation Program. According to GAO, NASA will need to determine the status of as many as 654 facilities, worth an estimated \$5.7 billion, and equipment estimated at \$12 billion. NASA continues to focus its efforts to address these challenges on providing improved estimates of transition costs.

**Acquisition Process.** GAO and OIG audits have continued to report systemic weaknesses involving NASA's acquisition process. This year there were bid protests involving significant NASA programs pertaining to missteps in the NASA acquisition process. The bid protests cost the Agency in many ways—through delaying the furtherance of the mission for which the contract was being let, through costs generated by the bid protest process itself, and through the costs associated with maintaining the operational status quo. Given that NASA spends approximately 90 percent of its budget on contracts and awards, these systemic weaknesses pose significant challenges to NASA's ability to make informed investment decisions. In response to this challenge, NASA revised its acquisition policy in 2007, which was a positive step in improving NASA's ability to complete its programs and projects within cost, schedule, and performance parameters. However, implementation of the revised policy has created its own challenges by fundamentally changing NASA's approach to acquisition.

In June 2007, the OIG initiated an audit of the Orion Project because it was one of the first space flight projects to implement the revised program and project management policy, which requires space flight projects to conduct life-cycle reviews during each phase of the project's life cycle. These reviews are considered essential elements of conducting, managing, evaluating, and approving space flight projects. However, during our audit of the Orion Project, we found that NASA conducted a life-cycle review with a vehicle configuration that was not at the proper maturity level to proceed to the next phase. As a result, a significant portion of the vehicle configuration that eventually did proceed to the next phase had not been completely evaluated for compliance with requirements, which increased the risk of costly rework and schedule delays.

More than 3 years ago, GAO testified that NASA's acquisition strategy of awarding a long-term contract for the design, development, production, and sustainment of Orion before developing a sound business case placed the project at risk of significant cost overruns, schedule delays, and performance shortfalls. Later, in October 2007, GAO noted that gaps in the Ares I Project included inadequate knowledge of requirements, costs, schedule, technology, design, and production feasibility. GAO also noted that, given the complexity and interdependence within the Constellation Program, these challenges were significant. In April 2008, GAO again testified that while NASA was working toward a preliminary design review for Ares I and Orion, there were considerable unknowns as to whether NASA's plans could be executed within schedule and cost parameters because NASA was still in the process of defining many performance requirements. Most recently, GAO stated that Constellation Program cost and schedule uncertainties persist because "NASA is still struggling to develop a solid business case—

