

**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON SPACE AND AERONAUTICS**

HEARING CHARTER

*Key Issues and Challenges Facing NASA:
Views of the Agency's Watchdogs*

February 3, 2010
10 a.m. – Noon
2318 Rayburn House Office Building

I. Purpose

On February 3, 2010 the Subcommittee on Space and Aeronautics will hold a hearing on the key issues and challenges facing the National Aeronautics and Space Administration (NASA) as seen by the agency's "watchdogs"—the NASA Inspector General, the Government Accountability Office (GAO), and the Aerospace Safety Advisory Panel (ASAP). Leveraging the unique perspectives these organizations developed in the course of their work at NASA in the areas of management, mission execution, and security and safety oversight, the hearing will examine (1) the critical issues and challenges facing NASA that warrant congressional attention and (2) the corresponding commitment, initiatives, and policies needed by NASA to successfully address these issues and challenges. Separate hearings are planned to address NASA's Fiscal Year 2011 budget request as well as the administration's human space flight strategy after they are announced.

II. Scheduled Witnesses:

Hon. Paul K. Martin

Inspector General
National Aeronautics and Space Administration

Ms. Cristina T. Chaplain

Director
Acquisition and Sourcing Management
Government Accountability Office

Vice Admiral Joseph W. Dyer [U.S. Navy, retired]

Chair
Aerospace Safety Advisory Panel
National Aeronautics and Space Administration

III. Overview

During the second session of the 111th Congress, the Committee on Science and Technology expects to move legislation reauthorizing NASA activities. To inform Congress' deliberations, it will be important to hear from the agency's "watchdog" organizations on what they consider to be the key issues and challenges facing NASA. At this hearing, they will be basing their testimony on recent work that they have carried out. In particular:

- In November 2009, the NASA Office of the Inspector General (OIG) issued its annual memorandum identifying what it views as NASA's most serious management and performance challenges, namely 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; and information technology security.
- On the eve of this hearing, GAO released its annual assessment of 19 large-scale projects focusing on the extent of cost and schedule growth in each project. In this congressionally-directed review, GAO found that 9 of the 10 projects that have been in the implementation phase for several years experienced cost growth ranging from 8 to 68 percent, and launch delays of 1 to 33 months, in the past 3 years. Contract management has been on GAO's high-risk list since 1990. As part of its high-risk update issued last year, GAO continued to include NASA's "acquisition management" activity on its high-risk list. The office cited the persistence of cost growth and schedule delays as reason for the inclusion. GAO has also recently reported on vulnerabilities of NASA's key information technology (IT) networks (at the direction of the 2008 NASA Authorization Act) and, at the request of the Committee on Science and Technology, on future research utilization of the International Space Station (ISS).
- The ASAP found, in its 2009 Annual report released on January 15, 2010, that NASA faces unprecedented challenges; and that important decisions on the future of human space flight face NASA, as well as the White House, Congress, and the Nation. Significant concerns identified by the ASAP include the need to: establish human rating requirements for potential commercial and international vehicle systems that might be used to carry U.S. astronauts; analyze the ramifications of any decision to extend the Space Shuttle beyond the current manifest; transition the workforce from the Shuttle to the follow-on program; candidly communicate the risks of human space flight with the public and the Congress; and more aggressively use robots to reduce the risk of human exploration.

IV. Potential Issues

- *What are the top priorities and issues that the witnesses think Congress should consider in upcoming NASA authorizing legislation?*

- *What critical challenges is NASA facing and what corresponding decisions are required? What are the major concerns regarding NASA's ability to address these challenges?*
- *How does NASA compare, in terms of financial accountability today to where the agency was three years ago? How successful has NASA been in instilling the rigor and discipline necessary for good financial management? What more needs to be done?*
- *How do acquisition management weaknesses impact NASA's ability to carry out its missions? What progress has NASA made in addressing its acquisition management weaknesses? What issues could interfere with NASA's progress in addressing these weaknesses?*
- *How significant are the identified vulnerabilities in NASA's key networks to the agency's ability to successfully execute future missions? What progress has NASA made in addressing these network vulnerabilities?*
- *What progress has NASA made in instilling and maintaining safety in the agency's culture, standards, and processes? What could impact continued progress?*

V. Background Information

Funding NASA for Fiscal Year 2010

To put NASA's FY 2010 budget request into context, NASA has been tasked with flying the Space Shuttle safely until the end of the decade and then retiring the Shuttle fleet; completing assembly of, operating, and utilizing the ISS; developing a new Crew Exploration Vehicle (known as Orion) and a Crew Launch Vehicle (known as Ares I) by 2015; returning U.S. astronauts to the Moon by 2020; and conducting a variety of challenging science and aeronautics programs. The NASA Authorization Act of 2008 [P.L. 110-422] authorized a FY 2009 funding level for NASA of \$20.21 billion; the appropriation enacted for FY 2009 was \$17.78 billion. P.L. 110-422 is a one-year authorization for NASA; the Committee on Science and Technology is planning to move legislation reauthorizing NASA this legislative session. In addition, The American Recovery and Reinvestment Act [P.L. 111-5] included \$1 billion for NASA's Earth science, aeronautics, exploration programs, cross-agency support, and Inspector General. Recovery Act funds are to be expended by September 30, 2010.

In response to the president's FY2010 budget request for NASA, the House passed the Commerce, Justice, Science (CJS) appropriations bill, which includes NASA, in June 2009. Agreement on the final bill was reached with the Senate as part of the FY2010 Consolidated Appropriations Act which passed the House on December 10, 2009 and the Senate on December 13, 2009. The president signed the bill into law on December 16, 2009. The total amount appropriated for FY 2010 for NASA approximates the total requested by the president for the agency. While the FY 2010 enacted appropriations total is about \$1 billion greater than that enacted for FY 2009, the total of FY 2009 appropriations is basically the same when the \$1 billion of funding provided to NASA by the American Recovery and Reinvestment Act (a.k.a "stimulus funds") is added.

Specific language was included in the Statement of Managers accompanying the consolidated appropriations with regards to human space flight expenditures. Because Congress is awaiting a decision from the president on his plans for future implementation of human space flight following the findings of the U.S. Human Spaceflight Plans Committee, the statement placed constraints on how the FY 2010 appropriations for human space exploration could be used, with specific direction on the current program. Specifically, the Statement said:

“Accordingly, it is premature for the conferees to advocate or initiate significant changes to the current program absent a bona fide proposal from the Administration and subsequent assessment, consideration and enactment by Congress.

To protect the jurisdiction and prerogatives of the House and Senate Committees on Appropriations and of the Congress generally while providing appropriate flexibility to the Administration in managing a complex research and development program, the conference agreement provides \$3,466,400,000 for human exploration architecture development, the same level as the budget request. Changes in budgetary and programmatic requirements for fiscal year 2010 from the original request shall be submitted only in the form of a supplemental budget request for fiscal year 2010 and not through an initial operating plan or subsequent updates.”

“Funds are also not provided herein to cancel, terminate or significantly modify contracts related to the spacecraft architecture of the current program, unless such changes or modifications have been considered in subsequent appropriations Acts.”

In addition, the conferees created a new account called “Construction and Environmental Compliance.” It is funded by moving money from several of the Mission Directorates into this new account and funds necessary expenses for the “*construction of facilities including repair, rehabilitation, revitalization, and modification of facilities, construction of new facilities and additions to existing facilities, facility planning and design, and restoration, and acquisition or condemnation or real property, as authorized by law, and environmental compliance and restoration.*”

The following table compares the NASA appropriation enacted for FY 2009, the amount requested by the president for FY 2010, and the appropriation recently enacted for FY 2010.

Dollars in millions

	FY 2009 Enacted	FY 2010 Request	FY 2010 Enacted
Science	4,503.0	4,477.2	4,469.0
Aeronautics	500.0	507.0	501.0
Exploration	3,505.5	3,963.1	3,746.3
Space operations	5,764.7	6,175.6	6,146.8
Education	169.2	126.1	182.5
Cross agency support	3,306.4	3,400.6	3,194.0
Construction and Environmental Compliance	0.0	0.0	448.3
Office of Inspector General	33.6	36.4	36.4
TOTAL	17,782.4	18,686.0	18,724.3

Source: H.R. 3288, the Consolidated Appropriations Act of 2010

NASA's Office of the Inspector General

Authority and Scope of Work

Public Law 95-452, known as the Inspector General Act of 1978, created independent audit and investigative units, called Offices of Inspector General (OIGs) at 63 Federal agencies. The mandate of the OIGs, as spelled out in the Act, is to:

- Conduct and supervise independent and objective audits and investigations relating to agency programs and operations;
- Promote economy, effectiveness and efficiency within the agency;
- Prevent and detect crime, fraud, waste and abuse in agency programs and operations;
- Review and make recommendations regarding existing and proposed legislation and regulations relating to agency programs and operations; and
- Keep the agency head and the Congress fully and currently informed of problems in agency programs and operations.

In accordance with the Inspector General Act, NASA's Office of the Inspector General (OIG) conducts oversight of NASA programs and operations and independently reports to the Administrator, Congress, and the public to further the agency's accomplishment of its mission. The OIG is led by the NASA Inspector General, a presidentially-appointed position requiring Senate confirmation. The OIG's Office of Audits conducts independent and objective audits, reviews, and other examinations to improve the economy, efficiency, and effectiveness and to identify any waste and mismanagement in NASA programs, projects, operations, and contractor activities. In addition, the Office of Audits oversees the work of the independent public accountant in

its audit of NASA's financial statements. The OIG's Office of Investigations investigates allegations of crime, cyber-crime, fraud, abuse or misconduct having an impact on NASA programs, operations, and resources. The Office of Investigations refers its findings to either the Department of Justice for prosecution or to NASA management for action. Through its investigations, the Office of Investigations identifies crime indicators and recommends effective measures for NASA management that are designed to reduce NASA's vulnerability to criminal activity.

Memorandum on NASA's Most Serious Management and Performance Challenges

In November 2009, the Acting Inspector General released a memorandum entitled "NASA's Most Serious Management and Performance Challenges". As required by the Reports Consolidation Act of 2000, this memorandum provides the OIG's views of the most serious management and performance challenges facing NASA. In determining whether to report an issue as a challenge, the OIG said that it considered 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. The NASA OIG found that NASA is working to improve agency programs and operations through various initiatives and by implementing recommendations made by GAO and itself. However, the NASA OIG said that challenges remain in several areas.

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

The NASA OIG said that "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."

Managing Risk to People, Equipment, and Mission

The NASA OIG said in the November 2009 memorandum that "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.”

Financial Management

The NASA OIG acknowledged that 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 OIG said that *“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.”*

While recognizing that much progress has been made in developing policies, procedures and controls to improve NASA’s financial processes and systems, the NASA OIG also reported that challenges remain. Specifically, the NASA OIG said that *“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).”* The NASA OIG found that the effort to address PP&E deficiencies is currently focused primarily on establishing 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, the NASA OIG said, *“Agency management and E&Y have been unable to obtain sufficient evidentiary support for the amounts presented in the financial statements.”*

Each year, federal agencies are required to obtain an audit of their consolidated financial statements from independent auditing firms. The E&Y November 2009 report said that E&Y determined that *“...the scope of our work was not sufficient to enable us to express, and we do not express, an opinion on the consolidated balance sheets....”* This constitutes a “disclaimed opinion” - one in which the auditing firm finds a material weakness in the accounting processes of the agency so severe that they cannot reliably verify the agency’s financial accounts. The Subcommittees on Investigations and Oversight and Space and Aeronautics held a joint hearing in December 2009 to determine what NASA needs to do to continue improving its financial control and accounting system.

Acquisition and Contracting Processes

One of NASA's long-standing management challenges, the OIG memorandum said, relates to systemic weaknesses identified in its acquisition and contracting processes. The OIG referenced GAO's identification of NASA's contract management as a high-risk area in 1990 and that office's acknowledgment of improvements to NASA's processes in its most recent update. The OIG also noted NASA's continued emphasis, in 2009, on monitoring this challenge and implementing disciplined acquisition management processes. However, the OIG said that both GAO's and its 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.*" OIG work has identified instances of fraud, waste, and abuse by SBIR Program participants that bring into question the effectiveness of the Program's internal controls. For example, the NASA OIG found that some SBIR contractors received awards from multiple agencies for essentially the same work, submitted different proposals to multiple agencies but then provided all of them the same deliverable, or misrepresented information including the role of the principal investigator who was supposed to perform the research.

Information Technology Security

The NASA OIG said in its November 2009 memorandum that it recognizes that strengthening the agency's Information Technology (IT) security program will occur through improvements in the Agency's overarching IT management practices. In the past, the OIG noted that NASA reported IT security as a material weakness in the Administrator's annual Statement of Assurance. The NASA OIG reported that subsequent to IT security being reported as a material weakness, NASA has implemented various solutions in an attempt to improve its IT security. The OIG said in the November 2009 memorandum that "*These solutions have resulted in continued incremental improvements across NASA's IT infrastructure; however, challenges remain. Specifically, not all solutions have been fully implemented and ongoing breaches of NASA computer systems have resulted in the theft of sensitive data related to Agency programs, which adversely affected NASA's mission and resulted in millions of dollars in losses.*"

Mr. Paul Martin, NASA's Inspector General, will be a witness at the hearing and can provide additional details on the November 2009 memorandum as well as other work performed by his office.

Government Accountability Office

Authority and Scope of Work

The U.S. Government Accountability Office (GAO) is an independent, nonpartisan agency that works for Congress. Often called the "congressional watchdog," GAO

investigates how the federal government spends taxpayer dollars. GAO's work is done at the request of congressional committees or subcommittees or is mandated by public laws or committee reports. It also undertakes research under the authority of the Comptroller General who heads GAO. GAO audits agency operations to determine whether federal funds are being spent efficiently and effectively and reports on how well government programs and policies are meeting their objectives. Ms. Cristina Chaplain, who directs much of GAO's work at NASA, is a witness at today's hearing and will use recent GAO findings as the basis for the office's views on key challenges facing NASA.

High-Risk Report Update

Since 1990, GAO has periodically reported on government operations that it identifies as "high risk." This effort has brought focus to problems impeding effective government and costing the government billions of dollars each year. GAO's high-risk status reports are provided at the start of each new Congress. Historically, high-risk areas have been so designated because of traditional vulnerabilities related to their greater susceptibility to fraud, waste, abuse, and mismanagement. As GAO's high-risk program has evolved, it has increasingly used the high-risk designation to draw attention to areas associated with broad-based transformations needed to achieve greater economy, efficiency, effectiveness, accountability, and sustainability of selected key government programs and operations. In 1990, GAO designated NASA's contract management as high risk in view of persistent cost growth and schedule slippage in the majority of its major projects. Since that time, GAO's high-risk work has focused on identifying a number of causal factors, including antiquated financial management systems, poor cost estimating, and undefinitized contracts.

In its January 2009 update of the office's high-risk list [GAO-09-271], GAO reported that since the 2007 high-risk update, NASA had taken significant steps to improve its acquisition management with the implementation of new policies and procedures and the development of a corrective action plan to address weaknesses in areas identified as high risk by GAO. For example, NASA revised its acquisition and engineering polices to incorporate elements of a knowledge-based approach that should allow the agency to make informed decisions. According to GAO, NASA is also instituting a new approach whereby senior leadership is reviewing acquisition strategies earlier in the process and developed broad procurement tenets to guide the agency's procurement practices. Among procurement policy reforms, GAO noted that an earned value management procurement policy has been established and a requirement that all award fee contracts undergo a cost-benefit analysis has been codified to improve the likelihood that NASA is using its resources most effectively. GAO noted NASA's broad plan for reducing acquisition risk and observed that successful implementation of both the plan and revised policies should stem cost growth and schedule slippage.

However, GAO said that because cost growth and schedule delays persist, this activity—now titled "acquisition management" because of the scope of issues that need to be resolved—remains high risk. GAO added that, to maximize NASA's investment dollars, implementation needs to be complemented by vigorous executive leadership to

foster the expansion of a business-oriented culture and a sustained commitment to identify and take action on projects that are not achieving cost, schedule or performance goals upon which they were based when they were initiated.

Assessment of Selected Large-Scale Projects [GAO-10-227SP]

GAO released its report [GAO-10-227-SP] on the eve of this hearing assessing the status of 19 NASA large-scale projects with a combined life-cycle cost of more than \$66 billion. GAO's independent assessment was initially undertaken in response to the explanatory statement of the House Committee on Appropriations accompanying the Consolidated Appropriations Act of 2008; the Committee on Science and Technology was a co-requester of that assessment and is a co-requester on the 2009 assessment [The explanatory statement of the House Committee on Appropriations accompanying the Fiscal Year 2009 Omnibus Appropriations Act directed GAO to prepare this latest assessment].

In its most recent assessment, GAO compared projects against best practice criteria for system development including attainment of knowledge on technologies and design. The office found that of the 19 projects, 4 are still in the formulation phase where cost and schedule baselines have yet to be established, and 5 just entered the implementation phase in fiscal year 2009 and therefore do not have any cost and schedule growth. However, GAO said that *“9 of the 10 projects that have been in the implementation phase for several years experienced cost growth ranging from 8 to 68 percent, and launch delays of 1 to 33 months, in the past 3 years. These 10 projects had average development cost growth of almost \$121.1 million—or 18.7 percent—and schedule growth of 15 months, and a total increase in development cost of over \$1.2 billion, with over half of this total—or \$706.6 million—occurring in the last year. In some cases, cost growth was higher than is reported because it occurred before project baselines were established in response to the statutory requirement.”*

Commenting on factors contributing to cost and schedule increases, GAO said *“Many of the projects we reviewed experienced challenges in developing new or retrofitting older technologies, stabilizing engineering designs, managing the performance of their contractors and development partners, as well as funding and launch planning issues. Reducing the kinds of problems this assessment identifies in acquisition programs hinges on developing a sound business case for a project. Based, in part, on GAO's previous recommendations, NASA has acted to adopt practices that would ensure programs proceed based on a sound business case and undertaken initiatives aimed at improving program management, cost estimating, and contractor oversight. Continued attention to these efforts should help maximize NASA's acquisition investments.”*

[GAO defines a “sound business case” as having, in its simplest form, the following two elements: (1) the customer's needs are valid and can best be met with the chosen concept, and (2) the chosen concept can be developed and produced within existing resources—

that is, proven technologies, design knowledge, adequate funding, and adequate time to deliver the product when needed.]

GAO recognized NASA's efforts to improve acquisition management through the issuance of a new policy instituting key decision points in the development life-cycle; a corrective plan to improve the effectiveness of the agency's program/project management; and an initiative to help programs and projects with management, cost and schedule estimating, and maintenance of adequate levels of reserves. However, GAO said that while these efforts are positive steps, it is too early to assess their impact. The office cautioned that *"For projects to have better outcomes not only must they demonstrate a high level of knowledge at key junctures, but decision makers must also use this information to determine whether and how best a project should proceed through the development life cycle. If done successfully, these measures should enable NASA to foster the expansion of a business-oriented culture, reduce persistent cost growth and schedule delays, and maximize investment dollars."*

Cost and schedule growth at NASA was the subject of a hearing held by the Space and Aeronautics Subcommittee in March 2009. At that hearing entitled "Cost Management Issues in NASA's Acquisitions and Programs", Subcommittee Chairwoman Giffords noted:

"It is clear that good cost and schedule management will be critical to the success of NASA's planned robotic and human space flight activities. However, it is also clear that NASA, Department of Defense (DOD), and the other agencies of the federal government involved in space activities have many dedicated and competent scientists and engineers working long hours to try to deliver successful projects. That tells me that dealing with these cost and schedule issues is hard, and that there's no simple fix or the situation would have been resolved long ago. We need to find out why preventing cost and schedule growth in our space projects is so hard, and more importantly, what we can do to put us on a better path for the future."

Report on International Space Station Utilization [GAO-10-9]

In 2005, Congress designated the ISS as a national laboratory; in addition, the NASA Authorization Act of 2008 required NASA to provide a research management plan for the ISS National Laboratory. GAO was asked by the Committee on Science and Technology to review the research use of the ISS. In a report dated November 2009, GAO found that research utilization has not been the priority because the primary objective for the ISS through 2010 is construction. GAO said that *"Some research has been and is being conducted as time and resources permit while the crew on board performs assembly tasks, but research is expected to begin in earnest in 2010. NASA projects that it will utilize approximately 50 percent of the U.S. ISS research facilities for its own research, including the Human Research Program, opening the remaining facilities to U.S. ISS National Laboratory researchers."*

GAO reported that “NASA faces several significant challenges that may impede efforts to maximize utilization of all ISS research facilities, including:

- *the impending retirement of the Space Shuttle in 2010 and reduced launch capabilities for transporting ISS research cargo once the shuttle retires,*
- *high costs for launches and no dedicated funding to support research,*
- *limited time available for research due to the fixed size of crew and competing demands for the crew’s time, and*
- *an uncertain future for the ISS beyond 2015.”*

GAO also reported that “NASA is researching the possibility of developing a management body including internal and external elements to manage ISS research, which would make the ISS National Laboratory similar to other national laboratories.” NASA concurred with GAO’s recommendations that the NASA Administrator implement certain actions such as increasing user outreach and centralizing decision-making to enhance use of the ISS.

Report on Vulnerabilities in Key IT Networks [GAO-10-4]

The NASA Authorization Act of 2008 directed GAO to (1) determine whether NASA has implemented appropriate controls to protect the confidentiality, integrity, and availability of the information and systems used to support NASA’s mission directorates and (2) assess NASA’s vulnerabilities in the context of prior incidents and corrective actions.

In a report dated October 2009, GAO found that “*although NASA has made important progress in implementing security controls and aspects of its information security program, it has not always implemented appropriate controls to sufficiently protect the confidentiality, integrity, and availability of the information and systems supporting its mission directorates.*” GAO said that NASA did not consistently implement effective controls to prevent, limit, and detect unauthorized access to its networks and systems. As examples, GAO said that NASA did not always sufficiently restrict user access to systems, encrypt network services and data, and audit and monitor computer-related events. GAO reported that a key reason for these weaknesses is that NASA has not yet fully implemented key activities of its information security program to ensure that controls are appropriately designed and operating effectively. For example, GAO found that NASA has not always conducted comprehensive tests and evaluation of its information system controls; tracked the status of plans to remedy known weaknesses; and maintained capabilities to detect, report, and respond to security incidents.

Despite actions to address prior security incidents, GAO concluded that “NASA remains vulnerable to similar incidents. NASA networks and systems have been successfully targeted by cyber attacks. During fiscal years 2007 and 2008, NASA reported 1,120 security incidents that have resulted in the installation of malicious software on its systems and unauthorized access to sensitive information.”

GAO also concluded that the control vulnerabilities and program shortfalls it identified “*collectively increase the risk of unauthorized access to NASA’s sensitive information, as well as inadvertent or deliberate disruption of its system operations and services. They make it possible for intruders, as well as government and contractor employees, to bypass or disable computer access controls and undertake a wide variety of inappropriate or malicious acts. As a result, increased and unnecessary risk exists that sensitive information is subject to unauthorized disclosure, modification, and destruction and that mission operations could be disrupted.*”

GAO recommended that the NASA Administrator take steps to mitigate control vulnerabilities and fully implement a comprehensive information security program. For example, GAO recommended that NASA “*conduct sufficient or comprehensive security testing and evaluation of all relevant security controls including management, operational, and technical controls.*” NASA concurred with GAO’s recommendations, stating that it would continue to mitigate the information security weaknesses identified, and noted that many of the recommendations are currently being implemented as part of an ongoing strategic effort to improve information technology management and correct information technology security program deficiencies.

Aerospace Safety Advisory Panel

Authority and Scope of Work

Since it was established in 1968 by Congress, the Aerospace Safety Advisory Panel (ASAP) has been evaluating NASA’s safety performance and advising the agency on ways to improve that performance. The panel, which is a Federal Advisory Committee Act (FACA)-chartered advisory body, is comprised of recognized safety, management, and engineering experts from industry, academia, and other government agencies. This senior advisory committee reports to the NASA Administrator and Congress. The panel was established by Congress in the aftermath of the January 1967 Apollo 204 spacecraft fire that took the lives of three astronauts. The ASAP’s statutory duties, as prescribed in Section 6 of the NASA Authorization Act of 1968, Public Law 90-67, 42 U.S.C. 2477 are as follows:

"The Panel shall review safety studies and operations plans that are referred to it and shall make reports thereon, shall advise the Administrator with respect to the hazards of proposed operations and with respect to the adequacy of proposed or existing safety standards, and shall perform such other duties as the Administrator may request."

The panel was reauthorized in Section 106, Safety Management, Section 6, of the National Aeronautics and Space Administration Authorization Act of 2005, [P.L. 109-155]. The ASAP bases its advice on direct observation of NASA operations and decision-making. The panel provides a report on an annual basis. Its “2009 Annual Report” was released on January 15, 2010. In addition to an annual report, the panel also

conducts quarterly meetings, submits minutes, and provides NASA with recommendations.

2009 Annual Report

In its recently issued 2009 annual report, the ASAP recognized several NASA accomplishments in 2009, such as safe completion of five successful Shuttle missions, continued construction of the ISS, flight testing of the Ares I-X, and progress in Constellation Program ground project efforts. Safety is the primary focus of the report. Two critical safety-related issues identified relate to human space flight, specifically those concerning the establishment of human rating requirements for follow-on vehicles and the potential extension of the Shuttle beyond its current flight manifest. Other issues identified as critical were external communication of the risks associated with exploration; transition of workforces from Shuttle to Constellation; integration of robotics agency-wide; and timeliness in completing mishap investigations. Other safety-related issues identified in the annual report were NASA facilities/aging infrastructure; timeliness of NASA responses to ASAP recommendations; and progress in addressing the recommendations of the Columbia Accident Investigation Board (CAIB).

Establishment of Human Rating Requirements

In referencing the work by the Review of U.S. Human Space Flight Plans Committee, better known as the “Augustine Committee”, the report raised concern about the committee’s observation that “*appropriate consideration be given to using the commercial space industry to fulfill NASA crew-delivery services to LEO.*” The panel said, regarding the committee’s assumption that safety was assumed to be “a given”, that “*this assumption is premature and oversimplifies a complex and challenging problem because there is not a “cookie-cutter approach” to safety in space.*” The ASAP strongly reaffirmed, as a basic principle, that “*whatever new policies or vehicles are selected for America’s space activities, ensuring human safety must continue to receive the appropriate funding, visibility, and support to prevent another Columbia-like tragedy. With this basic principle in mind, the Panel has set its focus on the following critical safety issues associated with the present program and its potential alternatives.*”

In its prior “2008 Annual Report”, the panel had stated that proposed commercial orbital transportation services (COTS) vehicles being developed by SpaceX and Orbital Sciences Corporation had not been required to meet Human Rating Requirements (HRR) standards nor were they proven to be appropriate to transport NASA personnel. The ASAP acknowledged that this was understandable, since these contractors were only tasked with developing cargo delivery systems.

However, the ASAP noted that the possible expansion of the commercial vehicle mission to include human transport caused the panel to highlight the standards for human rating requirements as an issue at every quarterly meeting in 2009. The report said that a principal concern identified at the first ASAP meeting in 2009 was that the current HRR procedures, when applied to the development of future human-related vehicles, were not

specifically intended to establish requirements for vehicles produced by entities external to NASA, such as commercial space transportation firms or international programs. Consequently, the panel recommended that *“NASA stipulate directly the applicable HRR standards and share acceptable risk levels with those other entities.”* The 2009 annual report noted that in the fourth quarter of 2009, *“NASA finally made a start at achieving progress to more clearly develop and communicate the standards necessary for any COTS manufacturer if astronauts are to be transported on non-NASA vehicles. However, this will only partially answer the challenge. After the criteria and their applicability are clearly established, a process must be developed for validating and certifying compliance with those criteria. Validation and certification itself has two components: that which takes place at the front end (at various stages) and one that follows the program in the form of insight, oversight etc. Although the Panel strongly supports the start that NASA has made, the Panel continues to believe that NASA is behind where it needs to be at this point in time. Considerable work must be done, and priority efforts should be established to accelerate the level of effort underway.”*

The report also stated that *“It is the Panel’s position that no COTS manufacturer is currently HRR qualified, despite some claims and beliefs to the contrary. Questions that must be answered are: What is the process for certifying that potential COTS vehicles are airworthy and capable of carrying astronauts into space safely? How is compliance assured over the life of the activity? The same questions would apply to any potential international orbital transportation systems.”*

With regard to NASA’s “program of record”, the report noted that *“The Ares I vehicle has been designed from the beginning with a clear emphasis on safety. Its architecture was selected by NASA’s Exploration System Architecture Study (ESAS) team because of its potential to deliver at least 10 times the level of crew safety as the current Shuttle. The launch vehicle configuration has been developed to provide the best possible allowances for crew escape in the event of a launch failure. The independent launch escape system pulls the capsule clear of the launch pad and any attendant explosion or fire. The demonstrated high reliability of the solid rocket booster (SRB) suggests a low likelihood of first stage failure on ascent, but the launch escape system would cover even this low probability of failure.”*

To abandon Ares I as a baseline vehicle for an alternative without demonstrated capability nor proven superiority (or even equivalence) is unwise and probably not cost-effective. The ability of any current COTS design to “close the gap” or even provide an equivalent degree of safety is speculative. Switching from a demonstrated (design approach proven by Apollo, use of heritage hardware, and Ares I-X flight success), well designed, safety optimized (ESAS) system to one based on nothing more than unsubstantiated claims would seem a poor choice. Before any change is made to another architecture, the inherent safety of that approach must be assessed to ensure that it offers a level of safety equal to or greater than the program of record.”

Shuttle Extension

The ASAP said in its 2009 report that it was very concerned about possible extension of Shuttle operations beyond those currently manifested to complete the construction of the ISS. The U.S. Human Space Flight Plans Committee had concluded that the only way to reduce the “gap” in human space flight launch capability between ISS completion and the planned flights of Ares I is by extending the Shuttle program well beyond 2010. The ASAP indicated that it *“does not support extending the Shuttle significantly beyond its current manifest. We are especially concerned over any kind of “serial extension” where a few flights at a time might be added. The risk of continuing to fly the Shuttle without a recertification and expending the resources to bring the vehicle up to modern standards is more than what we should ask astronauts to shoulder.”* The ASAP concluded that *“Extension significantly beyond what is planned through the current manifest would be unwise.”*

External Communication on Risks Associated with Exploration

The ASAP noted that, in light of critical human space flight efforts, communications with the public and Congress are more important than ever before. The report encouraged NASA to be *“fully candid with the public and Congress, and those audiences must fully understand what risks are involved. There can never be zero risk, and the rate of progress can be limited by the amount of risk one is willing to take. Space exploration is a dangerous enterprise, and the Nation is fortunate to have courageous people willing to accept the risk. In going forward with exploration, the shouldering of risk needs to be undertaken not only by NASA, but by Congress and the Administration. The risks must be communicated clearly to Congress and the public. To do otherwise is disingenuous and does the Nation a disservice.”*

Shuttle to Constellation Workforce Transition

The panel commended NASA Centers’ leadership and contractors in working to ease the transition from the Shuttle program to the Constellation Program. However, the report noted that the *“workforce is worried about the uncertainty of NASA’s mission and the five- to eight-year gap between Shuttle and its successor. Human space flight is a business in which safety rides on the shoulders of skilled, hard-working people. Successful workforce transition depends heavily on a decision being made about NASA’s direction. The Panel’s concern continues to grow as NASA’s future in human space flight remains undecided. The current “transition” plans were drawn up assuming that the program of record would be executed. The Panel is impressed by the level of detail in the plans and the diligence with which they are being carried out. A programmatic decision regarding exploration and a possible change to the program of record is under review as a result of the Augustine Committee report. At the time this Annual Report went to press, the future path forward for the space program had not been announced. When it is announced, the transition plans will need to be reevaluated and redefined.”*

Integration of Robotics Agency-Wide

In the annual report, the panel continued to urge NASA to take an aggressive view towards using robots to reduce human risk whenever possible, consistent with mission accomplishment. The report said that *“This means using robots to replace humans on some missions and to support astronauts on others. The Panel notes that the vision for exploration includes dangerous and challenging work like construction, mining, and manufacturing. In accomplishing this work, there is significant risk to astronauts in their fragile but critical spacesuits.”* The panel said that it is still finding a wide discrepancy between how NASA views robots and the current state of practice in the commercial and military arenas. As a result, during 2010, the ASAP said that it would undertake a more in-depth assessment of NASA’s investment in and planning for using robots in place of and in support of human astronauts.

Timeliness in Completing Mishap Investigations

In 2007, the panel had recommended that NASA reevaluate the mishap investigation process to provide for more timely release of information across the agency. The panel followed up with two more recommendations in 2008 to spur this effort forward. Despite some progress, the ASAP said in its 2009 annual report that it *“continues to be concerned about the need to correct each phase in the process to shorten the overall timeline: (1) accomplishing the investigation itself; (2) developing the investigation report; (3) obtaining the NASA Headquarters endorsements; (4) obtaining the Center approval; (5) developing the corrective action plan and implementing it; and (6) verifying implementation so that the case can be closed.”* While acknowledging progress at the Field Centers to reduce the timeline for the phases that are under their control, the ASAP said that *“it will take more effort, especially at NASA Headquarters, before an overall improvement in the final report’s timeline is seen. What is still lacking are the metrics that show the tracking and trending for all phases of the mishap investigation process so that one can see whether positive changes in the timelines are occurring.”*

Other Issues

- **NASA Facilities/Aging Infrastructure:** The ASAP said that *“over 80 percent of NASA facilities are beyond their design life, and annual maintenance is underfunded. Facilities continue to degrade and facilities failures are starting to impact missions and have safety implications Agency-wide. Evidence for this can be seen in the increasing number of small fires, key equipment losses through failures in material handling and transportation facilities, and in the “weak signals” that we observe in current safety reports. The infrastructure used to launch complex vehicles into space must be reviewed and maintained down to the smallest component to remain safe. In the past, one of NASA’s goals was “ten healthy Centers.” A considerable investment in facility maintenance, repair, and replacement is needed for this goal to be achieved. This may be unrealistic in the current economic climate. If funding is not available, NASA should consider consolidating its programs and efforts at fewer Centers so that its activities may be safely continued at the remaining facilities. This planning needs to be part of a conscious and deliberate facilities strategy.”*

- **Timeliness of NASA Responses to ASAP Recommendations:** The panel indicated concern about NASA's unresponsiveness to its recommendations. Following 25 written recommendations to NASA in 2009, by the end of the year, the report said that NASA had issued a single response addressing just three recommendations. The report found that about half of the remaining responses were in a "concurrency loop" at NASA for signature. The panel recommended *"that more management attention be placed on streamlining the review and concurrence process for NASA responses to Panel recommendations."*
- **Monitoring NASA's Responses to CAIB Recommendations:** As Congress mandated in the NASA Authorization Act of 2005, the ASAP evaluates and reports annually on NASA compliance with CAIB return-to-flight (RTF) and continue-to-fly (CTF) recommendations. In 2009, there were three outstanding CAIB recommendations: (1) eliminate all external tank thermal protection system debris shedding at the source; (2) increase the orbiter's ability to sustain debris damage; and (3) develop an on-orbit repair capability. In 2008, the panel had concluded that *"NASA must decide whether to formally accept the risks associated with these three outstanding recommendations. The Panel believes that informed, formal risk acceptance is essential for a successful safety program. This process provides a formal record of the risks that were accepted and the assumptions used in making those decisions. While NASA has concluded that no further action is warranted on the remaining three CAIB recommendations and has closed these out, it is not clear that the risk acceptance for that decision has been formally documented by NASA management. The Panel continues to recommend that NASA do so. NASA should revisit these decisions if the Agency decides to recertify the Shuttle. Because NASA has moved beyond the RTF phase, the Panel will no longer specifically address RTF in future annual reports."*

In the 2009 annual report, the ASAP stated that *"While NASA has concluded that no further action is warranted on the remaining three CAIB recommendations and has closed these out, it is not clear that the risk acceptance for that decision has been formally documented by NASA management. The Panel continues to recommend that NASA do so. NASA should revisit these decisions if the Agency decides to recertify the Shuttle. Because NASA has moved beyond the RTF phase, the Panel will no longer specifically address RTF in future annual reports. The Panel will continue to monitor, review, and provide recommendations on CTF issues."*

Admiral Dyer, the Chairman of the ASAP, will be a witness at the hearing and can provide additional details on the ASAP's 2009 Annual report.