National Aeronautics and
Space Administration

Office of Inspector General
Washington, D.C. 20546-0001

November 14, 2005

TO: Administrator

FROM: Inspector General

SUBJECT: NASA's Most Serious Management and Performance Challenges

As required by the Reports Consolidation Act of 2000, these are our views of the most serious management and performance challenges facing NASA. NASA is working to address these challenges and improve Agency programs and operations through various initiatives and by implementing recommendations made by my office and other evaluative bodies, such as the Columbia Accident Investigation Board and the Government Accountability Office. The four challenges are listed below and summarized in the enclosure.

- Continuing to correct the serious organizational and technical deficiencies that contributed to the Columbia accident in 2003.
- Completing the International Space Station.
- Transitioning from the Space Shuttle vehicle to the next-generation crew exploration vehicle (CEV).
- Ensuring that the integrated financial management system improves NASA's ability to accurately allocate costs to programs, efficiently provides reliable information to management, and supports compliance with the Chief Financial Officers Act.

Transitioning from the Space Shuttle vehicle to the next-generation CEV was added as a most serious challenge this year. The Agency will be focused for the foreseeable future on implementing the President's Vision for Space Exploration by transitioning from the Space Shuttle Program to the CEV and other vehicles that will carry crew and hardware to complete the assembly of the International Space Station, then on to the Moon and Mars. This transition presents a multitude of challenges. Transitioning existing workforce and facilities toward new vehicle production and, at the same time, flying the Space Shuttle as safely as reasonably possible until 2010 is a tremendous challenge, unique in scope and complexity. The accelerated schedule for implementation and budget constraints contribute to the difficulty of meeting this challenge. My office plans to dedicate considerable audit resources to reviewing these efforts, to include a review of the transition process and the development of the CEV.

Information technology (IT) security, included as a most serious challenge last year, is not included this year because of actions taken by the Agency to improve its IT security.

The Chief Information Officer has been very responsive to our recommendations and has implemented policies and procedures that strengthen the Agency's IT security and internal controls over sensitive information. My office will continue to monitor activities associated with IT security, as it remains an important issue for the Agency.

If you have any questions, or need additional information, please call me at 202-358-1220.

Robert W. Cobb

Enclosure

NASA's Most Serious Management and Performance Challenges

Continuing to correct the serious organizational and technical deficiencies that contributed to the Columbia accident in 2003.

Although the first of two return-to-flight (RTF) missions was completed successfully, NASA is still working to correct the serious organizational and technical deficiencies that contributed to the Columbia accident in 2003. After the Columbia accident, the Administrator established the Columbia Accident Investigation Board (CAIB) to identify the cause of the accident and to make recommendations for resolving known problems in order to safely return the Space Shuttle to flight. The CAIB's August 2003 report contained 29 recommendations related to the physical and organizational, including cultural, causes of the accident. Of the 29 recommendations, 15 related primarily to the physical causes of the accident, and the CAIB stated that these must be addressed before the Space Shuttle's RTF.

The Administrator formed the RTF Task Group to report on NASA's progress in implementing the CAIB's RTF recommendations. The Task Group issued its final report on August 17, 2005, stating that NASA had met the intent of 12 of the 15 recommendations but that the remaining 3 recommendations, which concerned debris shedding, orbiter hardening, and on-orbit inspection and repair, were so challenging that NASA could not yet comply with the CAIB recommendations. The report noted that NASA had made substantive progress in making the Space Shuttle safer through study, analysis, and hardware modification.

The July 26, 2005, launch of Discovery was the first of two RTF missions to test modifications made since the Columbia accident. However, because pieces of insulating foam broke off from the external tank during Discovery's launch, as had happened during Columbia's flight, the Shuttle fleet was again grounded. With the reoccurrence of debris shedding, the orbiter's thermal protection system remains vulnerable to impact, and although tested during the Discovery flight, a viable on-orbit repair capability continues to be a challenge. NASA has since established a Tiger Team and other technical boards to study and report on the root causes for the continued problem of debris shedding.

The Office of Inspector General (OIG) reviewed NASA's progress in preparing the Space Shuttle for its RTF. In May 2005, we issued a report that summarized the results of our reviews.[1] In that report, we noted that some of the documents we reviewed were simply plans to address CAIB recommendations, rather than the actual implementation of those plans. The OIG also assessed actions taken by NASA to address specific CAIB recommendations in separate reports, including management challenges on quality assurance at Kennedy Space

[1] "Summary of the Office of Inspector General's Reviews on Aspects of NASA's Response to the Columbia Accident Investigation Board Report" (IG-05-015, May 13, 2005).

Center (KSC),[2] orbiter wiring inspection,[3] and NASA's plan for independent technical authority (ITA) and safety and mission assurance (SMA).[4]

Quality Assurance. In our review of the quality assurance process and procedures, we noted that KSC improperly used outdated and obsolete position descriptions to hire and evaluate quality assurance personnel. KSC has since initiated action to promote quality assurance specialists and raised the journeyman level of a quality assurance specialist, which should serve to improve KSC's ability to recruit and retain skilled quality assurance specialists.

Orbiter Wiring. Our report on orbiter wiring disclosed that NASA had not formally assessed the risk of aging and damaged wiring in accordance with NASA guidance, nor had it developed a risk mitigation plan based on such an assessment. Without such assessments and plans, the Space Shuttle Program cannot ensure that it has effectively managed the risks that aging and damaged wiring could pose to flight safety. In addition, next-generation space vehicles could face similar wiring challenges. As a result of our recommendations, NASA has taken or is taking action to assess the wiring risk, develop a risk mitigation plan, and share lessons learned concerning new technology for wiring inspection.

ITA and SMA. In our review of NASA's plan for ITA and SMA, we noted that the organizational structure NASA had planned for the technical authority posed some risks to independence. However, NASA's technical authority concept was being modified at the time of our review (August 2005) and, therefore, we did not issue any recommendations. We plan to monitor the implementation of the revised technical authority, which will not be implemented until it is reviewed by NASA's new Chief Engineer (appointed October 30, 2005). To the extent the ITA as reconfigured will rely on Center directors as being the source of organizational independence, the ITA may not be organized as the CAIB envisioned. The CAIB found that the Space Shuttle Program does not consistently demonstrate the characteristics of organizations that effectively manage high risk. The CAIB's finding reflects the Agency's challenge of ensuring engineering integrity in the context of constant cost and schedule pressures inherent in executing space flight programs. The new ITA organization will require strict adherence by the space flight Center directors to their institutional (as opposed to programmatic) responsibilities, as directed by the Administrator, and avoidance of the informal chains of command that were evident in the events leading to the Columbia disaster. Additionally, particular sensitivity to independence of engineering authority is required during this period of transition to the new ITA organization.

We also reported that NASA diverged from the explicit intent of the CAIB recommendation by not implementing direct-line funding or reporting for Shuttle Program SMA personnel. We recommended that in lieu of implementing the CAIB recommendation, the Chief SMA Officer should demonstrate that there is a healthy, sustainable, independent oversight

[2] "Final Memorandum on NASA's Plans and Actions to Improve Kennedy Space Center Quality Assurance" (IG-05-018, May 13, 2005).

[3] "Space Shuttle Orbiter Wiring Inspection" (IG-05-023, July 14, 2005).

[4] "Risks Associated with NASA's Plan for Technical Authority and Safety and Mission Assurance" (IG-05-024, August 19, 2005).

function. Management concurred and is taking action to ensure that program oversight is independent and thorough and stated that the scope of the Office of SMA's audits will be expanded to include a review of the safety reporting process.

Completing the International Space Station.

Completing the International Space Station (ISS) and managing the ISS Program schedule and costs is contingent on returning the Space Shuttle to flight on a dependable and consistent basis. NASA's concerns about limitations imposed by the Iran Nonproliferation Act of 2000 have been alleviated with Congress's passage of S. 1713, "Iran Nonproliferation Amendments Act of 2005." However, concerns about debris shedding, and a shrinking timeline to Shuttle retirement, continue to impact the future of Space Shuttle operations.

Following the Space Shuttle Columbia's accident, the Shuttle fleet was grounded. That limited the number of crew that could be transported and supported aboard the ISS, halted ISS assembly, and significantly reduced available "up and down mass" (transport of crew and equipment) for ISS operations and utilization. ISS assembly was to resume after the successful completion of two RTF missions. The first was completed July 26–August 9, 2005, with the launch and landing of the Space Shuttle Discovery. During the mission, the Discovery crew successfully replenished the food and oxygen supply aboard the ISS and repaired the two damaged control gyroscopes. However, because of debris shedding during Discovery's launch, the Shuttle fleet was again grounded. Consequently, NASA's timeline for completing the second RTF mission has been extended to at least May 2006, extending the timeline for ISS assembly as well.

The impending retirement of the Space Shuttle fleet also presents an additional obstacle to ISS completion. Shuttle retirement threatens the U.S. segment of the ISS Program's projected budget. NASA has identified various viable configuration options for the ISS in the context of potential future Shuttle flight rates. Those configuration options have been identified in the context of international partner commitments, research utilization, cost, and ISS sustainability while operating under the constraint to cease Shuttle flights no later than FY 2010 and maintaining safety as NASA's highest priority. In November 2005, NASA intends to decide which option provides the optimum ISS configuration considering budgetary, performance, and schedule constraints.

Transitioning from the Space Shuttle vehicle to the next-generation crew exploration vehicle (CEV).

On January 14, 2004, President Bush announced *A Renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration*, a new directive for the Nation's space exploration program. The fundamental goal of the new directive is to advance U.S. scientific, security, and economic interests through a robust space exploration program. Specific objectives of the Vision are to (1) implement a sustained and affordable human and robotic program to explore the solar system and beyond; (2) extend human presence across the solar

system, starting with a human return to the Moon; (3) develop innovative technologies, knowledge, and infrastructures to explore and support decisions for human exploration; and (4) promote international and commercial participation in exploration. Initial cost estimates for implementing the Vision are approximately $100 billion for the next 20 years.

As part of the President's Vision, NASA was directed to return the Space Shuttle to flight as soon as possible, focus the use of the Space Shuttle on completion of the ISS, and retire the Space Shuttle around the end of the decade (2010). With respect to the broader space mission, NASA was directed to pursue lunar exploration activities with the goal of a human expedition no later than 2020; conduct robotic exploration and develop key capabilities (e.g., propulsion and life support) to explore Mars and other destinations; develop a new CEV to provide crew transportation for missions beyond low Earth orbit; and pursue opportunities for international and commercial partnerships.

Transitioning existing workforce and facilities toward new vehicle production and, at the same time, flying the Space Shuttle as safely as reasonably possible until 2010 is a tremendous challenge, unique in scope and complexity. The accelerated schedule for implementation and budget constraints contribute to the difficulty of meeting this challenge.

One of the keys to controlling CEV costs is maximizing the use of existing Space Shuttle technology in the new vehicle. NASA has concluded that the safest, most reliable, and most affordable means of CEV development is to use existing Shuttle systems, such as the solid rocket boosters and the liquid propulsion system. However, use of those systems on the CEV will require significant re-engineering and facilities reconfiguration. The re-engineering and reconfiguration will need to occur concurrently with the last Space Shuttle flights. The redirection of engineering talent and attention to the new program poses possible increased risks for Shuttle operations.

The NASA Administrator testified on November 3, 2005, before the House Science Committee concerning a $3 billion to $5 billion shortfall in funding the Shuttle through 2010. Such a shortfall could also impact NASA's ability to meet its accelerated timeframe for the CEV and to meet ISS requirements. These budgetary pressures may not only impact the ability to execute programs within desired timeframes, but may also impact the Agency's ability to retain the technically competent workforce necessary for efficient transition to the new generation of vehicles.

Ensuring that the integrated financial management system improves NASA's ability to accurately allocate costs to programs, efficiently provides reliable information to management, and supports compliance with the Chief Financial Officers Act.

NASA received a disclaimer of opinion on its financial statements as a result of the Independent Public Accountant (IPA) audits in FY 2003 by PricewaterhouseCoopers and in FY 2004 and FY 2005 by Ernst & Young LLP (E&Y) because NASA has been unable to

provide auditable financial statements and sufficient evidence to support statements throughout the fiscal year. The reports that the IPAs have submitted identify instances of noncompliance with generally accepted accounting principles, reportable conditions (with most being material weaknesses) in internal controls, and noncompliance with the Federal Financial Management Improvement Act and the Improper Payments Information Act of 2002. Many of the weaknesses the audits disclosed resulted from a lack of effective internal control procedures and continued data integrity issues, as well as problems related to NASA's conversion in FY 2003 from 10 separate systems to a new single Integrated Enterprise Management Program (IEMP).

The backbone of IEMP is the Core Financial module, which NASA implemented in FY 2003. However, despite substantial investment, in both time and money, into the development and implementation of the Core Financial module, NASA still cannot produce auditable financial statements—a key goal of the module.

NASA's continued problems in resolving its internal control weaknesses have contributed to its inability to produce complete and accurate financial statements. Many of NASA's internal control deficiencies are material weaknesses that have been reported for several years, as shown in the following table. Two of the most significant material weaknesses are property, plant, and equipment and materials (PP&E) and Fund Balance with Treasury (FBWT).

Internal Control Deficiencies						
Fiscal Year		2005	2004	2003	2002	2001
Independent Public Accountant		E&Y	E&Y	PwC[1]	PwC	PwC
Audit Opinion		Disclaimer	Disclaimer	Disclaimer	Unqualified	Disclaimer
Internal Control Deficiencies	General Controls Environment[2]	—	material weakness	reportable condition	reportable condition	—
	Property, Plant, and Equipment and Materials	material weakness	material weakness	material weakness	material weakness	material weakness
	Financial Statement Preparation Process and Oversight	material weakness	material weakness	material weakness	material weakness	—
	Fund Balance with Treasury	material weakness	material weakness	material weakness	—	—
	Audit Trail and Documentation to Support Financial Statements[3]	—	—	material weakness	—	—
	Environmental Liability Estimation	reportable condition	reportable condition	—	—	reportable condition
	Information Systems Controls[4]	—	—	—	—	reportable condition

[1] PricewaterhouseCoopers.

[2] General Controls Environment weaknesses have been mostly resolved for FY 2005. The segregation of duties component of this weakness was included in the Financial Statement Preparation Process and Oversight weakness in FY 2005.

[3] The weakness on Audit Trail cited in FY 2003 continued to exist in FY 2004 and FY 2005; however, the auditor included it in the overall Financial Statement Preparation Process and Oversight weakness for those years.

[4] This area includes disaster recovery tests, systems constraints, logical access controls, and access controls to mainframe, and included four individual reportable conditions cited in FY 2001 that continued to exist in FY 2002; however, the auditor included them in the General Controls Environment weakness in FY 2002.

NASA has demonstrated some limited progress in addressing three of its four reported material weaknesses and one reportable condition from the FY 2004 audit. NASA has made significant progress in correcting the fourth material weakness reported by E&Y in FY 2004, "Improvements in the IFMP Control Environment" (included as part of the General Controls Environment shown in the table).

NASA also achieved some limited success in producing interim financial statements from its Core Financial module, although many manual adjustments were still necessary. NASA generated its year-end financial statements directly from the Core Financial module. It accomplished this by posting adjustments in the module, rather than manually adjusting the financial statements. Other areas of progress include the implementation of reconciliation procedures for selected general ledger accounts and preparing checklists for Centers to complete and sign to certify the transactions. We also note that the Office of the Chief Financial Officer has added additional personnel, filled key leadership positions, and established a Quality Assurance office. The Quality Assurance office has the responsibility of providing oversight and quality control reviews of financial management and assisting the

Centers with compliance issues. In addition, the Center Chief Financial Officers now report to the NASA Chief Financial Officer instead of the Center directors.

NASA also made some progress on the material weakness in "Property, Plant, and Equipment and Materials" by developing an Internet-based Contractor Held Asset Tracking System (CHATS) for contractors to report information on their contractor-held, NASA-owned property.

To meet financial management expectations and requirements, NASA must have viable corrective action plans to address the repeat internal control weaknesses it faces. Plans developed to date have lacked clear strategies for resolving the weaknesses and have not been finalized. NASA must immediately develop and implement corrective action plans that fulfill comprehensive financial management objectives within parameters set by financial management and accounting laws and regulations. Such plans can only be developed as a collaborative product of NASA program and institutional leadership. While incremental progress can be made by focusing on separate pieces of financial management challenges, NASA will not likely correct its material weaknesses without a comprehensive approach that contemplates the framework in which the Agency accounts for the expenditure of taxpayer dollars.