KEY ISSUES AND CHALLENGES FACING NASA: VIEWS OF THE AGENCY'S WATCHDOGS

HEARING

BEFORE THE

SUBCOMMITTEE ON SPACE AND AERONAUTICS

COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED ELEVENTH CONGRESS

SECOND SESSION

February 3, 2010

Serial No. 111–73

Printed for the use of the Committee on Science and Technology

Available via the World Wide Web: http://www.science.house.gov

U.S. GOVERNMENT PRINTING OFFICE

54–616PDF WASHINGTON : 2010

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February 3, 2010

Appendix 1: Answers to Post-Hearing Questions

KEY ISSUES AND CHALLENGES FACING NASA: VIEWS OF THE AGENCY'S WATCHDOGS

WEDNESDAY, FEBRUARY 3, 2010

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON SPACE AND AERONAUTICS,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:06 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Gabrielle Giffords [Chairwoman of the Subcommittee] presiding.

COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON SPACE & AERONAUTICS
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, DC 20515

Hearing on

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

February 3, 2009
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

WITNESS LIST

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

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HEARING CHARTER

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

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

WEDNESDAY, FEBRUARY 3, 2010
10 A.M.—12:00 P.M.
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 three 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 FY 2010 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 FY 2010 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 in-*

volving 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 com-

mitment 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–10–227–SP]

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 three 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 with 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 1–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 "concurrence 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.

Chairwoman GIFFORDS. I want to welcome everyone this morning and let everyone know that this is the first subcommittee hearing of the second session, and we have had a very active subcommittee over the last session, and I fully expect that this upcoming year will be as busy in carrying out our oversight responsibilities.

In that regard, I have called this hearing today so that we have a chance to hear from NASA's watchdogs; the NASA Inspector General, the Government Accountability Office, and the Independent Aerospace Safety Advisory Panel.

As Congress prepares to reauthorize NASA, it is important that we focus on the issues and the challenges that will determine whether or not NASA will be successful over the next decade. The three individuals testifying before us today can provide us with the kind of expert, objective assessments that we will need to inform our deliberations over NASA's future, and we look forward to your testimony.

As everyone knows, the President's fiscal year 2011 budget request was delivered to the Hill on Monday. It proposes large changes to NASA's programs, including the outright cancellation of Constellation. Today's hearing, of course, is not intended to be an examination of that request, in part because many of those details are still unavailable to us.

However, I can assure you that the full Science and Technology Committee and this subcommittee will be holding hearings over the next few weeks to examine the President's proposals, and of course, we intend to give them serious scrutiny.

I would just like to state that one of the reasons that I was particularly honored to accept the chairmanship of this subcommittee last year was my excitement to be involved in an agency that has inspired Americans, and frankly the world at large for decades.

But as I reviewed the President's budget request, I found a quite glaring omission. I once again point all of you to this chamber, in this chamber to the proverb that is on the wall behind us, and in fact, it is good for members of this subcommittee and the full committee to think about why we are here, and of course, that quote is, "Where there is no vision, the people perish." And these words are as true today as when our forefathers undertook a voyage of discovery, when they landed on this continent and founded America as a city upon a hill, a beacon of light for the future world, for the entire world to admire.

We are still that city on the hill, and the eyes of all people are upon us. We have set forth on a mission to explore the heavens, and should we deal falsely with this work we have undertaken, we shall be made a byword across the world. We shall shame the faces of many of America's worthy civil servants who have dedicated their lives to this mission.

Today we are still a city on that hill, but I fear that we may soon abandon our vision. Our job as servants of the people, as members of this subcommittee, is to allow our scientists, our engineers, our researchers, our visionaries, to be as bold in this undertaking as our faculties will allow. To be unconstrained by artificial impositions of expedience or purse but rather limited only by the strength of their imagination and the immutability of the laws of physics.

My concern today is not numbers on a ledger but rather the state of the American dream to reach for the stars. Should we falter, should we slip, should we let our dream fade? What will we tell our children? How will we inspire the next generation of great minds to pursue the science and engineering fields critical to our competitiveness in the 21st century when we abandoned a generation of thousands of aerospace engineers in the middle of this endeavor? What will we tell the world that we led into space and that we took the moon? My fear is that we will tell them—tell us what the stars are like when you get there.

So in the coming weeks we will be holding a number of hearings, both in the subcommittee and in the full committee to address the range of NASA programs and responsibility in science, aeronautics, and space flight. We will discuss the potential impact of program changes on tens of thousands of jobs, precisely the type of high-tech jobs that are critical to our economic competitiveness. We will discuss the impact that NASA programs, especially those in human space exploration, play in inspiring young people to pursue careers in STEM fields, another issue vital to developing a workforce for the 21st century.

Both of these issues will be especially timely as the full committee considered reauthorization of the America COMPETES legislation. And I in my work on the House Arm Services Committee and others that serve on both of these committees, will be diving into the impact the proposed cuts to human spaceflight will have on our aerospace industry and our national defense as well.

No doubt we will hear a great deal in order to assess what will be decided in the next few weeks and the testimony that we hear I think will—today, will likely raise additional concerns and considerations.

And just in closing before I hand it over to Mr. Olson, I would just like to tell a story that illustrates my concern. Nearly 100 years before Columbus sailed to the Americas, China had a great fleet of ships traveling throughout the Indian Ocean. This fleet was ahead of its time, exploring the seas, and spurring an unprecedented era of knowledge, trade, and discovery. However, as times changed China felt they could no longer afford its fleet and so it was defunded. The fleet soon fell to ruin, with some historians reporting that the ships were burned and destroyed, and so ended a great opportunity for the Chinese people.

Had the Chinese continued to fund this endeavor of exploration, of discovery, the world today might very well be a totally different place, and how ironic, then, it is that today we consider abandoning our space-worthy vessels, ending a half century of American leadership in space exploration just as the Chinese ramp up their own space program and aim for the moon.

NASA is an agency with a wide range of programs and responsibilities in science, aeronautics, and human spaceflight, and we need to make sure that the agency is proceeding as effectively as possible to carry out its diverse missions. Today's hearing will help us assess how NASA is doing in that regard.

I look forward to working with members on both sides of the aisle as we strive to ensure that Congress crafts the most responsible and productive future for the Nation's space and aeronautics

programs. The stakes for America are too high for us to attempt anything less.

[The prepared statement of Chairwoman Giffords follows:]

PREPARED STATEMENT OF CHAIRWOMAN GABRIELLE GIFFORDS

Good morning, and welcome to the Subcommittee's first hearing of the 2nd session. We had a very active Subcommittee last session, and I expect to be at least as busy this year as we carry out our oversight responsibilities. In that regard, I have called this morning's hearing so that we may have a chance to hear early on from NASA's "watchdogs"—the NASA Inspector General, the Government Accountability Office, and the independent Aerospace Safety Advisory Panel.

As Congress prepares to reauthorize NASA, it is important that we focus on the issues and challenges that will determine whether or not NASA succeeds or fails in the coming decade. The three individuals testifying before us today can provide us with the kind of expert, objective assessments that we will need to inform our deliberations over NASA's future, and I look forward to their testimony.

As you know, the president's Fiscal Year 2011 budget request was delivered to the Hill on Monday. It proposes large changes to NASA programs, including the outright cancellation of Constellation. Today's hearing is not intended to be an examination of that request, in part because many of the details are still unavailable. However, I can assure you that the full Science and Technology Committee and this Subcommittee will be holding a series of hearings over the coming weeks to examine the president's proposals, and we intend to give them serious scrutiny. One of the reasons I was particularly honored to accept the chairmanship of this subcommittee was my excitement to be involved in an agency that has inspired Americans, and the world at large, for decades.

But as I reviewed the President's budget request, I found a quite glaring omission. I would once again point all of you in this chamber to the proverb written on the wall behind me. "Where there is no vision, the people perish." These words are as true today as when our forefathers undertook a voyage of discovery, when they landed on this continent and founded America as a city upon a hill, a beacon of light for the whole world to admire. We are still that city upon a hill and the eyes of all people are upon us.

We have set forth on a mission to explore the heavens and should we deal falsely with this work we have undertaken, we shall be made a byword across the world. We shall shame the faces of many of America's worthy civil servants who have dedicated their lives to this mission. Today we are still that city upon a hill, but I fear that we may soon abandon our vision. Our job as servants of the people, as members of this committee is to allow our scientists, our engineers and researchers, our visionaries to be as bold in this undertaking as their faculties allow. To be unconstrained by artificial impositions of expedience or purse, but rather limited only by the strength of their imagination and the immutability of the laws of physics. My concern today is not numbers on a ledger, but rather the fate of the American dream to reach for the stars. Should we falter, should we slip, should we let our dream fade, what will we tell our children? How will we inspire the next generation of great minds to pursue the science and engineering fields critical to our competitiveness in the 21st century when we abandon a generation of thousands of aerospace engineers in the middle of this endeavor? What will we tell the world that we led into space, that we took to the moon? My fear is that we will tell them, "Tell us what the stars are like, when you get there."

In the coming weeks we will be holding a number of hearings both in this subcommittee and the full committee to address the range of NASA programs and responsibilities in science, aeronautics, and human spaceflight. We will discuss the potential impact of program changes on tens of thousands of jobs, precisely the type of high tech jobs that are critical to our economic competitiveness. We will discuss the impact that NASA programs, especially those in human space exploration, play in inspiring young people to pursue careers in STEM fields, another issue vital to developing a workforce for the 21st century. Both of these issues will be especially timely as the full committee considers reauthorization of America COMPETES legislation.

And I, in my work on the House Armed Services Committee, will be diving into the impact that proposed cuts to human spaceflight will have on our aerospace industry and our national defense.

No doubt we will have a great deal to assess in the coming weeks. The testimony we hear today will likely raise additional issues that we will need to consider.

In closing, I would like to tell a story that illustrates my concern. Nearly 100 years before Columbus sailed to the Americas, China had a great fleet of ships traveling throughout the Indian Ocean. This fleet was ahead of its time, exploring the seas and spurring an unprecedented era of knowledge, trade, and discovery. However, as times changed, China felt that it could no longer afford its fleet, and so it was defunded. The fleet soon fell to ruin, with some historians reporting that the ships were burned and destroyed, and so ended a great opportunity for the Chinese people. Had the Chinese continued to fund this endeavor of exploration, of discovery, the world might now be a very different place. How ironic then that today we consider abandoning our space worthy vessels, ending a half century of American leadership in space exploration just as the Chinese ramp up their own space program and aim for the moon.

NASA is an agency with a range of programs and responsibilities in science, aeronautics, and human spaceflight—and we need to make sure that the agency is proceeding as effectively as possible to carry out its diverse missions. Today's hearing will help us to assess how NASA is doing in that regard. I look forward to working with Members on both sides of the aisle as we strive to ensure that Congress crafts the most responsible and productive future for the nation's space and aeronautics programs. The stakes for America are too high for us to attempt anything less.

Chairwoman GIFFORDS. And with that the Chair now recognizes Mr. Olson for an opening statement.

Mr. OLSON. Well, thank you, Madam Chairwoman, and thank you for calling this morning's hearing, and I will do my best to stay on the advertised topic, but I make no guarantees.

I would like to thank our witnesses for their appearance today. I realize that each one of you has spent considerable time and effort preparing for this hearing, and I look forward to hearing from you so that our subcommittee can benefit from your expertise.

The role of watchdogs is critical in our government, and I applaud your efforts and encourage your continued diligence going forward. We have a similar role right here in Congress, and when we can, we would like to partner with you to make each of our jobs more effective to accomplish our shared goals.

Mr. Martin, good to see you again. I trust you have gotten more acquainted in your new role as you are settling in there. I do have an admonition that we will surely discuss in the future, but it is in light of the President's recent budget proposal. His proposal is a radical departure for how NASA does business. The impacts to the workforce and to the relationship between the government and its contractors is about to change and change dramatically. I implore you, implore you to monitor how this process evolves going forward.

Ms. Chaplain, thank you for your work, especially in light of your recent report on the International Space Station. Should this program continue, and it appears it is going to continue at least until 2020, your recommendations about a centralized structure will need to be addressed, and we are anxious to hear more.

And finally, Admiral Dyer, we thank you for your service. Earlier this week we marked the seventh anniversary of the Columbia tragedy. We must not forget the inherent dangers that travel by space brings on. You and the members of the ASAP are critical in our efforts of exploration. Your recent annual report provided critical insight on the path our Nation should be pursuing in regard to human spaceflight, and I would like to read for the record a very significant passage. The statement was included in a press release the agency issued but since that release went out at 6:00 p.m. on

the Friday of the long Martin Luther King Day holiday, I think it is worth reading for the record.

In regard to the Constellation Program you found, and I quote, "To abandon the program of record as a baseline for an alternative without demonstrated capability or proven superiority is unwise and probably not cost effective." Let me read that again. "To abandon the program of record as a baseline for an alternative without demonstrated capability or proven superiority is unwise and probably not cost effective." And yet this is exactly what the President's 2011 budget aims to do.

My concern about the direction of the Administration's budget proposal will take NASA is something I have spoken out about and will continue to do so. We are on the verge of abandoning human spaceflight in the near term, and I fear beyond that. The witnesses before us will play a critical role in the direction the agency goes, and the men and women on this dais will have an equally-critical role in the direction our Nation goes.

And I look forward to working with you to chart that path.

[The prepared statement of Mr. Olson follows:]

PREPARED STATEMENT OF REPRESENTATIVE PETE OLSON

Madam Chairwoman, thank you for calling this morning's hearing. I will do my best to ensure we stay on the advertised topic, but I make no guarantees. I'd like to thank our witnesses for their appearance today. I realize that each of you has spent considerable time and effort preparing for this hearing, and I look forward to hearing from you so that our subcommittee can benefit from your expertise.

The role of watchdogs is critical in our government, and I applaud your efforts and encourage your continued diligence going forward. We have a similar role here in Congress, and when we can, would like to partner with you to make each of our jobs more effective to accomplish our shared goals.

Mr. Martin, it is good to see you again and I trust you are getting more acquainted with your still-new role. I do have an admonition that we will surely discuss more in the future, but it is in light of the President's recent budget proposal. His proposal is a radical departure for how NASA does business. The impacts to the workforce and to the relationship between the government and its contractors is about to change. I implore you to monitor how this process evolves going forward.

Ms. Chaplain, thank you for your work, especially in light of your recent report on the International Space Station. Should this program continue, your recommendations about a centralized structure will need to be addressed and we are anxious to hear more.

Finally, Admiral Dyer, thank you for your service. Earlier this week we marked the 7th anniversary of the Columbia tragedy. We must not forget the inherent dangers that travel by rocket brings. You and the members of the ASAP are critical in our efforts of exploration.

Your recent annual report provided critical insight on the path our nation should be pursuing in regard to human space flight. I would like to read, for the record, a very significant passage. This statement was included in the press release the agency issued, but since that release was sent out at 6:00 pm on the Friday of the long Martin Luther King Day Holiday weekend I think it is worth reading for the record:

> In regard to the Constellation program you found that: To abandon the program of record as a baseline for an alternative without demonstrated capability or proven superiority is unwise and probably not cost-effective."

My concerns about the direction the Administration's budget proposal will take NASA is something I have spoken about, and will continue to do so. We are on the verge of abandoning human space flight in the near term, and I fear beyond that. The witnesses before us will play a critical role in the direction the agency goes, and the men and women on this dais will have an equally critical one in the direction we as a nation goes. I look forward to working with you all to chart that path.

Thank you, Madam Chairwoman. I yield back by time.

Mr. OLSON. And I yield the balance of my time, Madam Chairwoman, to the Ranking Member of the full committee.

Chairwoman GIFFORDS. No objection.

Mr. OLSON. Gentleman from Texas.

Mr. HALL. Thank you, and thank you, Madam Chairman.

Everyone in this room knows NASA's management is constantly challenged to manage a diverse, complex, and yet risky set of programs and missions with resources that too often are deemed to be inadequate and yet NASA succeeds, producing startling discoveries that help us better understand our solar system and universe, the planet earth, and living and working in space. I can't think of any other civil, federal agency that matches its record of scientific achievement, not one with a record of fostering new technologies that have helped transform the American economy.

And Madam Chairwoman, speaking of sound management practices, I want to digress slightly by offering a couple of thoughts regarding NASA's fiscal year 2011 budget request. I can hardly read this damn thing I am so mad.

Congress expects and demands that the Executive Branch offer solid justification for their plans and programs, but for the life of me I cannot understand how this Administration can rationalize its decision to scrap Constellation and simply start anew, especially given the strong support it has received from Congress, Republicans and Democrats. It is naive to assume that a do-over will somehow offer a safer, cheaper system faster than the current path we are on.

The Ares Launcher and Orion Crew Vehicle have been designed to be very safe and robust systems. They have undergone rigorous engineering reviews. American taxpayers have invested $9 billion, and the agency and its contractors have spent five years working to ensure that Constellation will be flexible, affordable, and safe. To simply toss this aside and gamble America's human spaceflight program on an undefined, untested system is more than alarming.

I look forward to taking part in your incoming hearings, examining NASA's budget requests and exploration program.

Madam Chairman, I thank you. I yield back.

[The prepared statement of Mr. Hall follows:]

PREPARED STATEMENT OF REPRESENTATIVE RALPH M. HALL

Madam Chairwoman, thank you for calling this hearing, and my thanks to our witnesses for testifying before us this morning. I realize you and your staffs have worked long and hard to prepare for this appearance, and I want to assure you that your efforts will help this Committee as we begin the necessary work of reauthorizing NASA later this spring.

As everyone in this room knows, NASA's management is constantly challenged to manage a diverse, complex and risky set of programs and missions with resources that too often are deemed to be inadequate. And yet NASA succeeds, producing startling discoveries that help us better understand our solar system and universe, the planet Earth, and living and working in space. I cannot think of any other civil federal agency that matches its record of scientific achievement, nor one with a record of fostering new technologies that have helped transform the American economy.

Day-in and day-out, NASA has to rely on the talents of its scientists and engineers, and its trained and motivated managers, to ensure taxpayers' dollars are wisely spent to meet its goals while also ensuring the best use of very limited resources. With 90 percent of the agency's budget spent on procuring goods and services, fiscal accountability and sound business practices are crucial.

Thanks to the good work performed by the organizations represented at the witness table this morning, I am confident their skills and expertise help push NASA

to be a better and more capable manager as it seeks to launch future missions and engage scientists and engineers in research that will be exciting and inspiring.

Madam Chairwoman, speaking of sound management practices, before closing I want to digress slightly by offering a couple of thoughts regarding NASA's FY11 budget request. Congress expects and demands that the executive branch offer solid justification for their plans and programs, but for the life of me I cannot understand how this Administration can rationalize its decision to scrap Constellation and simply start anew, especially given the strong support it has received in Congress. It is naive to assume that a do-over will somehow deliver a safer, cheaper system faster than the current path we're on.

The Ares launcher and Orion crew vehicle have been designed to be a very safe and robust system. They have undergone rigorous engineering reviews. American taxpayers have invested nine billion dollars—and the agency and its contractors have spent five years—working to ensure that Constellation will be flexible, affordable, and safe. To simply toss this aside and gamble America's human spaceflight program on an undefined, untested system is alarming.

I look forward to taking part in your upcoming hearings examining NASA's budget request and the Exploration program.

Thank you.

Chairwoman GIFFORDS. And thank you, Mr. Hall, for your leadership over so many years and Mr. Olson.

If there are other members that wish to submit opening statements, your statements will be added to the record at this point.

At this time I would like to introduce our witnesses. First up we have Honorable Paul Martin, who was recently confirmed by the Senate as Inspector General for NASA. Welcome back, Mr. Martin.

We have Ms. Cristina Chaplain, who is the Director of Acquisition and Source Management Team at the Government Accountability Office. Thank you, our Nation's watchdog group. We are glad you are back as well.

And finally we have Vice Admiral Joseph Dyer, who is the Chair of NASA's Aerospace Safety Advisory Panel, and Admiral, thank you for your service to our Nation.

As our witnesses should know, you will each have five minutes for your spoken testimony. Your written testimony will be included in the record for the hearing, and when you have completed your spoken testimony, we will begin rounds of questions, and each member will have five minutes to question the panel.

We would like to start this morning with the Honorable Mr. Martin.

STATEMENT OF HON. PAUL K. MARTIN, INSPECTOR GENERAL, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Mr. MARTIN. Thank you, Madam Chairwoman. Chairwoman Giffords, Ranking Member Olson, and members of the subcommittee, thank you for inviting the Office of Inspector General to testify about the key challenges facing NASA. Based on our oversight work we identified five critical issues.

Number one, transitioning from the Space Shuttle to the Next Generation of Space Vehicles. Number two, managing risks to people, equipment, and mission. Number three, improving the agency's financial management. Number four, addressing systemic weaknesses in acquisition and contracting processes, and number five, ensuring the security of NASA's information and information technology systems.

Some of these challenges, in particular financial management, acquisition and contracting, and IT security, have confronted NASA

leadership for most of the past decade. Other challenges such as transitioning from the Space Shuttle are more recent. But none of these challenges are easily solved. They are complex, multi-faceted issues that will take dedication, determination, and NASA's best efforts to do successfully.

My written statement provides detailed information about each of these challenges. In my remarks this morning I will focus on two challenges; transitioning from the Space Shuttle and NASA's efforts to produce a clean financial statement.

Perhaps the highest-profile challenge facing NASA at the moment is maintaining the critical skills and capabilities required to safely fly the five remaining Space Shuttle missions until the program's planned retirement in September of this year. We have doubts, however, that NASA will be able to keep to this ambitious timetable and most likely the last of the planned Shuttle flights will take place in the second quarter of fiscal year 2011.

Importantly, any delay in NASA's current timetable has ramifications far beyond scheduling, given that the agency spends approximately $200 million a month to sustain the Shuttle program. Moreover, if the Shuttle's flight schedule is extended beyond the five missions currently planned, NASA will need to evaluate not only funding issues but also the sustainability of the Shuttle's workforce and infrastructure, much of which has been in wind-down mode since 2009.

I will leave it to ASAP Chairman Dyer to address the potential safety implications of extending the Shuttle Program beyond its currently-scheduled manifest.

Just this past Monday the President's fiscal year 2011, budget set out the Administration's blueprint for NASA and the Shuttle Program. Of course, this subcommittee and other committees of Congress will weigh in and help shape NASA's future direction. However, one thing is clear. NASA will need a sustained level of funding to enable it to successfully execute whatever plan is ultimately adopted.

Financial management. For most of the past decade the OIG has identified the need to improve financial management as one of the agency's top management challenges. In early December, 2009, when I last testified before this subcommittee, I noted that several challenges remain, even though NASA has successfully implemented a variety of corrective actions to address these long-standing weaknesses. In NASA's fiscal year 2009 audit the independent accounting firm, Ernst and Young, disclaimed an opinion on the agency's financial statements. This disclaimer resulted primarily because of continued weaknesses in NASA's internal controls over accounting for legacy assets, specifically the Space Shuttle and the International Space Station.

As we discussed in detail at the December hearing, E & Y identified three significant deficiencies in internal controls, one of which was considered a material weakness. Since that December hearing staff from the Inspector General's Office and E & Y have met with NASA's financial staff to discuss the agency's efforts to address these weaknesses, in particular, the evaluation of legacy assets.

While we cannot predict the success of NASA's efforts, I am hopeful that by implementing the outstanding recommendations

and continuing to focus on its monitoring and remediation efforts NASA can correct these weaknesses in its financial management to the point that E & Y can render an opinion for fiscal year 2010. We will continue to work closely with NASA managers in an attempt to achieve that goal.

Finally, the OIG has several reviews ongoing that examine other high-profile NASA projects such as the agency's development of the James Webb Space Telescope and upgrades to the Tracking and Data Relay Satellite System.

In the months ahead we look forward to working with NASA leadership, this subcommittee, and other Congressional committees as we seek to help the agency address these and other critical challenges. Thank you.

[The prepared statement of Mr. Martin follows:]

PREPARED STATEMENT OF PAUL K. MARTIN

Chairwoman Giffords, Ranking Member Olson, and Members of the Subcommittee:

Thank you for the opportunity to discuss the key issues and challenges facing NASA. As requested, this statement describes the Office of Inspector General's (OIG's) observations based on findings and recommendations from our recent oversight work, particularly our report on "NASA's Most Serious Management and Performance Challenges," which we provided to the Administrator and Congress in November 2009. Our report, which was included in the Agency's *Performance and Accountability Report* for fiscal year (FY) 2009, is available to the public on the OIG's Web site.

Based on our audit and investigative work, we identified five areas that we believe constitute the most serious management and performance challenges facing NASA. They are:

- 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

In determining whether to identify an issue as a "top management and performance challenge," we consider its significance in relation to NASA's mission; its susceptibility to fraud, waste, and abuse; whether the underlying problems are systemic; and the Agency's progress in addressing the issue. Some of the challenges, such as financial management, acquisition and contracting processes, and information technology security, have confronted Agency leadership for most of the past decade.

Through various initiatives, including implementing recommendations made by the OIG and other oversight bodies such as the Government Accountability Office (GAO) and the Aerospace Safety Advisory Panel (ASAP), NASA is working to address these and other challenges and to improve Agency operations. For example, NASA has implemented a variety of corrective actions over the last several years to address long-standing weaknesses in its financial management processes and systems, reduce vulnerabilities in information technology security, and improve acquisition and contracting practices. However, NASA needs to do more to address these and other critical challenges.

The remainder of this statement provides more detail on NASA's five major management and performance challenges identified by the OIG.

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

A key challenge for NASA is maintaining the critical skills and capabilities required to fly the Space Shuttle safely 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 human spaceflight goals of returning to the Moon and reaching Mars. However, since that time fiscal constraints and technical challenges have hampered NASA's efforts to implement the Vision effectively.

NASA continues to fund and plan for completion of the five remaining Space Shuttle flights by September 30, 2010. However, we have doubts that NASA will be able to keep to this aggressive and ambitious flight schedule. Based on calculations by the OIG, historical flight rates, the presidentially directed Review of U.S. Human Space Flight Plans Committee (the Augustine Committee), and internal NASA evaluations, NASA is not likely to meet its September 2010 timetable, and it will most likely take until the second quarter of FY 2011 to complete the last of the planned Space Shuttle flights. Importantly, any delay in this timetable has ramifications far beyond scheduling, given that NASA spends approximately $200 million a month to sustain the Shuttle Program.

At the request of Congress and the Administration, NASA has developed options for extending Shuttle operations and closing the gap between its planned retirement in 2010 and the planned first piloted space flight of the Constellation Program's Orion crew exploration vehicle in 2015. While technically feasible, each option involves additional Shuttle flights and results in a higher cumulative safety risk associated with increased exposure to debris and potential vehicle failures. Moreover, NASA would need additional funding to avoid "borrowing" from the development of the next generation of space vehicles and other NASA programs to pay for more Shuttle missions.

If the Shuttle's flight schedule is extended beyond the five missions currently planned, NASA will need to reevaluate not only funding issues, but also the sustainability of the Shuttle's workforce and infrastructure, much of which has been in wind-down mode since 2009. In 2003, the Columbia Accident Investigation Board recommended that NASA complete a recertification at the material, component, system, and subsystem levels before operating the Shuttle beyond 2010. In its recently released annual report, the ASAP stated that it does not support extending the Shuttle Program significantly beyond its current manifest. I will leave to ASAP Chairman Joseph Dyer any additional comments he cares to offer on the potential safety implications of extending the Shuttle Program beyond its currently scheduled manifest.

The President's FY 2011 budget, released on Monday, set out the Administration's blueprint for NASA's future. Of course, this Subcommittee and other Committees of Congress will weigh in and help shape NASA's future direction. Amid much uncertainty, one thing is clear: NASA will need a sustained level of funding to enable successful execution of whatever future plan is ultimately adopted.

Managing Risk to People, Equipment, and Mission

NASA program and project managers face a variety of challenges associated with risks introduced by fiscal constraints, schedule demands, and changing priorities. To meet these challenges, NASA program and project managers must adhere to the fundamentals of program and project management, fully implement acquisition strategies that share risks and rewards with contractors, and effectively use earned value management systems to help Agency managers identify and mitigate risks.

In the past year, the OIG dedicated considerable resources to reviewing the Agency's risk management efforts at program and project levels. For example, we identified opportunities to improve the risk management processes in the Landsat Program and Orion Project. Specifically, we found that the Landsat Data Continuity Mission was facing a cost increase and possible launch schedule delays because baseline requirements were not finalized prior to contract award. In reviewing the Orion Project, we found that the Project Office conducted a premature life-cycle review. Instead of delaying the life-cycle review until the revised vehicle configuration was developed, the Orion Project Office proceeded with the review of a vehicle configuration that was under revision.

Technical issues continue to add risk to NASA projects and challenge mission success. For example:

- The Stratospheric Observatory for Infrared Astronomy (SOFIA) Program recently resolved technological challenges with the aircraft's movable door that covers the opening to the telescope, challenges that had caused delays in flight testing.
- The Mars Science Lab suffered a major setback due to technical challenges that resulted in a missed launch opportunity in 2009, a $400 million cost increase, and a 2-year schedule delay.

- The Orbiting Carbon Observatory, a satellite important to monitoring and understanding the Earth's changing climate, suffered an undetermined technical failure on launch, resulting in the loss of the $209 million satellite and leaving a gap in NASA's ability to measure carbon dioxide in the atmosphere and its role in global warming.

Financial Management

For most of the past decade, the OIG has identified the need to improve financial management at NASA as one of the Agency's most serious management and performance challenges. In early December 2009, when I testified on this issue before this Subcommittee, I noted that while NASA has successfully implemented a variety of corrective actions over the years to address long-standing weaknesses, several challenges remain.

For example, in its most recent report the independent public accounting firm Ernst & Young (E&Y) disclaimed an opinion on NASA's financial statements for FY 2009, noting that it was unable to obtain sufficient evidentiary support for the amounts presented in the Agency's financial statements. This disclaimer resulted primarily because of continued weaknesses in NASA's internal controls over accounting for legacy assets—specifically, the Space Shuttle and International Space Station.

As we discussed in detail at the December hearing, E&Y identified three significant deficiencies in internal controls with one considered a material weakness. Specifically, E&Y reported a material weakness in NASA's controls for assuring that the financial statements fairly state the value of legacy property, plant, and equipment (PP&E) and materials. E&Y's identification of internal controls over legacy assets as a material weakness means there was a reasonable possibility that the controls were not sufficient to prevent a material misstatement in the financial statements. The other two internal control deficiencies cited by E&Y involved NASA's processes for estimating environmental liabilities and its compliance with the Federal Financial Management Improvement Act of 1996.

E&Y's report contained specific recommendations intended to assist NASA in remediating these weaknesses during FY 2010, to include implementing guidance allowing the use of estimates in establishing the value of legacy assets. Since the December hearing, OIG and E&Y staff have met with staff in NASA's Office of the Chief Financial Officer to discuss the Agency's efforts to address identified weaknesses in internal controls.

While we cannot predict the success of NASA's efforts, I am hopeful that through effective implementation of E&Y's most recent recommendations and a continued focus on its ongoing monitoring and remediation efforts, the Agency can correct existing weaknesses in financial management during FY 2010 to the point that E&Y can render an opinion. We will continue to work closely with NASA managers throughout the fiscal year in an attempt to achieve that goal.

Acquisition and Contracting Processes

Systemic weaknesses in NASA's acquisition and contracting processes represent another long-standing management challenge for the Agency. In our November report addressing NASA's key challenges, we specifically note acquisition and contracting challenges in relation to cost estimating, acquisition processes, contract management, and ethical standards.

In recent reviews of several NASA programs, the OIG found that NASA still lacks the disciplined cost-estimating processes and financial and performance management systems needed to effectively establish priorities, quantify risks, and manage program costs. For example, in our review of the SOFIA Program, which is now 10 years behind schedule with costs more than 200 percent over initial estimates, we found that the program had not developed an independent cost estimate or implemented an earned value management plan to monitor and control program costs. Given that NASA programs and projects have historically experienced cost overruns, improvements in cost estimating using detailed, empirical data to explain program decisions could help minimize the risk of cost overruns.

GAO—which has done a lot of oversight work in this area—first identified NASA's contract management as a high-risk area in 1990, citing NASA's undisciplined cost-estimating processes, a lack of information needed to assess contract progress, and persistent cost growth and schedule slippage in many of its major projects. In its most recent high-risk update, GAO reported improvements in NASA's processes, including its plan for addressing systemic weaknesses. I will leave it to Cristina Chaplain from GAO to provide further details on their work.

During 2009, the OIG also noted NASA's plan for addressing systemic weaknesses and improving its acquisition and contract management processes. However, our audits and investigations continue to identify weaknesses such as those we found in contracts under NASA's Small Business Innovation Research (SBIR) Program that bring into question the effectiveness of the program's internal controls.

Given that NASA spends approximately 90 percent of its $19 billion budget on contracts and grants, it is imperative that NASA employees comply with applicable ethics laws and regulations. The scope of this ongoing challenge is underscored by the large amount of interaction between NASA employees and individuals in the private sector, both in industry and academia.

As an illustration of the challenge, NASA directives require that Standing Review Board (SRB) members be independent to ensure that the boards can provide an impartial opinion of a project's potential success. Our 2009 review of membership for all Constellation Program SRBs found that 21 of the 66 non-Federal board members were employees or consultants of a NASA contractor with an interest in or contract with either the Constellation Program or one of its constituent projects.

Our review concluded that NASA's procedures for determining the independence of SRB members were inadequate. Specifically, NASA did not organize the SRBs in accordance with the Federal Advisory Committee Act (FACA) requirements even though they met the definition of a FACA committee. As a result, NASA did not use the more stringent ethics review process associated with the establishment of FACA committees. Instead, NASA used a process that was lacking in both rigor and accuracy for determining the independence of SRB members. During our review, NASA suspended the activities of its Constellation Program SRBs while it addressed the FACA and conflict of interest compliance issues we disclosed.

Given the large amount of money at stake in NASA projects, the OIG's Office of Investigations has made procurement fraud and ethics a high priority. Within the past year, several OIG investigations led to criminal indictments and convictions. For example:

- A former NASA Chief of Staff was convicted on conflict of interest and false statement charges stemming from his steering of earmarked funds to a client of his private consulting company.
- A NASA SBIR contractor submitted false financial reports and improperly claimed family members on the company payroll.
- An individual working on Intergovernmental Personnel Act agreements pled guilty to conspiracy to defraud and tax evasion for payments he received from NASA and other Federal agencies.
- A senior NASA scientist steered contracts to a company operated by his spouse.

These cases illustrate the types of criminal offenses the OIG pursues to help guard against waste, fraud, abuse, and misconduct. Moving forward, the OIG will continue to work with NASA ethics officials and the Agency's Acquisition Integrity Program to address these issues proactively through comprehensive training while at the same time conducting vigorous investigations and enforcement.

Information Technology Security

NASA continues to face significant challenges in developing, documenting, and implementing an Agency-wide program to secure its information and information technology (IT) systems. Recent 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. Over the last several years, NASA implemented a series of technical solutions that have incrementally improved the Agency's overarching IT infrastructure and management practices. However, IT security remains a key management challenge.

During FYs 2008 and 2009, the Agency reported making progress on two key management initiatives related to IT security. First, NASA implemented the Cyber Threat Analysis Program to proactively detect and handle intrusions into NASA's cyber assets. The program includes threat analysis, identification, and reporting as well as advanced data forensics. Second, NASA initiated the Security Operations Center (SOC) project to consolidate Agency security operations and incident response capabilities. The SOC, scheduled to be fully operational in late FY 2010, will provide the Agency with the capability to perform real-time monitoring of its computer networks and systems.

Similarly, NASA has shown progress in improving IT security as judged by our annual Federal Information Security Management Act (FISMA) audits. For exam-

ple, in our FY 2009 FISMA audit we found that 89 percent of the 29 NASA IT systems we reviewed were certified and accredited as required. However, only 50 percent of the systems met FISMA requirements for annual contingency plan testing and only 25 percent had their security controls tested within the last year as required.

NASA is a prime target for sophisticated cyber attacks as new phishing techniques and malware programs become more advanced and destructive. In a recent incident, for example, intruders were able to steal large amounts of NASA research data, including information protected under the International Traffic in Arms Regulations. The foreign-based intruders initially compromised a single user's account but gained access to a great deal of data across a number of NASA programs because of poorly implemented access controls. This incident remains under investigation by our Computer Crimes Division, a group of highly skilled special agents and forensic technicians with advanced training in cybercrime investigations.

Our cybercrime investigations have resulted in criminal convictions or disruptions in the operations of internationally based cyber-intruders who are highly adaptive in avoiding detection. For example, a group of Romanian hackers, the so-called "White Hat Gang," penetrated and damaged a number of NASA systems integral to the Global Earth Observation System. Our agents and technicians eventually tracked one perpetrator to Arad, Romania, where local officials held him accountable in the Romanian Judicial System. Similarly, we have had investigative success against cyber-criminals from Nigeria, Portugal, Slovenia, Italy, Venezuela, and Sweden.

Finally, recommendations from our cybercrime investigations have also identified opportunities to enhance NASA's incident response training, internal coordination, and centralized command and control, leading to systemic improvements in NASA IT security. Significantly, NASA's decision to establish a Security Operations Center for centralized management of intrusion detection, response, reporting, and damage assessment was partially based on OIG recommendations supported by over 4 years of investigative and audit analyses.

Conclusion

We have a number of ongoing or planned reviews that address the key challenges facing NASA. For example, we are assessing critical components of NASA's efforts to transition from the Space Shuttle to the next generation of space vehicles. Specific areas of focus include NASA's plans for completing the remaining Shuttle flights, disposing of Shuttle Program equipment, and estimating costs for transition and retirement activities.

In addition, we are nearing the completion of fieldwork for our reviews of the James Webb Space Telescope and the Tracking and Data Relay Satellite System. We are also conducting a review of NASA's acquisition strategy for obtaining launch services when the current contract expires in June 2010.

We continue to work with NASA to improve its financial management through both the annual audit of the Agency's financial statements and our monitoring NASA's use of the $1 billion received under the American Recovery and Reinvestment Act of 2009.

In the area of acquisition and contracting, our investigative work continues to identify fraud, waste, and abuse by participants in NASA's SBIR Program. Consequently, we opened a comprehensive audit of NASA's management of the SBIR Program that will examine the sufficiency and implementation of the Program's internal controls.

Finally, we are continuing to assess NASA's IT security and the Agency's efforts to ensure the availability, confidentiality, and integrity of mission and mission support networks and systems.

We look forward to continuing our work with NASA leadership, this Subcommittee, and other congressional Committees as we seek to help the Agency address its top management and performance challenges.

Chairwoman GIFFORDS. Thank you, Mr. Martin.

Ms. Chaplain, please.

STATEMENT OF MS. CRISTINA T. CHAPLAIN, DIRECTOR, ACQUISITION AND SOURCING MANAGEMENT, GOVERNMENT ACCOUNTABILITY OFFICE

Ms. CHAPLAIN. Madam Chairwoman, members of the subcommittee, thank you for inviting me to discuss NASA's major

management challenges. Our work in recent years has identified several specific challenges. They are very similar to the IG's. They include retiring the Space Shuttle, completing and sustaining the International Space Station, acquiring highly-complex, unique systems for exploration, science, and aeronautics research, improving financial management, and protecting critical data in IT systems.

Each one of these activities is integral to the success of the agency, yet difficult to achieve given a variety of factors. For instance, inherent technical and engineering complexities and challenges to developing systems create challenges to developing systems, as well as recruiting the right workforce. Complications associated with launching spacecraft can also make missing schedule deadlines much more costly than non-space systems.

The broad changes to NASA's direction proposed in the President's budget this week do not change the basic challenges facing NASA. The agency will still be acquiring complex, unique systems that demand highly-specialized skills, high-performing contractors and partners, and highly-effective management and oversight.

But for nearly 2 decades GAO has identified significant weaknesses in acquisition management practices at NASA. Specifically, projects are allowed to move forward into full-scale acquisition programs when they still have considerable unknowns about technology and design. In turn, technology and design problems invariably arise and are much more costly to fix than they would have been in a more forgiving environment earlier in the acquisition process.

Another issue, contractors and international partners are not always able to execute as intended. Optimistic estimating allows too many programs to compete for too few dollars. Funding instability disrupts high-performing programs and causes delays that may end up being much more costly in the long run. Requirements might not always be stable. And lastly, sound contract management practices such as limiting the use of undefinitized contracts are not always followed.

A review of NASA's projects issued this week confirm that these problems still persist. Nine of 19 projects we reviewed experience significant costs and schedule growth, some within just a year or two. Only one ongoing project in the implementation phase did not have significant cost and schedule growth. The remaining projects were either in the formulation phase where no baselines are set or just very recently had baselines set.

There was a 1.2 billion total cost increase in just two years with the projects that had baselines. This number does not include the Constellation Program, as it does not have a baseline yet, or the James Webb telescope, which just established a measurable baseline fiscal year 2009. It also does not include cost growth that may have occurred before the baselines were set.

The President's budget also proposes heavier reliance on commercial suppliers for human spaceflight missions. Again, the need for effective management and oversight practices will be just as necessary here as they were for the Constellation Program. In the past space programs claiming to be following commercial approaches did not succeed because they lacked sound insight and oversight on the government's part. In fact, key government tech-

nical expertise was let go once such programs were in vogue, and that was a trend that both DOD and NASA have deeply regretted.

Moreover, while we found in prior reports that the cost providers were making progress in meeting their milestones and that the program was well managed, we also noted that the most very difficult phases of development lay ahead.

Lastly, in moving forward with the new budget it is critical that NASA maintain transparency and accountability for its spending. Requirements for baselining and authorizing major programs have helped considerably to shed light on problems and the help of the acquisition portfolio, but little is known about programs before they reach implementation, which can sometimes take years, and there has not always been clarity on costs involved with the challenges we identify in our testimony.

We recognize that NASA is taking an array of actions to reduce acquisition risks and respond to recommendations. For example, it is revamping cost estimating and providing more oversight at the headquarters' level. We are hopeful that these and other efforts will meet the challenges we discussed, but for this to happen senior leaders need to sustain their attention to instituting discipline processes and remove incentives that drive poor decision making. This will be difficult to do but yet integral for the future success of NASA.

Thank you.

[The prepared statement of Ms. Chaplain follows:]

PREPARED STATEMENT OF CRISTINA T. CHAPLAIN

Madam Chairwoman and Members of the Subcommittee:

Thank you for inviting me to discuss the challenges facing the National Aeronautics and Space Administration (NASA). NASA is in the midst of many changes and one of the most challenging periods in its history: the space shuttle is slated to retire this year after flying for 29 years; the International Space Station draws closer both to its completion but remains underutilized; and the future vehicles for human space flight are experiencing problems in development and have been hotly debated and recently reviewed by an independent commission.

The Administration in its 2011 budget is proposing to cancel the Constellation Systems program and replace it with a new approach that uses the commercial space industry and international partnerships to develop new technologies for space exploration. Amid all this potential change, one thing that will most likely remain constant is NASA's need to manage programs and projects within a fiscally constrained environment. This will require hard choices among competing priorities within the organization, which must balance its core missions in science, aeronautics, and human space flight and exploration. In addition, NASA will be competing for an ever-shrinking share of discretionary spending against other national priorities such as the economy, fighting terrorism, and health care reform.

Over the years NASA has had significant achievements exploring space, helping us understand Earth's environment, and conducting fundamental research in the aeronautical disciplines. Unfortunately, it has not achieved the same level of results on its business side. For 20 years, NASA acquisition management has been on GAO's list of federal programs and operations at high risk and vulnerable to fraud, waste, abuse, and mismanagement. To its credit, NASA has made a concerted effort to improve its acquisition management and continues to work constructively with GAO to address systemic weaknesses in program/project management, contractor performance, business processes, financial management, and information technology.

The broad changes proposed for NASA do not change the basic challenges facing the agency. Against this backdrop, my testimony today focuses on four management and program challenges: (1) retiring of the space shuttle, (2) utilizing and sustaining the International Space Station, (3) continuing difficulty developing large-scale systems, and (4) continuing weaknesses in financial management and information tech-

nology systems.In preparing this statement, we relied on completed and ongoing work. All of the work used in preparing this statement was performed in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. We have made a number of recommendations to address some of the challenges we identified.

NASA Challenges

Retiring of the Space Shuttle

This year the space shuttle is scheduled to fly its final six missions to deliver hardware, supplies, and an international scientific laboratory to the International Space Station. NASA officials remain confident that the current flight manifest can be accomplished within the given time, and add that should delays occur, the International Space Station can still function. According to NASA, there are trade-offs the agency can make in what it can take up to support and sustain the station. However, failure to complete assembly as currently planned would further reduce the station's ability to fulfill its research objectives and deprive the station of critical spare parts that only the shuttle can deliver. The recent review completed by the U.S. Human Space Flight Plans Committee included the option of flying the space shuttle through 2011 in order to complete the International Space Station. However, the Committee noted that there are currently no funds in NASA's budget for additional shuttle flights. Most recently, the Administration is proposing over $600 million in the fiscal year 2011 budget to, ensure that the space shuttle can fly its final missions, in case the space shuttle's schedule slips into fiscal year 2011.

Retirement of the shuttle will involve many activities that warrant special attention. These include: disposing of the facilities that no longer are needed while complying with federal, state, and local environmental laws and regulations; ensuring the retention of critical shills within NASA's workforce and its suppliers; and disposing of over 1 million equipment items. In addition, the total cost of shuttle retirement and transition to include the disposition of the orbiters themselves-is not readily transparent in NASA's budget. We have recommended that NASA clearly identify all direct and indirect shuttle transition and retirement costs, including any potential sale proceeds of excess inventory and environmental remediation costs in its future budget requests. NASA provided this information to the House and Senate Appropriations committees hi July 2009 but did not identify all indirect shuttle transition and retirement costs in its fiscal year 2010 budget request. We look forward to examining the fiscal year 2011 budget request to determine whether this information is identified.

Lastly, NASA has recognized that sustaining the shuttle workforce through the retirement of the shuttle while ensuring that a viable workforce is available to support future activities is a major challenge. We commend NASA for its efforts to understand and mitigate the effect of the space shuttle's retirement on the civil service and contractor workforce. Nevertheless, how well NASA executes its workforce management plans as they retire the space shuttle will affect the agency's ability to maintain the skilled workforce to support space exploration.

Utilizing and Sustaining the International Space

Although it is nearing completion, the International Space Station faces several significant challenges that may impede efforts to maximize utilization of research facilities available onboard. These include: the retirement of the Space Shuttle in 2010 and the loss of its unmatched capacity to move cargo and astronauts to and from the station; the uncertain future for the station beyond 2015; and the limited time available for research due to competing demands for the crew's time.

We have previously reported that the International Space Station will face a significant cargo supply shortfall without the Space Shuttle's great capacity to deliver cargo to the station and return it to earth.[1] NASA plans on using a mixed fleet of vehicles, including those developed by international partners, to service the space station on an interim basis. However, international partners' vehicles alone cannot fully satisfy the space station's cargo resupply needs. Without a domestic cargo resupply capability to augment this mixed fleet approach, NASA faces a 40 metric ton

[1] GAO, *NASA: Commercial Partners Are Making Progress, but Face Aggressive Schedules to Demonstrate Critical Space Station. Cargo Transport Capabilities,* GAO–09–618 (Washington, D.C.: June 16, 2009).

(approximately 88,000 pounds) cargo resupply shortfall between 2010 and 2015. While NASA is sponsoring commercial efforts to develop vehicles capable of carrying cargo to the station and the administration has endorsed this approach, none of those currently in development has been launched into orbit, and the vehicles' aggressive development schedules leave little room for the unexpected.

Furthermore, upon completion of construction, unless the decision is made to extend station operations, NASA has only 5 years to execute a robust research program before the International Space Station is deorbited. The leaves little time to establish a strong utilization program. At present, NASA projects that its share of the International Space Station research facilities will be less than fully utilized by planned NASA research. Specifically, NASA plans to utilize only 48 percent of the racks that accommodate scientific research facilities onboard, with the remainder available for use by others.[2] Congress has directed NASA to take all necessary steps to ensure that the International Space Station remains a viable and productive facility capable of potential utilization through at least 2020.[3] The Administration is proposing in its fiscal year 2011 budget to extend operations of the International Space Station to 2020 or beyond in concert with its international partners.

Lastly, NASA faces a significant constraint for science on board the space station because of limited crew time. There can only be six crew members aboard the station at one time due to the number of spaces available in the "lifeboats," or docked spacecraft that can transport the crew in case of an emergency. As such, crew time cannot presently be increased to meet increased demand. Though available crew time may increase as the six-person crew becomes more experienced with operating the space station efficiently or if the crew volunteers its free time for research, crew time for U.S. research remains a limiting factor. According to NASA officials, potential National Laboratory researchers should design their experiments to be as automated as possible or minimize crew involvement required for their experiments to ensure that they are accepted for flight.

We have recommended that NASA implement actions, such as developing a plan to broaden and enhance ongoing outreach to potential users and creating a centralized body to oversee U.S. space station research decision making, including the selection of all U.S. research to be conducted on board and ensuring that all U.S. International Space Station National Laboratory research is meritorious and valid. NASA concurred with our recommendation and is researching the possibility of developing a management body to manage space station research, which would make the International Space Station National Laboratory similar to other national laboratories.

Continuing Difficulty Developing Large-Scale Systems

NASA projects have produced ground-breaking research and advanced our understanding of the universe. However, one common theme binds most of the projects—they cost more and take longer to develop than planned. As we reported in our recently completed assessment of NASA's 19 most costly projects—which have a combined life-cycle cost that exceeds $66 billion—the agency's projects continue to experience cost growth and schedule delays.[4] Ten of the 19 projects, which had their baselines set within the last 3 years, experienced cost growth averaging $121.1 million or 18.7 percent and the average schedule growth was 15 months.[5] For example, the Glory project has recently breached its revised schedule baseline by 16 months and exceeded its development cost baseline by over 14 percent—for a total development cost growth of over 75 percent in just 2 years.[6] Project officials also indicated that recent technical problems could cause additional cost growth. Similarly, the Mars Science Laboratory project is currently seeking reauthorization from Congress after experiencing development cost growth in excess of 30 percent. Many of the

[2] Scientific research facilities currently available inside the space station are generally mounted in modular, refrigerator-sized mounts called racks or ExPRESS racks, which provide the utilities necessary for conducting research.

[3] National Aeronautics and Space Administration Authorization Act of 2008, Pub. L. No. 110–422 § 601.

[4] GAO, *NASA: Assessments of Selected Large-Scale Projects,* GAO–10–22–7SP (Washington, D.C.: Feb. 1, 2010.)

[5] Of the 19 projects included in our review, 4 are still in the formulation phase, including Ares I and Orion, where cost and schedule baselines have yet to be established. Five of the projects just entered the implementation phase in fiscal year 2009 and therefore have not experienced cost and schedule growth.

[6] If development cost of a program will exceed the baseline estimate by more than 30 percent, then NASA is required to seek reauthorization from Congress in order to continue the program. If the program is reauthorized, NASA is required to establish new cost and schedule baselines. 42 U.S.C. § 16613(e).

other projects we reviewed experienced challenges, including developing new or retrofitting older technologies, stabilizing engineering designs, and managing the performance of contractors and development partners.

Our work has consistently shown that reducing these kinds of problems in acquisition programs hinges on developing a sound business case for each project. Such a business case provides for early recognition of challenges, allows managers to take corrective action, and places needed and justifiable projects in a better position to succeed. Product development efforts that have not followed a knowledge-based business case approach have frequently suffered poor cost, schedule, and performance outcomes. A sound business case includes development of firm requirements, mature technologies, a preliminary design, a realistic cost estimate, and sound estimates of available funding and time needed before the projects proceed beyond preliminary design review. If necessary, the project should be delayed until a sound business case, demonstrating the project's readiness to move forward into product development, is in hand.

In particular, two of NASA's largest projects—Ares I and Orion, which are part of NASA's Constellation program to return to the moon—face considerable technical, design, and production challenges. NASA is actively addressing these challenges. Both projects, however, still face considerable hurdles to meeting overarching safety and performance requirements, including limiting vibration during launch, mitigating the risk of hitting the launch tower during liftoff, and reducing the mass of the Orion vehicle. In addition, we found that the Constellation program, from the onset, has faced a mismatch between funding and program needs. This finding was reinforced by the Review of U.S. Human Spaceflight Plans Committee, which reported that NASA's plans for the Constellation program to return to the moon by 2020 are unexecutable without increases to NASA's current budget.

To its credit, NASA has acknowledged that the Constellation program, for example, faces knowledge gaps concerning requirements, technologies, funding, schedule, and other resources. NASA stated that it is working to close these gaps and at the preliminary design review the program will be required to demonstrate that the program and its projects meet all system requirements with acceptable risk and within cost and schedule constraints, and that the program has established a sound business case for proceeding into the implementation phase. Even though NASA has made progress in developing the actual vehicles, the mismatch between resources and requirements remains and the administration's proposed fiscal year 2011 budget leaves the future of the program in question.

Continuing Weakness in Financial Management and Information Technology Systems

NASA has continually struggled to put its financial house in order. GAO and others have reported for years on these efforts.[7] In fact, GAO has made a number of recommendations to address NASA's financial management challenges. Moreover, the NASA Inspector General has identified financial management as one of NASA's most serious challenges. In a November 2008 report, the Inspector General found continuing weaknesses in NASA's financial management process and systems, including internal controls over property accounting. It noted that these deficiencies have resulted in disclaimed audits of NASA's financial statements since fiscal year 2003. The disclaimers were largely attributed to data integrity issues and poor internal controls. NASA has made progress in addressing some of these issues, but the recent disclaimer on the fiscal year 2009 audit shows that more work needs to be done.

We have also reported that NASA remains vulnerable to disruptions in its information technology network.[8] Information security is a critical consideration for any organization reliant on information technology and especially important for NASA, which depends on a number of key computer systems and communication networks to conduct its work. These networks traverse the Earth and beyond, providing critical two-way communication links between Earth and spacecraft; connections between NASA centers and partners, scientists, and the public; and administrative applications and functions. NASA has made important progress in implementing secu-

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[7] GAO, *Property Management: NASA's Goal of Increasing Equipment Reutilization May Fall Short without Further Efforts,* GAO–09–187 (Washington, D.C.: Jan. 30, 2009); *GAO; Business Modernization: NASA Must Consider Agencywide Needs to Reap the Full Benefits of Its Enterprise Management System Modernization Effort,* GAO–07–691 (Washington, D.C.: July 20, 2007); and GAO, *Financial Management Systems: Additional Efforts Needed to Address Key Causes of Modernization Failures,* GAO–06–184 (Washington, D.C.: Mar. 15, 2006).

[8] GAO, *Information Security: NASA Needs to Remedy Vulnerabilities in Key Networks,* GAO–10–4 (Washington, D.C.: Oct. 15, 2009.)

rity controls and aspects of its information security program. However, NASA has not always implemented sufficient controls to protect the confidentiality, integrity, and availability of the information and systems supporting its mission directorates. Specifically, NASA did not consistently implement effective controls to prevent, limit, and detect unauthorized access to its networks and systems. 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.

During fiscal years 2007 and 2008, NASA reported 1,120 security incidents that resulted in the installation of malicious software on its systems and unauthorized access to sensitive information. NASA established a Security Operations Center in 2008 to enhance prevention and provide early detection of security incidents and coordinate agency-level information related to its security posture. Nevertheless, the control vulnerabilities and program shortfalls—which GAO 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 has recommended actions the NASA Administrator should take to mitigate control vulnerabilities and fully implement a comprehensive information security program including: developing and implementing comprehensive and physical risk assessments; conducting sufficient or comprehensive security testing and evaluation of all relevant security controls; and implementing an adequate incident detection program. In response to our report, the Deputy Administrator noted that NASA is implementing many of our recommendations as part of an ongoing NASA strategic effort to improve information technology management and information technology security program deficiencies. The Deputy Administrator also stated that NASA will continue to mitigate the information security weaknesses identified in our report. The actions identified by the Deputy Administrator, if effectively implemented, will improve the agency's information security program.

Concluding Observations

In executing NASA's space exploration, scientific discovery, and aeronautics research missions, NASA must use its resources as effectively and efficiently as possible because of the severity of the fiscal challenges our nation faces and the wide range of competing national priorities. Establishing a sound business case before a project starts should also better position NASA management to deliver promised capability for the funding it receives. While space development programs are complex and difficult by nature, and most are one-time efforts, the nature of its work should not preclude NASA from being accountable for achieving what it promises when requesting and receiving funds. Congress will also need to do its part to ensure that NASA has the support to hold poorly performing programs accountable in order to provide an environment where the systems portfolio as a whole can succeed with the resources NASA is given. NASA shows a willingness to face these challenges. We look forward to continuing work with NASA to develop tools to enhance the management of acquisitions and agency operations to optimize its investment in space and aeronautics missions.

Madam Chairwoman, and Members of the Subcommittee, this concludes my prepared statement. I would be happy to answer any questions you may have at this time.

Chairwoman GIFFORDS. Thank you, Ms. Chaplain.

Admiral Dyer. Admiral Dyer, before you start, yeah, the microphone, please.

STATEMENT OF VICE ADMIRAL JOSEPH W. DYER (U.S. NAVY, RETIRED), CHAIR, AEROSPACE SAFETY ADVISORY PANEL, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Admiral DYER. Thank you. Thank you for the opportunity to discuss the Aerospace Safety Advisory Panel's 2009 activities and annual report.

Let me begin by quoting from the report's conclusion. "The panel continues to believe, as it did in 2008, that NASA faces unprecedented challenges, perhaps greater than any time in the agency's history. Important decisions on the future of human spaceflight face NASA as well as the White House, the Congress, and the Nation. Commercial entities and international partners will likely have a larger role in transporting both cargo and crew to orbit. It is critical that NASA focus on establishing the criteria requirements and the certification process for orbital transportation vehicles, as well as a process for validating compliance. The performance and safety requirements must be stated promptly and clearly to enable NASA and non-NASA entities to proceed in the most productive and effective manner.

The Ares I vehicle has been designed from the beginning with a clear emphasis on safety. Before any changes made to architecture, the inherent safety of a selected approach should be assessed to ensure it offers a level of safety equal to or greater than the program of record. We recognize that the Shuttle is risky by inherent design and is becoming more so because of aging and wear. Extension of the Shuttle's use significantly beyond what is planned through the current manifest is not recommended.

Space exploration is a dangerous enterprise. The risks must be shouldered by NASA, the Congress, and the Administration, and those risks must be communicated clearly to the public. The panel hopes that our summary of critical safety-related issues will help focus attention on the important decisions and the direction of the agency."

The 2009, report has been widely read, strongly commended, and energetically criticized. With those well-rounded metrics we believe we have fulfilled our statutory purpose which is to infuse safety considerations into an informed debate.

The panel spent a good amount of ink on two specific issues; human rating requirements or HRR for follow-on vehicles and the Shuttle extension.

Regarding human rating requirements, in our report the panel recommends NASA stipulate directly the applicable HRR standards and the level of acceptable risk for potential commercial contractors. Not only should the standards be provided but the certification mechanism and required validation data should be made clear as well.

Regarding the Shuttle extension, the panel 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 report goes on to add other issues and opportunities. Those include the use of robots to both supplement astronauts and to replace them in some undertakings, as well as facilities and aging infrastructure, a growing and under-funded issue. If one steps back and observes with a wide lens the 2009 ASAP report is about three things. First, about the Space Shuttle, second about safely meeting our Nation's goals and objectives for space transportation, and third, the knowledge needed to safely transport human beings into space.

Let me address those one at a time. With the Shuttle, we believe that every responsible American has some concerns about the safety of the Shuttle. The Shuttle has flown 129 flights. There have been two catastrophic accidents and 14 lives lost. The Shuttle's history, age, and eroding supply and support chain all speak to increasing risks.

Secondly, we must be clear about our goals for space transportation and what is required to achieve safety in the implementation of those goals. Are the goals to, A, minimize the gap between Shuttle and America's next transportation vehicle? Is it to privatize transport of NASA astronauts into low-earth orbit? Is it to secure a launch vehicle with greater lift and potentially greater flexibility? The panel believes NASA can accomplish any of these goals given sufficient time and money, but NASA cannot be expected to accomplish all three safely and concurrently within available budgets.

Third, let us talk about the knowledge. Perhaps competency would be the better word. The panel is not against commercial transport of humans but has registered concern in our report about commercial transportation without updated safety standards. Those standards have not yet been written by NASA, so no one can truly claim compliance with them.

Chairman, in closing I want to highlight what causes programs to get into situations where safety is at risk. We believe there are most often three common themes; compressing schedule, stretching resources, and a workforce that loses direction. We believe both resources and scheduling must include management reserve to accomplish and accommodate issues that will arise as the new design evolves and working relationship matures.

Additionally, managing the Shuttle's workforce, both government and contractor, will require new and focused attention. The Workforce Transition Plan that has maintained the stable Shuttle workforce and requisite knowledge is now in jeopardy. It will be a challenge to keep the necessary skill sets as workers find themselves without a clear future and are looking for a safe place to land.

Again, thank you for the opportunity to testify today on behalf of the Aerospace Safety Advisory Panel.

[The prepared statement of Mr. Dyer follows:]

PREPARED STATEMENT OF JOSEPH W. DYER

Chairwoman Giffords, Ranking Member Olson, and Members of the Subcommittee:

Thank you for the opportunity to discuss the Aerospace Safety Advisory Panel's 2009 Activities and Annual Report. Let me begin by quoting from the Report's conclusion.

CONCLUSION

"The Panel continues to believe, as it did in 2008, that NASA faces unprecedented challenges, perhaps greater than any time in the Agency's history. Important decisions on the future of human spaceflight face NASA, as well as the White House, the Congress, and the Nation.

Commercial entities and international partners will likely have a larger role in transporting both cargo and crew to orbit. It is crucial that NASA focus on establishing the certification requirements, a certification process for orbital transportation vehicles, and a process for validating compliance. The performance and safety requirements must be stated promptly and clearly to enable NASA and non-NASA entities to proceed in the most productive and effective manner possible.

The Ares I vehicle has been designed from the beginning with a clear emphasis on safety. Before any change is made to architecture, the inherent safety of that ap-

proach should be assessed to ensure that it offers a level of safety equal to or greater than the program of record.

We recognize that the Shuttle is risky by inherent design, and it is becoming more so because of aging and wear. Extension of its use significantly beyond what is planned through the current manifest is not recommended.

Space exploration is a dangerous enterprise. The risks must be shouldered by NASA, Congress, and the Administration, and those risks must be communicated clearly to the public.

The Panel hopes that our summary of critical safety-related issues will help focus attention on the important decisions and the direction of the Agency."

The 2009 Report has been widely read, strongly commended, and energetically criticized. With those well rounded metrics, we believe we have fulfilled our statutory purpose, which is to infuse safety considerations into an informed debate.

During this period of deliberation and redirection, it is important not to overlook NASA's 2009 accomplishments. In the Report, we highlight several accomplishments that are noteworthy due to the commitment to safety. Highlights include:

- Five successful Shuttle launches,
- Progress on International Space Station (ISS) build out,
- Ares I–X Rocket flight test,
- NASA Safety Center (NSC) Safety & Mission Assurance Technical Excellence Program (STEP),
- ISS cargo resupply,
- Safe and successful Hubble Servicing Mission (SM)–4,
- NASA and the OSHA Voluntary Protection Program (VPP), and
- Continuing successes in deep space missions.

The Panel also highlighted a few critical issues in the Report. The most important one is, "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 . . .."

The Panel spent a good amount of ink on two specific issues: Human Rating Requirements (HRR) for Follow-on Vehicles and Shuttle Extension.

Human Rating Requirements

In our Report, we note that the Commercial Orbital Transportation Services (COTS) vehicles being developed thus far had not been required to meet HRR standards nor were they proven to be appropriate to transport NASA personnel. This is understandable since COTS vehicle contractors are currently tasked only with developing cargo delivery systems. However, since expanding the commercial vehicle mission to include human transport has become an active topic, the Panel highlighted the HRR standards issue at every quarterly meeting in 2009. A principal concern identified at the first 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. The Panel recommended that NASA stipulate directly the applicable HRR standards and share acceptable risk levels with those other entities. It is essential that any entity that might be creating human-rated transport systems that may transport NASA astronauts must understand the safety requirements that will be mandatory for such services. Not only should the standards be provided, but the certification mechanism and required validation data should be made clear.

We go on to note that, in the fourth quarter of 2009, NASA 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. 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.

For these reasons, the Panel stated, "To abandon Ares I as a baseline vehicle for an alternative without demonstrated capability nor proven superiority 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."

Shuttle Extension

The Augustine Committee concluded that the only way to reduce the "gap" in human spaceflight launch capability between ISS completion and the planned flights of Ares I is by extending the Shuttle program well beyond 2010.

The Panel 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 modem standards is more than what we should ask astronauts to shoulder. The Panel does not believe that there is full transparency to the risk. We recognize that such transparency is challenging due to the difficulty in communicating highly technical issues to a largely non-technical public. Still, NASA must find a way to successfully communicate the level of risk inherent in experimental space flight. The Agency must be supported in doing so by Congress and the Administration. In our opinion, the time to extend the Shuttle was several years ago when there was an opportunity to go forward with an extension certification program of reasonable scope and cost. With sufficient money, manpower, and recertification efforts, it is possible that the Shuttle could be extended. While we are aware of no major systems that are "on the knee of the curve" of wear out, the funds needed to allow full recertification are substantial, and the probability of finding things that demand even more resources during recertification is very real.

The Report goes on to address other issues and opportunities. Those include:

- Integration of Robotics Agency-wide
  - The Panel continues to urge NASA to take a more open-minded and aggressive view towards using robots to reduce human risk whenever possible, consistent with mission accomplishment. 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 space suits.
- Facilities and Aging Infrastructure

Over eighty percent of NASA facilities are beyond their design life, and annual maintenance is underfunded.[1] 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.

If one steps back and observes with a wide lens, the FY 2009 ASAP Annual Report is about three things: the Space Shuttle, safely meeting our nation's goals and objectives for space transportation, and the knowledge needed to safely transport human beings into space.

- The Space Shuttle—We believe every responsible American has concerns about the safety of the Shuttle. The Shuttle has flown 129 flights; there have been two catastrophic accidents and 14 lives lost. The Shuttle's history, age, and its eroding supply and support chain all speak to increasing risk.
- Space Transportation Goals—We must be clear on our goals for space transportation to meet those goals safely. Are they to:
  - Minimize the gap between the Shuttle and America's next human transport vehicle?
  - Privatize the transport of NASA astronauts to low earth orbit?

[1] Presentation "NASA's Construction Program" by Frank Bellinger, Director Facilities Engineering & Real Property Division, NASA Headquarters, to American Council of Engineering Companies, April 27, 2009.

- Secure a new launch vehicle with greater lift and potentially greater flexibility?

The panel believes NASA can accomplish any of these goals, given sufficient time and money, but NASA cannot be expected to accomplish all three safely and concurrently within available budgets.

To speak clearly about the first goal, the ASAP believes attempting to close the gap or to buy time for new program direction by extending the Shuttle is ill advised.

- Competency—The Panel is not against commercial transport of humans but has registered concern in our Report about commercial transport without updated safety standards. These standards have not yet been written by NASA, so no one can truly claim compliance with them. So far in the U.S., only NASA has demonstrated the knowledge and competence needed to transport humans into space and return them safely to the earth. If the U.S. decides to contract for commercial services to transport our astronauts into low earth orbit, there is much work to be done. That work is about transferring knowledge and about developing a process whereby competency and design can be certified.

Whatever the direction forward, the Congress and the White House need to provide NASA with clear guidance. The focus needs to turn to getting the job done as soon as possible.

What causes programs to get into situations where safety is at risk or, sometimes, even a causality? We believe there are most often three common themes:

1. Compressing schedule,
2. Stretching resources,
3. A workforce that looses direction.

With the new budget come significant changes to our Nation's plan for space. The ASAP's advice is to carefully and adequately provide resources and to realistically schedule work. We believe both resources and scheduling must include a "management reserve" to accommodate issues that will arise as new designs evolve and working relationships mature.

Additionally, managing the Shuttle's workforce—both government and contactor—will require new and focused attention. NASA's workforce transition planning that has maintained a stable Shuttle workforce and requisite knowledge is now in jeopardy. It will be a challenge to keep the necessary skill-sets as workers find themselves without a clear future and looking for a safe place to land.

Once again, I thank you for the opportunity to offer the Panel's view on these issues and would be pleased to respond to any questions you or other Members of the Subcommittee may have.

Chairwoman GIFFORDS. Thank you, Admiral Dyer, and to all of our witnesses today, at this point we are going to begin our first round of questions, and the Chair will recognize herself for five minutes.

COST GROWTH

I would like to start with Ms. Chaplain. GAO has reported that cost and schedule growth in several of NASA's projects has resulted from problems such as failing to adequately identify requirements and underestimating technology complexity and maturity. And I know that this is just a draft that you have submitted here to our subcommittee, but can you talk a little bit about cost growth and schedule delay? Is this a matter of agency discipline, or is it something else that has—that is involved in this very slow progress at NASA?

Ms. CHAPLAIN. I believe it is more than just discipline, though discipline has a lot to do with it. There are issues with regard to planning ahead for acquisitions, notably like really looking at your supplier base, the health of it, what gaps and expertise they have, what potential problems you may have when you come to acquisi-

tions. More of that could be done at the headquarters level and at the project level.

There are also issues that are related to launch manifest that are going to be very severe in the next few years as NASA goes away from the Delta II vehicles to other medium launch vehicles. They raised the cost of missing any kind of launch deadline.

So I think it is just an array of issues, but discipline is a big part of it.

Chairwoman GIFFORDS. Thank you. Mr. Martin, would you care to comment.

Mr. MARTIN. Yes. Our observation would be we think that NASA has done a better job developing guidance to steer program management and now is really more of a matter of effectively implementing the guidance developed. And they have had varying degrees of success with some programs.

RISK REDUCTION REPORT METHODS

Chairwoman GIFFORDS. As a follow up, Ms. Chaplain, looking at the report you released yesterday, and you talk about 19 large-scale projects and includes a thumbnail sketch of Ares I, you indicate in the report that the totality of your work lasted until February 10, yet when you go to describe the status of Ares I, you failed to acknowledge significant progress such as the successful Ares I ground tests, the I–X flight, an agreement on how to deal with the thrust oscillation issue. All of these events that I mentioned happened late last year, so I am curious as to why they weren't acknowledged in the report and whether or not you consider them to be among the risk-reduction activities.

Ms. CHAPLAIN. A couple of things with regard to that. We do have to cut off our audit work at a certain point in time to allow for production of the report, and they also allow at least a month for agency comment period, so you are always going to have a lag of a month or two between the audit work and the report.

Where we could, we tried to update the projects, specifically with some issues that were brought to our attention, either by NASA or the committee. Some key events like the Ares I–X we couldn't validate the results yet, so they are not reflected. They will be reflected in the next one.

On the other hand, too, while you might have some positive events taking place, there might be negative events taking place. The NPP Project, for example, may have more cost increase than what we reflect in the report. So we really need to be sure that we are as accurate as possible. We have to cut off and know what we can validate.

I will also note that when NASA does have an opportunity to provide comments, it can also point out those events that have taken place. They didn't specifically point anything like that out in their comment letter, and in our agency exit meeting we didn't have any specific updates that were validated, and when I say validated, it has to be provided by documentation, things we can substantiate and analyze. We didn't get those kinds of materials from NASA at the exit conference, either.

In addition to that, each program has an opportunity to update their status when they comment on the 2-page sheet that we produce for that report.

Chairwoman GIFFORDS. And Ms. Chaplain, is that pretty typical of agencies not providing that information? I mean, obviously, NASA is unlike all agencies just because of the complexity and the cost of these programs, but I am just curious whether or not that is typical and——

Ms. CHAPLAIN. I would say yes. We produce a very similar product for our DOD weapons portfolio, and there, again, most of the information on that is based on these selected acquisition reports that go to Congress every year, and that information can be dated by the time the report comes out. The projects try to update where we can, and we try to validate where we can, but you tend to have that lag.

The one thing about this mandate for this work is there is a biannual reporting requirement. That gives us an opportunity to brief staff midyear and kind of report on the updates that have taken place and where we stand with some of the programs.

RISK IN ARES PROGRAM

Chairwoman GIFFORDS. Okay. Just—I just have a few seconds.

Admiral Dyer, would you just talk briefly about your thoughts on where Ares I stands relative to risk, in relation to risk rather?

Admiral DYER. The panel's position is that if the goal is to minimize the gap between Shuttle and a follow-on vehicle, then Ares I offers the safest, quickest opportunity and probably the most cost effective one. If the Nation is willing to accept a wider gap, more risk, and a higher cost, then other opportunities avail themselves.

Chairwoman GIFFORDS. And Admiral Dyer, in terms of your—the panel, the experts that are apart of your organization, I mean, to what extent are you confident that the analysis is truly accurate?

Admiral DYER. We are confident that the analysis is accurate, that the program is on track. I bristle a bit when any program is referenced as troubled, because you have to discriminate between the ongoing activities of any developmental program, part of getting the work done, and programs that are really in general in great difficulty. We think what you see with Ares is part of the developmental process. We think the program is on track.

Chairwoman GIFFORDS. Okay. Thank you, Admiral.

The Chair recognizes Mr. Olson for five minutes.

REGULATION OF HUMAN SPACE FLIGHT

Mr. OLSON. Well, thank you very much, Madam Chairwoman, and I have got a question for all the panelists.

With respect to ensuring that future human space-related vehicles meet NASA requirements and to validate compliance, it has been suggested that NASA follow the FAA model by delegating safety mission assurance authority to the space launch provider.

It has been asserted that this system is much more efficient, adaptable, and cost effective than having to deal with NASA's cumbersome safety regime. Under the FAA Enforcement System select employees of aircraft manufacturers, airlines, and aircraft mainte-

nance companies are licensed by the FAA and charged with enforcing FAA safety regulations. Failure to adhere to FAA standards can lead to fines, license suspensions, or worse.

What are your views on adapting such a system for companies hired to fly astronauts to low-earth orbit? Mr. Martin.

Mr. MARTIN. Okay. We will take that one first. We have not done work in this particular issue, but speaking for myself I would think that NASA would be foolish to cede any issues dealing with the safety of its most precious cargo, that is the astronauts. I would be shocked if the administrator, who is an astronaut, would agree to that, and I just think the human rating issue and the safety issue needs to remain in house.

Mr. OLSON. Thank you for that answer.

Ms. Chaplain.

Ms. CHAPLAIN. I am not as familiar with the FAA process, but I do have some thoughts. We would almost like to see a process analogous to what they have for the launch services program for NASA, probably more stringent than that, so when NASA is looking to get a new supplier, for example, to take up science missions, it has a very rigorous process for certifying those suppliers and ensuring that they meet all of NASA's standards for taking up science missions, which are pretty stringent in and of themselves.

Along with this process comes insight into design production and test activities, and in the case of human spaceflight you would almost expect that they have approval authority over top-level requirements and test strategies and success criteria, et cetera.

Overall, I would just see a much more rigorous process and a lot more insight and oversight than what we have with the COTS Program. The COTS wasn't set up to be that kind of rigorous oversight effort.

Mr. OLSON. Thank you, Ms. Chaplain.

Admiral Dyer.

Admiral DYER. May I point out or perhaps predict two evolving catch-22 opportunities. The first is that FAA has great knowledge about the certification of commercial vehicles but little knowledge about space. Just the opposite is true on NASA; deep knowledge with regard to spaceflight, little knowledge with regard to certifying commercial vehicles.

Madam Chairman, I guess you could call this an interagency opportunity in the making.

A second catch-22 related is how do you, as you have heard us mention a couple of times, how do you both communicate what is required and then certify it? The second catch-22, Mr. Olson, I believe, will be commercial industry's belief that they can only deliver on-cost and on-schedule if NASA is kept at arm's length. But keeping NASA at arm's length will neither transition the knowledge that is needed, nor build the confidence to certify.

These are two serious problems that need to be addressed as we go into the future.

Mr. OLSON. Yes, sir. I can see how both of those would affect safety.

TECHNOLOGY DEVELOPMENT ON ARES/ORION

One more question and this is for you, again, Admiral Dyer. One of the biggest technical challenges for the Ares and Orion has been the design and development of a launch-abort system, and as you know, later this spring NASA has scheduled its first major test of an integrated launch-abort system at White Sands.

Assuming this system won't be used now on the Orion Vehicle, is it reasonable to believe that this technology and design can be transferred to other vehicles? Would the hardware and software be fairly generic, and what are the kinds of validation tests that would be required to ensure the system is safe and reliable?

Admiral DYER. Sir, I would note that the technology and the development is sound. There is much knowledge with this regard. Probably some of it can be transferred, but I am afraid we don't have on the board the panel, the deep knowledge necessary to answer your question.

COST GROWTH

Mr. OLSON. Thank you for that answer, sir, and I will close with just one comment I would like to make.

I mean, one of the things we hear, and it is sort of a follow up on a comment Admiral Dyer made, but one of the things we hear is how the justification for this new budget and its implication for human spaceflight is the cost overruns and how the Constellation Project is just way beyond budget. And the numbers are true. We have, you know, we have put $9 billion in there, and I want to point out that some of the cost overruns, the majority of that problem hasn't been with the agency. It has been with the people in this room, the people in the Congress, and the people over at 1600 Pennsylvania Avenue.

We haven't given NASA the resources they need to complete the missions we have asked them to do, and I hope to eliminate that process in the future, and again, keep the Constellation Program going.

Madam Chairwoman, I yield back.

Chairwoman GIFFORDS. Thank you, Mr. Olson.

The Chair will now recognize Ms. Edwards.

SYSTEMIC WEAKNESS OF GOVERNMENT ACQUISITIONS

Ms. EDWARDS. Thank you, Madam Chairwoman, and thank you for holding this hearing and discussion today. I think it is really important and especially in light of the Administration, the President's release of the budget for 2011.

I want to—and I just wanted to say I do share the concerns expressed by my colleagues about the proposed budget and the impact on human spaceflight and essentially decimating America's human spaceflight capacity. I think there is a bit of an inconsistency between thinking about it and as the President has outlined, the future and 21st century technology and job creation for this century and maintaining a robust human spaceflight program. And we need to resolve those inconsistencies, and I look forward to working with the committee and with this subcommittee in doing that.

I am concerned about a couple of things. One, Ms. Chaplain, you said that—you noted in your testimony that NASA has produced over the years some amazing research and technology, but the projects cost more and take longer. How much different really is this say from Department of Defense large-scale weapon systems or military spaceflight? How much greater are the cost overruns and the financial management problems in—within NASA different from these—from say the Department of Defense and other agencies? Because I think we suffer from some of those same problems across the board in the Federal Government, and the fact that we are spotlighting NASA for I think a cut, a decimation of the human spaceflight program, looking at those kind of things, really misplaces where we need to go in terms of how we think about risk taking and technology.

And I also wonder whether you have had an opportunity really to look within the culture of NASA where I think that there are times when the agency recognizes the limitations here in the Congress, and as Mr. Olson has pointed out, at 1600 Pennsylvania Avenue, and then constrains its requests to the Congress and then we run up costs in programs and systems. And that is in, you know, and I don't know that that necessarily can be placed at the foot of the agency.

Ms. CHAPLAIN. I would say NASA's issues with constant schedule overruns are very similar to the ones that DOD, particularly the space systems, and the underlying causes are very similar, and some of that does have to do with culture and the competition for funding and having a lot of instability in that funding process.

I will note at DOD there has been cuts in big programs there as well.

PROGRESS ON IMPROVING PROGRAM MANAGEMENT

Ms. EDWARDS. Thank you, and then I am also curious as to—and perhaps, Admiral Dyer, you can comment on this, when you look at things like contractor management and trying to stabilize, stabilizing engineering designs and those challenges that NASA faces, do you think that the agency is actually on a path and perhaps Mr. Martin, you could talk to this, speak to this as well, is actually on a path to doing a better job there so that there is a little bit more predictability for future programs?

Admiral DYER. I think the situation is improving. It is certainly a focus for General Boldon, but you do give me an opportunity to make a point I was thinking about during Ms. Chaplain's answer to your question.

Cost and schedule and safety warp and weave. They are very tightly related to one another, so both from a safety perspective as well from a program management cost performance perspective. If I could give this subcommittee a gift in deliberation going forward, it would be an independent, truly independent cost estimate, one that is independent of the missionary movement, the folks that are trying to sell a program, and one that is also independent of the folks that are trying to fit a program within the available budget. In my experience and many folks on the panel, an independent cost estimate is the key to predicting the future.

Ms. EDWARDS. Thank you, and lastly, is there any indication whatsoever that abandoning the human spaceflight program in terms of its residence within NASA will result in any lower costs and would change any of the challenges that you have already identified that NASA faces?

I will take that—as I mentioned in my opening, it won't change the challenges. There still needs to be a lot more discipline in the acquisition process. We need cost estimates to improve, we need them to be independent. There is a lot of things that need to change whether that Constellation Program is there or not. The condition is very systemic across the agency.

Thank you very much.

Chairwoman GIFFORDS. Thank you, Ms. Edwards.

The Chair will recognize Mr. Hall.

I am sorry. Mr. Rohrabacher.

Mr. ROHRABACHER. Thank you very much, and thank you, Chairman Hall.

PUBLIC VS. PRIVATE MANAGEMENT OF SPACEFLIGHT

We are all pretty shocked about the President's budget one way or the other. There are some good things in it, there are some things in it that we really need to discuss, and I am very pleased that we have got some people who are focusing on these issues.

Today our witnesses are not necessarily here to discuss the new budget, however, and not even perhaps to discuss policy but to talk about key challenges that we face in America's Space Program, and safety is, of course, one of the preeminent challenges.

Let us note that those of us who do believe that mankind is destined to head into space and that we look at that as a dramatic challenge to our generation, to continue that movement of humankind into space, that we understand that there are great risks involved with this perhaps most noble of human endeavors. And that is to locate human beings elsewhere in this universe.

But let us also note there that great risks should not be the impediment to fulfilling that task. They are saying, and Admiral, I am sure you have heard this many times, that if a captain thinks his only responsibility towards the ship is the safety of his ship, he will never leave port, and there are safety elements that we have to have identified with my colleagues. Remarks recently—we just heard about comparing the cost overruns and some of the efficiency problems of NASA to the Department of Defense.

Let me just note that that is not a proper comparison. The proper comparison is are these extra costs and are these overruns comparable to the private sector, and that is the question that needs to be asked and perhaps I would ask that of our witness.

Ms. CHAPLAIN. We have compared——

Mr. ROHRABACHER. To Space X, et cetera.

Ms. CHAPLAIN. Yeah. We have done some comparisons to the other space companies and found out most of the commercial companies don't have the same costs and growth, but you have to remember they are not chasing after the same requirements. They have much less demanding, they are not pushing the technical edge that DOD and both NASA are trying to do.

Mr. ROHRABACHER. Okay. Pushing the edge and let us take a look at this and look at some of the things that that indicates.

Admiral, in your statement you indicate that Ares, the government approach to trying to—new approach to getting into space, has been designed from the very beginning with a clear emphasis on safety. Is it your contention that Space X or Orbital or Lockheed Martin or Boeing have not had an emphasis on safety in launching, in developing and designing their launch vehicles?

Admiral DYER. For sure. These are right-hearted folks, and they have given safety a great consideration, but I would make two points, sir. The first is they are on contract only for cargo deliveries, not for human transport.

Mr. ROHRABACHER. Uh-huh.

Admiral DYER. Number one, and number two, the information, the knowledge that needs to be transmitted in terms of human rating requirements out of NASA and provided to the commercial sector has not been published, has not been made available.

And by the way, that is a hard challenge because while NASA has human rating requirements, they are for NASA, and they rest on a foundation of 50 years of understanding and institutional knowledge.

Mr. ROHRABACHER. Right.

Admiral DYER. To transmit that out to new activities with new undertakings is quite——

Mr. ROHRABACHER. Well, is it your contention that these private companies are then developing something that is unsafe?

Admiral DYER. Absolutely not, sir. I didn't say that.

Mr. ROHRABACHER. All right.

Admiral DYER. What I said was they don't have the measuring stick yet available to answer that question.

Mr. ROHRABACHER. Uh-huh. So these requirements that we are talking about just have not been presented by NASA then. Is that it?

Admiral DYER. That is correct.

Mr. ROHRABACHER. So we have a bureaucratic impasse, not based on a willingness of these private companies to meet standards, but instead by, again, a government agency not being able or willing to do its job in a timely manner.

Admiral DYER. Upon General Boldon's arrival at NASA, this activity started, and it started in earnest in the last quarter of last year, but in terms of being behind the ball, yes, sir.

Mr. ROHRABACHER. So how long do you expect this to take before we can actually let these—I have been involved with commercial space concepts for 20 years now, and I think it should be a cost-effective alternative to just simply relying on the government for these endeavors. How long do you think it should take to develop this certification and these standards that we can measure these companies by?

Admiral DYER. Less time than it will take but you need, sir, to, I think, put that question to NASA rather than the panel. We can never speak, neither speak for them, nor do we have the insight of the staffing requirements in terms of the timeline or delivery.

Mr. ROHRABACHER. Let me be very——

Chairwoman GIFFORDS. Mr. Rohrabacher, your time——

Mr. ROHRABACHER.—just a clarification on a point that he has already made. You then are not saying that the Ares Program by what you are testifying today is that—you are not saying that it is safer and more reliable than the counterparts in the private sector? You are not saying that?

Admiral DYER. We are saying that it is well ahead on that timeline because it had human rating requirements and institutional knowledge and from the get-go had a set of measuring sticks——

Mr. ROHRABACHER. Does that mean safer? That you consider them to be safer and that the other ones are less safe?

Chairwoman GIFFORDS. Mr. Rohrabacher, we are going to do a second round of questions.

Mr. ROHRABACHER. All right.

Chairwoman GIFFORDS. So I think it is just important that everyone gets a first round of questions——

Mr. ROHRABACHER. Got it.

Chairwoman GIFFORDS.—and then hold that, and we will come back to you in a few minutes.

Mr. ROHRABACHER. All right. Got it.

Chairwoman GIFFORDS. Thank you, Mr. Rohrabacher.

The Chair recognizes Mr. Wilson.

MANAGING THE SHUTTLE AND CONSTELLATION TRANSITIONS

Mr. WILSON. Thank you, Madam Chairman.

The ASAP mentioned that the current workforce transition plans were drawn up assuming that the Constellation Program would be executed. These plans have been put on hold because of the uncertain future of NASA's human spaceflight program. How are NASA personnel being impacted by the delays in settling on a new strategy, number one? Number two, how quickly can NASA modify and implement these transition plans once a final decision is made with regard to the Constellation Program?

Please, anyone on the panel give me that. Start with you, Mr. Martin.

Mr. MARTIN. That would be fine. Obviously, the—it is exactly right that the transition plan was based on retirement of the Shuttle and movement of the technology and many of the people onto the Constellation Program. There needs to be a new development of this workforce transition strategy, and it is going to affect NASA's people, it is going to affect NASA's parts and NASA's facilities.

As far as a timetable for execution of that, that is up the agency. I think they need to develop the strategy. I doubt that it is developed at this point and then how long it would take to implement that remains to be seen.

Mr. WILSON. Ms. Chaplain.

Ms. CHAPLAIN. I would agree, but I would also add that to NASA's advantage it does have a very robust, strategic human planning process and a lot of good mechanisms for dealing with uncertainties and changes. They were dealing with that somewhat under the Constellation Program, a lot of flexibility needed to be in place because we didn't quite know what the requirements were yet for Constellation.

So I have confidence that the agency has a lot of good tools and processes to manage this uncertainty, but it will take time because it is a big change.

Mr. WILSON. Admiral Dyer.

Admiral DYER. I really don't have anything to add. I think Mr. Martin and Ms. Chaplain covered the water, sir.

Mr. WILSON. Okay. You know, we are very concerned.

OVERSIGHT OF COMMERCIAL HUMAN SPACEFLIGHT

The jobs and what all effects it has, NASA Glenn in Ohio is significant and concerned about the decisions that are being made and why we are going through the time that we are. Then in my second question, if the decision is made to end NASA's direct involvement in sending U.S. astronauts into space, what would be an appropriate level of NASA involvement in oversight during vehicle design and development?

Ms. CHAPLAIN. I covered a little bit of this before, but I think they should have a much stronger role than they have now under the COTS Program. They do have a pretty good process and guidance and certifications for bringing new commercial vehicles on to do science missions, and it is a very rigorous process, and it involves a lot of oversight into the design of the vehicles and what is behind them.

So I would see that as sort of the starting point for the thinking of what should happen when it comes to human spaceflight.

Mr. WILSON. Thank you. Admiral Dyer.

Admiral DYER. Well, sir, I think you do touch this requirement for a delicate balance, and the balance is deep enough insight to be able to certify and to manage the process of certification but at the same time to have enough distance to allow commercial industry to exercise efficiencies and hopefully speed that are promised.

Mr. WILSON. Thank you. Mr. Martin.

Mr. MARTIN. I have nothing to add, Mr. Wilson. Thank you.

Mr. WILSON. Thank you very much.

Chairwoman GIFFORDS. Thank you, Mr. Wilson.

The Chair will now recognize Mr. Olson.

Oh. Mr. Hall.

HUMAN RATING REQUIREMENTS

Mr. HALL. Okay. Thank you. Thank you very much.

I won't go any further than Mr. Rohrabacher and Congressman Wilson have gone on their questions, but just one thing I would like to ask is will each competing commercial crew vehicle and launcher have its own set—own unique set of requirements?

Admiral DYER. I would not anticipate, sir, that the requirements would be different. The performance requirements. Design approaches may be different, but there will be different trades across the system at large, and you can meet a common set of requirements with different approaches.

Mr. HALL. And I note that you support or supported the theory of the Constellation because of its safety. I somehow gleaned that from your testimony, and I believe, and I would like to ask you how you feel about the President just clearing off a place and canceling

it, but I don't imagine that is one that you all, any of you want to answer. We sure would like to hear it, but I will get away from that.

ENSURING ACCESS TO LEO

A premise underlying NASA's reliance on commercial human space launches, that the launch company is going to be a successful business, but if they have a bad day at the launch pad or if sufficient customers don't materialize, there is always the risk of going out of business. Right?

Admiral DYER. Sure.

Mr. HALL. So leaving NASA then and the Nation in the lurch, what steps should NASA take to ensure that it has alternative means of getting U.S. astronauts to and from orbit if we are in the hands of a contractor that falls by the wayside or doesn't come up to do what they have indicated that they can do?

It gives you some concern, doesn't it?

Admiral DYER. Well, sir, it isn't cheap, but if you have sufficient resources, and the undertaking is of sufficient importance, an acquisition technique is to dual source, to mitigate that risk that you discussed.

Mr. HALL. Well, money ain't much, but it sure keeps you in touch with your kids. That is what you are saying.

Admiral DYER. Yes, sir.

NASA ROLE IN COMMERCIAL SPACEFLIGHT

Mr. HALL. And I ask, Admiral, proponents of the commercial human spaceflight have argued that presently NASA relies on private contractors to build, maintain, and launch the Shuttle. NASA is merely the Shuttle owner. Right?

Admiral DYER. NASA's involvement today in programs is significantly more engaging.

Mr. HALL. But they are the owner.

Admiral DYER. They are the owner.

Mr. HALL. And by giving up their ownership role and becoming the customer, there is an implication that little else has changed in the relationship or in the execution of the program, and from a safety perspective what are your thoughts about the significance of being a mere customer now? Going from an owner to being just a customer?

Admiral DYER. Well, when we talk about certification and the process of certification, we are talking about clearing up or sharpening up this gray zone that extends from just contracting the services over to being the systems integrator and general contractor if you want to use a term from the housing industry perhaps.

It can be—you can rest at many places on that continuum, Congressman Hall, but deciding what is the right place is work yet to be done.

Mr. HALL. I can't disagree with that, but if the private contractors fall by the wayside and we have lost the faith of our international partners and we have lost our huge professional group of people that have carried out the work of NASA, we would be in a pretty tough situation, wouldn't we?

Admiral DYER. It would be regrettable, sir.

Mr. HALL. I thank you, Admiral. I admire you, and I thank you for your testimony.

I yield back. Thank you, Madam.

Chairwoman GIFFORDS. Thank you, Mr. Hall.

The Chair recognizes Ms. Kosmas for five minutes.

Ms. KOSMAS. Thank you very much. Thank you all for being here today. I happen to be the representative from the 24th Congressional District in Florida, which is the home of Kennedy Space Center, so obviously, your participation in the discussions as we move forward are very important to me, and like many others have expressed today, I am extremely concerned about some of the lack of direction that we might have in the policy as put forth in the President's budget. I don't see a vision, I don't see an inspiration, and I see a major loss of workforce and workforce skills.

SHUTTLE EXTENSION

So I have a couple questions that I would like to ask first to Admiral Dyer and Ms. Chaplain. Can you discuss whether or not you have studied the recertification process for the Shuttle? In other words, what it would take to fly the Shuttle past 2010, and how that could be impacted if we should make a determination that we want to add a couple of Shuttle flights?

Ms. CHAPLAIN. We have not been requested to do that study, and we have not done work there.

Ms. KOSMAS. Do you know if the certification process is in process, recertification process?

Ms. CHAPLAIN. I don't believe so.

MAINTAINING VITAL SKILLS IN TRANSITION

Ms. KOSMAS. Okay. Okay. The other question I guess it would be for anybody who wants to answer it. What do you see in terms of human spaceflight expertise, capabilities, and critical skills? Are we at risk of losing in the Nation due to the gap in the human access to space after—U.S. access to space after the Shuttle is retired, and how do we go about retaining those skills, particularly if the government's human exploration program is put on a hiatus, which is apparently what is happening in the Administration's budget directive.

Ms. CHAPLAIN. I think NASA has a very good basis to build on when it comes to determining what skills might be at risk with this transition. For the past several years they have been going through a skill-mapping exercise at all their centers, determining like what are the very critical skills each center needs to retain, what kind of skills they are, and so they kind of have an inventory now of what they need and what they have, and they can look at this change coming up and see what the gaps are, because they could be considerable, and you don't want to lose certain expertise in case there is something disastrous that happens, and you need to call people back.

Ms. KOSMAS. I appreciate that. Again, if they have been doing this assessment for several years, it would be somewhat not relative to where we look to be moving based on what we have

learned this week. So I guess the question then becomes—that you all observed that the current workforce transition plans were drawn based on what we anticipated to happen, that is to say, obviously, that the next phase would be Constellation and so forth.

Now, these plans would be on hold because the uncertain future of what has not been identified frankly as the U.S. Human Spaceflight Program.

So if you can put that into the answer, I would appreciate it.

Ms. CHAPLAIN. Yeah. Just to clarify what I said earlier, at least they have an as-is inventory, so they know what kinds of skills they have onboard. As they look to the new programs coming on and the new requirements that they will have, they will at least have the first part of the basis that they need to do a gap analysis for. You are exactly right that going forward it is going to be a whole new kind of ballgame in terms of what you want to stay on board, what you may not want. That part is going to be all new to them.

SHUTTLE EXTENSION

Ms. KOSMAS. Okay. With that response let me go back to Admiral Dyer, if you don't mind. Can you answer the earlier question that I asked about the certification and whether you have any details on what it would take for an extension should there be a Congressional move towards extending the Shuttle Program for a couple of flights?

Admiral DYER. Well, let me repeat a caution from the panel. We think the most dangerous thing that could happen to us with regard to extending the Shuttle would be serial extension. A couple more followed by a couple more followed by a couple more.

Ms. KOSMAS. Okay. I am going to run out of time, but let us just assume four or less.

Admiral DYER. With that said, could the Shuttle be extended? Absolutely. It would be, we believe, a fairly serious and expensive undertaking.

Ms. KOSMAS. Okay. Again, I am going to run out time, but I want to just express to you, again, my appreciation for your being here and my extreme concern for my particular loss of jobs and the lost opportunities for this Nation to remain number one in space exploration in the world and continue to be a leader with this undefined plan. I think you are going to see based on what you have heard here that Congress is going to fill in some of the blanks with what we see as our vision.

Thank you, Madam Chairman.

Chairwoman GIFFORDS. Thank you, Ms. Kosmas.

Mr. McCaul.

OPINIONS ON CONSTELLATION

Mr. MCCAUL. Thank you, Madam Chair.

In his State of Union, President Kennedy outlined the mission of NASA, and that was to land a man on the moon and return him safely to the earth, and according to the NASA website their vision was to explore the universe and search for life and to inspire the next generation of explorers as only NASA can.

I believe that with the President's cutting in his budget of the Constellation Program it undermines that very mission, the vision of NASA, and the actual, the principles upon which NASA was set up in the first place was human spaceflight. I am concerned about the impact on our children in science and math, in those fields, and I am concerned about our leadership in the world as it relates to the Russians and the Chinese by scrapping this human spaceflight program.

We have invested a tremendous amount of money, billions of dollars already in the Constellation Program. Now, I know this may be a policy decision that may be a little bit over your pay grade, but I would like to get some comment from you as to why we are doing this.

Ms. CHAPLAIN. I really can't offer a comment. We don't look at policy and the goodness of it or not at GAO.

Mr. MCCAUL. Well, instead we are moving to an earth science mission as opposed to a human spaceflight mission. That is what I am getting from this Administration, and I am sorry. Did you have a comment?

Mr. MARTIN. Just that at the Inspector General's office we don't do policy. We come behind the policy made by the agency and then criticize them.

Mr. MCCAUL. Well, maybe you could criticize them here.

GAP IN HUMAN SPACEFLIGHT

Admiral, I don't know if you have a comment. You may not want to touch that, but as it relates to the commercial, I mean, we are going to have a gap in human spaceflight in my judgment, and it sounds like the plan here is to have a commercial spaceflight somehow fill the void and the gap there. I have got some serious questions and reservations whether that is going to—or that it is possible.

Can you comment on that and also the fact that, you know, we have been working on the safety requirements as it relates to Orion and Ares. Why wouldn't that also apply to commercial?

Admiral DYER. Would you restate that last part?

Mr. MCCAUL. Well, first of all, do you think, do you really think that, I mean, I think we are going to have a real gap and a break in human spaceflight under this proposal. Do you really think the commercial sector after we have invested billions of dollars in infrastructure in NASA can possibly fill that gap in this short period of time?

Admiral DYER. Well, you constrained that in a number of ways. Again, the panel believes that Ares I is the quickest gap fill because it has been underway for a considerable period of time with human transport, a fundamental part, and with NASA's knowledge imparted into it. Again, can commercial industry do that? Absolutely. Is it important to have a commercial industry going forward? I think the panel would agree, but it is a question of what are those goals that we talked about earlier in the testimony.

Mr. MCCAUL. But do you foresee a disruption in human spaceflight, though, under this plan?

Admiral DYER. We think that some of the positions that say that the commercial industry can deliver a launch vehicle in three years probably is unrealistic given the work to be done.

Mr. MCCAUL. You know, sir, and I am all for competition in the private sector. I just think we have—NASA has had a, you know, a very different mission here. We have invested a lot of money into NASA, and particularly in the Constellation Program, and I hate to see that being completely scrubbed and taken out of this budget.

And with that I yield back.

FULLY UTILIZING THE ISS

Chairwoman GIFFORDS. Thank you, Mr. McCaul.

With that, members have expressed an interest in a second round of questions, so I will begin.

I would like to talk about the International Space Station. The President did outline a proposal to extend the ISS until 2020, and this is, of course, something that has been expressed favorably by members of the subcommittee for quite some period of time, even in consideration of the fact that the International Space Station is not even yet completed, we certainly don't want to de-orbit it and not take advantage of the science and technology that we have worked so hard and paid so much to construct.

Ms. Chaplain, can you talk about the primary obstacles in the way of utilization in terms of effective research for the International Space Station and the provisions and the upcoming NASA authorization legislation that you think would enhance greater prospects for better research on the ISS?

Ms. CHAPLAIN. Yes. We identified several challenges in our recent report on the Station. One of them just being the mere absence of the Shuttle itself severely limited as to what you can take up and down from the Station, even more so in terms of what you can take down, and that matters a lot for scientific research. The results of the high cost to develop experiments and launch them, those costs were somewhat unknown and unknown as to who would really pay for them when you are involving other agencies like the NIH.

There is also the issue of little crew time available on the Station to manage experiments, so they have to be as automated as possible, which could be a disincentive to some researchers.

There has also up until recently been very much uncertainty about the retirement date for the Station, which is another disincentive for the scientific community to really engage. You need a lot of lead time to plan for experiments.

In terms of the authorization, we looked at other national labs to see how they manage their facilities and could anything be helpful for the Station, and we did identify three things, one being a central management body to kind of help put the research together, decide what is the most important, ensure that it is peer reviewed, and NASA recognized that this could be a good practice. It just—that idea hasn't gone anywhere for a couple of years, and I know you guys have emphasized it a couple of times.

The need for robust, in-house technical expertise, that was lost in recent years on the Station Program, and that really needs to come back if you want to fully utilize the Station.

And then the idea of significant user outreach, NASA does have activities to outreach to user communities, but they really could be more robust, and I think the budget helps provide some of those resources, but it really needs to be emphasized that they need to have very strong outreach efforts.

Chairwoman GIFFORDS. To follow up with that, you touched on it, but can you elaborate on NASA's progress so far in establishing some agreements for using the ISS in conjunction with federal agencies, perhaps private firms, academic institutions, and the provisions in, again, the upcoming authorization that would enhance the prospects of the ISS becoming a national lab?

Ms. CHAPLAIN. What was the second part of that?

Chairwoman GIFFORDS. Yes. The chances, what we can do to improve the prospects of the ISS becoming a national laboratory.

Ms. CHAPLAIN. Okay. In terms of agreements, we—I think there were five in place at the time of our review, and it doesn't sound like a large number, but they seem to be very significant agreements. There weren't any with academic institutions at the time of our review. They were with agencies like the NIH.

In terms of what could be done to improve the utilization, the biggest issue we saw was resources just in the hands of the managers of the station. They have been depleted over the years, and they are not able to do all the things they could be doing to man the station, and then also to kind of encourage NASA to manage it more like the labs in terms of having a central management body kind of help collect all the research ideas, decide who is going to go on board and to really assist the users in their ability to use the Station. You need a lot of guidance and outreach out there to kind of tell people what is available and then, you know, bring them into that process.

Chairwoman GIFFORDS. Thank you. Admiral Dyer, any safety concerns with the extension of the ISS beyond 2015?

Admiral DYER. No specific ones. We—our scope has been limited to looking at the operation of ISS and look at logistic support.

I might add just one point, and that is while the panel has expressed some concerns about COTS contractors or others in terms of human rating, their ability to deliver cargo to space has been underway, has been an intimate part of the design from the beginning, and we think can help significantly.

Chairwoman GIFFORDS. Thank you.

Mr. Olson.

TRANSITIONING WORKFORCE AND INFRASTRUCTURE

Mr. OLSON. Thank you, Madam Chairwoman.

Question for Mr. Martin and Ms. Chaplain regarding human spaceflight infrastructure costs. NASA has estimated that the carrying cost of the Shuttle Program was approximately $2.7 billion a year to pay for much of the personnel, management, and related infrastructure costs at the several NASA centers devoted to human spaceflight.

If NASA implements its proposed human spaceflight program, as the Obama Administration wants, by becoming a customer of commercial space launch companies, how should it book keep the infrastructure and personnel now charged to the shuttle program, as-

suming that some portion of those same facilities in people continue to play a role in human spaceflight?

Mr. Martin.

Mr. MARTIN. That is a good question. I will defer that if I could to Ms. Chaplain. We have not done work in that area. We are looking at the—our work to date has focused on the transition of the Shuttle Program, the costs associated with that, and the concerns we have about NASA being able to maintain its ambitious and aggressive schedule.

Mr. OLSON. Thank you. Ms. Chaplain.

Ms. CHAPLAIN. Well, one thing our work showed is there are a lot of aging facilities out there, and the plans for the transition effort weren't really showing what costs would be involved in terms of revitalizing facilities that you could keep for Constellation and what you couldn't. Obviously, now, everything changes, so the question is what do you do with all these facilities. NASA will have to go through a process where it examines everything, because some things could be available to the commercial suppliers, for example, on a leasing basis.

So they will just have to think more out of the box in terms of what to do with the facilities. If they take them down and dispense with them, as they may have done with the Constellation transition, there is a lot of costs associated with environmental clean-up and indirect costs that could be better reflected in budgets and things like that.

Mr. OLSON. Thank you.

Mr. MARTIN. Sir, if I could raise one related matter——

Mr. OLSON. Sure.

Mr. MARTIN.—and that is the issue of deferred maintenance and facilities. I know that wasn't exactly what you were asking, but as far as being a significant challenge facing NASA and an expensive challenge, I think the latest estimate is there has been about $2.5 billion in deferred maintenance at NASA's aging facilities, and that is a key issue that NASA needs to keep its eye on the ball.

Mr. OLSON. Thanks for that answer, and I want to get—many of my colleagues mentioned the issue of workforce transition, and sort of what is happening now with the President's budget out there, and I spent yesterday, I talked with the director of the Johnson Center, Mike Coats, and he is spending his days in the office going around to every employee, ever federal employee that he has oversight over to talk to them, letting them know what he knows and trying to assuage their fears about their future.

And he is very confident that they are going to proceed as the professionals they are and complete the five, you know, we have got three operations working out of the Johnson Center. We have got the Constellation, the Shuttle, and the ISS, and you know, with the Administration's budget we are going to be down to one. But he is confident the five Shuttle missions, they are going to do their darnedest and be the professionals they are. They are going to come off without a hitch.

SAFETY IMPLICATIONS OF TRANSITION

But I just want to—how would you rate NASA's overall efforts to keep its Shuttle workforce fully focused on flying safely out the

manifest? Do you see any deficiencies? And as a follow-on question, now that the Administration has proposed canceling the Constellation, by injecting new uncertainties in terms of a follow on system, scheduling jobs, would this further complicate NASA's ability to keep the Shuttle workforce for at least to close out the five manifested flights we have?

Admiral Dyer.

Admiral DYER. I think that is perhaps the most significant, near-term safety worry. You are a Navy veteran, and in keeping with Chairwoman Giffords opening with the historical story of the Chinese Navy, let me use a naval term that you will appreciate. Underway without way on. The layman's definition of that is there is always risks in drifting while you are trying to figure it out.

So whatever the route forward, to transition from deciding to implementing will lower this risk and allow for better human resource management and keeping the skills necessary to fly safely.

Mr. OLSON. Thank you very much.

Ms. Chaplain.

Ms. CHAPLAIN. We have commended NASA for its ability to try to manage the workforce through the transition and assure that the right people are maintained for the Shuttle. They have used things like DCMA employees and other kinds of measures to get stop-gap people in there.

But definitely this change will further complicate matters.

Mr. OLSON. Mr. Martin.

Mr. MARTIN. As you indicated, it is incredibly important that NASA keeps its eye on its mission, especially this Sunday with the launch of Endeavour, and so I think if they, you know, what we have seen as NASA, very professional work for us, but the potential changes out there do create an air of uncertainty that NASA is going to need to manage through.

Mr. OLSON. Thanks for the answers. I see I have used my time up.

Chairwoman GIFFORDS. Thank you, Mr. Olson.

The Chair will recognize Ms. Edwards.

Ms. EDWARDS. Thank you, Madam Chairwoman. I have a couple of areas of questions.

SBIR PROGRAM PROGRESS/MINORITY CONTRACTING

First for Mr. Martin and Ms. Chaplain. In 2009, both the GAO and the OIG noted that in your audits and investigations, "They continue to reveal systemic weakness in the area of acquisition and procurement to include awards as part of the Small Business Innovation Research, the SBIR Program."

And I would note that in the announcement of the awards of $50 million in Recovery Act funding, to companies for development and demonstration contracts—concepts, five of the companies that received awards, none were minority owned. There may have been one woman-owned business, and I wonder if you could comment on how NASA is meeting its goals for investing in small, minority-owned businesses?

Mr. MARTIN. Just quickly, we have done a fair amount of work in the SBIR Program and actually have raised a series of concerns that the lack of internal controls. These tend to be—not to be large

contracts or grants. I think NASA's focus given this multitude of other issues has been to push the money out. I don't think there have been adequate, again, safeguards to make sure that, frankly, there is not double dipping where someone is putting in for an SBIR grant through NASA and at the same time through the National Science Foundation.

Ms. EDWARDS. Uh-huh.

Mr. MARTIN. So I think we can learn, we can adopt past practices from the National Science Foundation and others, and we can monitor and oversee these grants much more effectively.

Ms. EDWARDS. Well, I think I would like to see, you know, a little bit more analysis both from GAO and from the Inspector General to look at NASA's minority contracting processes. I know over at Goddard Space Flight Center, you know, a number of businesses in and around the center who want to do business there, it is very complicated for them, they don't understand the contracting process, and although I think the Administrator has made a commitment on this, I don't—I can't see the pathway toward meeting those commitments.

Also, in the general contracting area and looking at subcontracts and then analyzing where those subcontracts are going as well, and I would like to see some additional reporting and analysis in that area.

Mr. MARTIN. The Inspector General's Office has an ongoing review looking at the entire NASA SBIR Program. I have been here——

Ms. EDWARDS. Not just SBIR, though. I am talking about looking at—because, you know, that is one way for small minority-owned businesses to get in. Women own businesses to get in the door, but the general contracting processes and making sure that those are spread out across our small and our large business community and that the subcontracting processes also are open in that sense.

And I just—I really want to pay attention to this because if we are investing on one hand in developing scientists, engineers, and researchers who represent the broad base of our population, and we expect them, some of them to be entrepreneurs, where do they get a foot into the agency?

Anyway, I just leave that for open consideration for the future.

HUMAN RATING REQUIREMENTS

Just as a close here, Admiral Dyer, in your statement you said that the 2009, report has been widely read, strongly commended, and energetically criticized. With those well-rounded metrics we believe we have fulfilled our statutory purpose, which is to infuse safety considerations into an informed debate.

And I want you to know that this subcommittee is really appreciative of ASAP's contributions, and we will continue to seek your counsel on safety matters, but I also am sure that you are aware that Mr. Elon Musk, the CEO of SpaceX, and one of two COTS manufacturers disagrees with your panel's findings and conclusions regarding the human rating of SpaceX vehicles currently under development. He says that the Falcon 9 Rocket and Dragon Spacecraft, "meet all of NASA's published human rating requirements apart from the escape systems," and it was reported also that he

said that the members of your panel didn't review SpaceX's data and have, "no idea what our margins are and what is and what isn't human rated."

Why is there so much divergence in the views held by ASAP and Mr. Musk regarding SpaceX's human rating status?

Admiral DYER. Well, I think Mr. Musk used the phrase that he has lost respect for the panel. I would tell you that the panel has not lost respect for Mr. Musk. He is an icon, an American entrepreneur. There is great strength in that, and these folks make great things happen. I would predict an exciting future for SpaceX, but in terms of fundamentals the human rating requirements have not been published by NASA, and therefore, a claim that one meets them we think is incorrect. It is that simple.

Ms. EDWARDS. Thank you very much, and I yield, Madam Chairwoman.

Chairwoman GIFFORDS. Thank you, Ms. Edwards.

The Chair recognizes Mr. Rohrabacher.

Mr. ROHRABACHER. Thank you very much. Let me just note that earlier my colleague suggested that there would be a gap in human space, our capabilities if the President's budget suggestions are followed. It is not going to be just a gap. I hope we all understand. We are not talking about a gap here. The President's budget is leaving us with no governmental alternative to human space transportation in the works, anyway.

So this is something that should be taken very seriously by those of us who do believe that human beings should be, eventually be playing a role in space. Let us just look at—and let me take a look at one other element here.

We have had one test of—on all of this research that has been done on Constellation. One test that had no new technology and hardware, no new hardware in that test, and that brought us to $9 billion that we spent on the program that now is being suggested that we scrap. This does not speak well of using our government as the vehicle of getting human beings into space, whether it is Elon Musk or whether—I know in the, for example, Boeing has the Delta System that could someway be reconfigured, but instead we spent $9 billion, and we didn't even have any new hardware.

So we—if we are going to have human beings in space, which I believe in, we have got to get serious about this, and we can't simply just go back and say, NASA, we are going to rely on NASA to do it, because obviously it is not working out.

Let me get back then to some analysis of this human space endeavor. Admiral, how long did it take us—it seems to me that the stumbling block now is still NASA in the sense that we have to have these standards, and you—that will determine human flight, whether human flight is possible in a certain vehicle. How long did it take us to determine that the Soyuz vehicles were approved for Americans?

Admiral DYER. Sir, I don't know the definitive answer to that. We have had discussions with regard to the NASA senior technical leadership, with regard to the safety of Soyuz——

Mr. ROHRABACHER. Okay.

Admiral DYER.—but I am afraid we don't know the details.

Mr. ROHRABACHER. Apparently it took about three years for us to, even to analyze what the Soviets had been doing for a long time, much less a new system, which is being developed.

Don't you see this as one unacceptable burden and weight that are being carried perhaps by some of our—the entrepreneurs in the private sector? To wait for that long just before they will even know what the standard is, much less being able to incorporate it into their designs?

Admiral DYER. I am a bit more empathetic in the following sense. This institutional knowledge that is part of NASA, to communicate that to the private sector is a job to be done and one that needs to be done carefully, and some discussions on this topic a week or so ago I used an analogy, sir, and it was—it is one thing to give a building code to an electrician of significant experience. A guy who has built a lot of houses.

Mr. ROHRABACHER. Uh-huh.

Admiral DYER. But to give a building code to a novice electrician that doesn't have that history of experience in working in the human, in this case, by stretching the analogy, in this human arena, it is a dicier undertaking.

Mr. ROHRABACHER. Well, let me go back on that. You know, I worked for a guy, sorry, I worked for Ronald Reagan, and Reagan always told me that, well, you know, the experts know every reason why something can't be done, and so quite often it is a better thing to bring in fresh blood and new thoughts that may not have the experience but may have an open vision to new ideas, and perhaps certainly new approach to trying to do things in a cost-effective manner than what the NASA bureaucracy has been showing us that they do in this last decade or two.

Well, thank you very much to all of you for sharing your talents with us today, and sharing your thoughts because we need this type of input the thank you, Madam Chairman, again, for your leadership, which you are constantly demonstrating in your leadership here on this subcommittee.

Chairwoman GIFFORDS. Well, thank you, Mr. Rohrabacher.

We have one final question from Ms. Kosmas, but just to—you know, you threw out a question, Mr. Rohrabacher, that I would like Ms. Chaplain to answer concerning the investment that has been made so far in Constellation, the $9 billion that has been spent.

PROGRESS ON CONSTELLATION

Obviously, you know, it wasn't—just for one test flight so if you could just detail briefly the money that has been invested so far in the program.

Ms. CHAPLAIN. Well, it was more than just that test flight. I think concurrently there was a lot of money being invested in developing the new stuff that will be eventually included in Ares and Orion, and you have to think about all the money that went to Orion, too, but a lot of the money—concurrently as Ares I was being developed, it is going into the new parts in the final spacecraft.

Chairwoman GIFFORDS. And either Ms. Chaplain or perhaps Admiral Dyer, can you comment on how far along Orion is at this point?

Ms. CHAPLAIN. I believe they recently had their preliminary design review, and the Constellation Program as a whole is expected to have a preliminary design review this spring. That put them very close to the time and point when NASA would consider moving them into the formal phase of acquisition, what we call implementation. That is when baselines get set, that is when they are held more accountable.

One thing that has been talked about here today is cost overruns. Technically they haven't had cost overruns because there is no baseline. We are just looking at more money that was put to the contract than was originally anticipated.

Chairwoman GIFFORDS. Okay. Thank you.

The Chair will recognize Ms. Kosmas.

Ms. KOSMAS. Thank you, Madam Chairman.

ROLE OF NASA IN COMMERCIAL SPACE PROGRAM

I apologize. This is a busy day in my office today, but this is an extremely important matter to me. I want to—and I am sorry I missed some of the answers and questions and answers earlier, particularly with regard to safety and the assessment of commercial safety.

But I want to move onto a slightly different question, ask you, Ms. Chaplain, does NASA have the tools to—in place to manage a commercial procurement program, and what steps would you recommend to enable NASA to adequately manage such a program, particularly, and how would that affect Kennedy Space Center?

Ms. CHAPLAIN. They do have the beginnings of that in place, and but I think what they need to do is to see how much more robust it needs to be. Up until now the idea of having a commercial crew was plan B, not the only plan. So you have—when it becomes the only plan, you kind of need to reconsider all your contracting tools, your oversight mechanisms, and you probably want to ramp up things, you know, in a more position of strength in terms of oversight and management than you had when it was just going to be one of several options.

Ms. KOSMAS. Okay. Thank you for that answer. I guess it sort of begs the question then, do you, does anyone want to make a statement as to whether or not they believe that the policy articulated by the Administration anticipated this or adequately provides an opportunity for this to be addressed?

Ms. CHAPLAIN. I don't know the budget and enough detail to see that happening myself.

Ms. KOSMAS. Okay. Thank you. I yield back.

Chairwoman GIFFORDS. Thank you, Ms. Kosmas.

Before we bring the hearing to a close, I just want to thank our witnesses for testifying before the subcommittee today, particularly for the GAO and for the IG's office. There are a lot of people that work with you that we don't see. They are behind the scenes, but you know, every member of Congress and all the American people really depend on the work that you do. I would say underappreciated probably not quite understood, and I just want to thank the two of you and if you will please pass that onto your colleagues.

Admiral Dyer as well, thank you, not just to you but to members of your panel for your many, many years of dedication to, you

know, a very, very important issue that is facing our Nation really at the moment.

The record will remain open for the next two weeks for additional statements from members and for answers to any follow-up questions that perhaps the subcommittee members may have of the witnesses, and as I said in my opening remarks, you can be assured that the full Science and Technology Committee and our subcommittee as well will be holding a series of hearings over the next few weeks to examine the President's proposed budget.

The witnesses are now excused, and the hearing is adjourned. Thank you.

[Whereupon, at 11:44 a.m., the Subcommittee was adjourned.]

Appendix:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Paul K. Martin, Inspector General, National Aeronautics and Space Administration

Questions submitted by Chairwoman Gabrielle Giffords

Q1. The ASAP's latest report says that over 80 percent of NASA facilities are beyond their design life, annual maintenance is underfunded, facilities continue to degrade and facilities failures are starting to impact missions and have safety implications Agency-wide.

Q1a. Is this another neglected area in need of resources at the Agency?

A1,1a. Yes. As the ninth largest federal government property holder, NASA owns more than 100,000 acres with over 6,000 buildings and other structures that provided more than 44 million square feet of space. Most of the buildings and other structures are more than 40 years old and some predate the establishment of NASA. NASA's deferred maintenance has increased over the last several years as the Agency has focused its funds on mission and project-oriented priorities.

Q1b. Does the NASA IG know the extent to which NASA's facilities are in need of repair, how much this will cost, and what the priority projects are?

A1,1b. The NASA OIG is currently conducting an audit of NASA's processes for identifying and prioritizing maintenance projects. NASA's estimate of deferred maintenance increased from $1.9 billion in fiscal year (FY) 2005 to $2.55 billion in FY 2009. Each NASA Center maintains a list of priority maintenance and upgrade projects.

Q1c. Is this area likely to receive greater attention with the recent establishment of a Construction and Environmental Compliance account as required by NASA's FY2010 appropriations?

A1,1c. Possibly. Creation of the separate account has the potential for focusing greater attention on the deferred maintenance backlog, but it remains to be seen whether this will translate into increased spending in this area.

Q2. If a decision is made to carry U.S. astronauts on a commercial transportation system in the future, NASA will, likely need early warning safety systems. Can you suggest any "time out" indicators that would be capable of providing NASA and the Congress a warning when projected margins of safety are in danger of being reduced?

A2. The OIG has not conducted any recent oversight work on this issue. Moreover, since the Aerospace Safety Advisory Panel (ASAP) evaluates NASA's safety performance, we believe this question would be best addressed by ASAP.

Q3. Are you satisfied with NASA's efforts to enhance its application of sound project management principles and identification of technical and safety risks? What key areas warrant the OIG's continued oversight?

A3. In the past year, the OIG has found deficiencies when we examined the Agency's risk management efforts at the program and project levels. For example, we found that the Landsat Data Continuity Mission was facing a cost increase and possible launch schedule delays because mangers awarded the contract before finalizing baseline requirements. In reviewing the Orion Project, we found that the Project Office conducted a life-cycle review with a version of the vehicle that was under revision instead of delaying the review until the revised vehicle configuration was developed.

Given the importance and cost of its projects. NASA must establish and validate project requirements, manages risks, and controls costs and schedules using established life-cycle reviews.

Q4. Your memorandum on serious management challenges references the risk posed by counterfeit or inferior parts. I understand that testing is being done to determine the extent of "improperly treated non-conforming" titanium" on the $2.5 billion Mars Science Laboratory scheduled for launch later this year. NASA is concerned that some parts built using this non-conforming titanium might not withstand the stresses, pressures. temperatures present during the life of the mission. Is the risk of counterfeit parts being purchased a growing issue and if so, how can NASA protect itself from this problem?

A4. A recent proliferation of counterfeit electronic parts (primarily microchips) is a new risk to NASA's programs and operations. We have found that trade in international counterfeit electronic parts begins with traders who export scrap circuit boards from the United States to foreign-based counterfeiters who remove, copy, and after the parts so they appear to be new parts from reputable manufacturers. Domestic distributors then buy the parts and sell them as genuine to industry or government buyers, including NASA and the Department of Defense.

Protecting NASA programs from counterfeit electronics is a complex task that involves sensitive law enforcement investigations and aggressive oversight policies within NASA. This includes NASA's continued commitment to world class quality assurance programs for its critical systems, continued participation in interagency information sharing groups on counterfeit parts, and a zero tolerance management philosophy that holds offending contractors accountable. In that regard, NASA OIG is fully integrated with the interagency law enforcement to address the distribution of counterfeit electronics alongside the FBI and the Department of Homeland Security.

Q5. In your November memorandum, you note the need for NASA to examine the effectiveness of its ethics training and processes. Investigations completed by your office have identified cases such as conflict of interest and false statement charges stemming from the steering of earmarked funds to a client and a NASA scientist steering contracts to a company operated by his spouse. In addition to improving ethics training and enforcement, what other ways can NASA use to reduce instances of ethics violations with its acquisitions?

A5. Given that NASA spends approximately 90 percent of its $19 billion budget on contracts and grants, it is imperative that NASA employees comply with applicable ethics laws and regulations. The significant interaction between NASA employees and individuals in the private sector, both in industry and academia, underscores the scope of this ongoing challenge.

Any efforts to reduce ethics violations do not lend themselves to a singular solution. Ethics training, awareness, and active enforcement of ethics laws and regulations are critical components in ensuring NASA employees and contractors have a clear understanding of their respective roles, responsibilities, and the consequences for noncompliance. Agency initiatives such as NASA's Acquisition Integrity Program have proven to be valuable ethics training tools for acquisition practitioners. But we also believe the Agency can further reduce violations in the acquisition process by strengthening its procurement oversight mechanisms, particularly in the pre-award phase of the contracting and grant process. For example, in the area of grants OIG investigations in the area of Small Business Innovative Research indicate that a strong "certification" process is helpful in ensuring that the award is not an opportunity for fraud—such as billing two federal agencies for the same research.

Q6. Last July, your office reported on NASA's research in support of FAA's modernization of the nation's air traffic control system known as Next Gen. The report identified some instances where NASA research activities could be better coordinated with FAA. What do you recommend be done?

A6. Since issuance our report, NASA has taken action to coordinate more effectively with FAA on Next Gen support. In response to one of our recommendations, the NASA Associate Administrator for the Aerospace Research Mission Directorate established a policy for coordinating investment decisions with FAA's Joint Planning and Development Office that includes quarterly meetings to discuss strategic issues.

Questions submitted by Representative Pete Olson

Q1. What are your views about NASA's reliance on Space Act Agreements to fund commercial space capabilities in lieu of the more standard acquisition based on Federal Acquisition Regulations? And going forward, where is the threshold that should compel NASA to discontinue using Space Act Agreements in favor of a FAR-based acquisition?

A1. Space Act Agreements provide NASA a means to meet wide-ranging NASA mission and program requirements and objectives by partnering with diverse groups of people and organizations, both in the private and public sector. The agreement partner can be a U.S. or foreign person or entity, an educational institution, a Federal, state, or local governmental unit, a foreign government, or an international organization.

Historically, NASA has used the broad authority granted in the Space Act to further a variety of the Agency's missions. However, funded agreements, under which

the Agency transfers appropriated funds to a domestic agreement partner, may be used only when NASA's objectives cannot be accomplished with a procurement contract, grant, or cooperative agreement.

The OIG intends to examine NASA's use of Space Act Agreements to fund commercial space capabilities in order to ensure that the Agency is adhering to requirements of the Space Act and Federal Acquisition Regulations, and, ultimately, obtaining the best value for the taxpayer.

Q2. With regard to commercial crew and cargo procurements, NASA's FY2011 budget request states that, "Government requirements are kept to a minimum and are only concerned with assuring safe interaction with the ISS. The partners [meaning commercial launch companies] are not required to follow the standard NASA Program and Project Management Processes and Requirements, NPR 7120.5." In other places, the budget says crew safety won't be compromised and acknowledges the imperative of safety, but otherwise provides no detail. What are your thoughts about NASA's proposal to relieve commercial launch providers from adherence to NPR 7120.5? How difficult would it be for NASA to maintain good insight and oversight?

A2. NPR 7120.5 and other NASA acquisition and life-cycle management requirements are based on sound management principles and should be the standard for all NASA program and project procurements. It is unclear to us how NASA intends to maintain the contractor oversight currently required by Federal and NASA regulations in the absence of a requirement to follow NPR 7120.5 and other NASA acquisition and life-cycle management requirements.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Cristina T. Chaplain, Director, Acquisition and Sourcing Management, Government Accountability Office

Questions submitted by Chairwoman Gabrielle Giffords

Q1. Cyber-security is a growing concern across government, as well as in the private sector.

Q1a. Do control weaknesses similar to those GAO found at NASA that jeopardize the agency's systems and networks exist across other federal agencies?

A1,1a. Unfortunately, NASA is not unique. Most federal agencies have deficient information security. We have identified information security as a government-wide high risk area since 1997. Having said that, the 187 recommendations that we made during our audit are the most we made in an engagement.

Q1b. Is GAO satisfied that NASA is moving in the direction of correcting these weaknesses in a systematic and pro-active way?

A1,1b. It appears that NASA is moving in the right direction. In his "60 day letter" dated January 6, 2010, the NASA Administrator provided a detailed accounting for each of the 179 technical recommendations we made in an October 2009 report designated for limited official use only. In essence, the Administrator concurred with 159 recommendations, partially concurred with 10, and non-concurred with 10. He also provided details on the status of planned and completed actions to mitigate the vulnerabilities. The actions identified by the Administrator will, if effectively and consistently implemented, improve the agency's information security program. We plan to follow-up with NASA to assess the effectiveness of its corrective actions going forward.

Q2. The ASAP's latest report says that over 80 percent of NASA facilities are beyond their design life, annual maintenance is underfunded, facilities continue to degrade and facilities failures are starting to impact missions and have safety implications Agency-wide.

Q2a. Is this another neglected area in need of resources?

A2,2a. As the ninth largest federal government property holder, NASA owns more than 100,000 acres of real estate, as well as over 3,000 buildings and 3,000 other structures totaling over 44 million square feet. Like many federal agencies, NASA faces considerable challenges addressing facilities needs with limited funds. In January 2003, GAO designated federal real property a high risk area because of long-standing problems with excess and underutilized property, deteriorating facilities, unreliable real property data, over-reliance on costly leasing, and building security challenges.

Q2b. Do we know the extent to which NASA's facilities are in need for repair, how much this will cost, and what the priority projects are?

A2,2b. In 2008, GAO reported that NASA has a $2.3 billion repair backlog. NASA has used a contractor since 2002 to conduct annual deferred maintenance assessments of all its facilities and their component systems. NASA contractors visually assess nine different systems within each facility (such as the roof and the electrical system), and rate each facility using an overall condition index with a scale from 0 to 5. Based on that rating, the contractor uses an industry cost database and other information to estimate the costs of correcting the identified deficiencies. According to NASA officials, using a contractor and a standard estimating methodology to assess all its facilities provides consistent information across sites.

Furthermore, NASA requires its Centers to conduct their own detailed condition assessments at least every 5 years. These assessments, which are separate from the annual deferred maintenance assessments, are used by the Centers to identify and prioritize repair and maintenance projects. According to officials at the Ames Research Center, for example, their assessment focuses more on active, mission-critical assets and repairs and maintenance that they will try to get funded within the next 5 years. According to NASA officials, the backlog reported by these individual NASA centers is lower than the deferred repair and maintenance needs NASA reported because the centers include only the most important projects that they believe should receive funding, instead of all projects to address their backlog as estimated in NASA's annual deferred maintenance assessment report.

Q2c. Is this area likely to receive greater attention with the recent establishment of a Construction and Environmental Compliance account as required by NASA's FY 2010 appropriations?

A2,2c. Establishment of a Construction and Environmental Compliance account should provide the Congress better visibility to NASA's plans to revitalize or construct facilities and its environmental and restoration activities.

Q3. If a decision is made to carry U.S. astronauts on a commercial transportation system in the future, NASA will likely need early warning safety systems. Can you suggest any "time out" indicators that would be capable of providing NASA and the Congress a warning when projected margins of safety are in danger of being reduced?

A3. Although GAO has not performed any work in this area, in my opinion NASA should have processes in place to obtain the insight into all design, production, and test activities and should have approval authority over top level requirements, test strategies, success criteria, and anomaly resolution. Furthermore, before flying astronauts on commercial launch vehicles, NASA should subject these vehicles to a formal certification process including an agency inspection of vehicle designs, contractor engineering process and analysis of data from all flights and test events. This certification should also consider demonstrated flight history, e.g., vehicles with less successful flight history should be subject to more stringent certification requirements. Furthermore, the Congress could direct NASA to provide periodic reports on key performance metrics of programs or projects in order to facilitate the Congress' oversight of those programs.

Q4. Philosophically, it is hard to disagree with GAO's call to ensure that adequate knowledge is secured at key development points, especially for large and costly projects. However, some may question the cost-effectiveness of applying this approach uniformly, such as for low-cost missions when the agency is openly willing to take greater risks in return for the promise of lower development costs. What are your views on this matter?

A4. Regardless of the size of the mission, we believe that risk should be managed by demonstrating the requisite knowledge prior to moving from one phase of development to the next, as even low-cost missions have life-cycle estimates of hundreds of millions of dollars. However, as long as the all risks are known, openly recognized, accepted, and planned for, it is hard to argue that knowingly accepting risks for low-cost efforts is inherently bad. Unfortunately, history shows that there can be issues associated with this type of approach. For example, in the 1990's the NASA administrator challenged agency personnel to do projects faster, better, and cheaper by streamlining practices and becoming more efficient. The goal was to shorten program development times, reduce cost, and increase scientific return by flying more and smaller missions in less time. However, smaller lower cost missions do not always result in successful projects. For example, NASA experienced a few notable failures such as the Mars Polar Lander and Climate Orbiter. After-action reports commissioned by NASA found that the Mars Program failures resulted from cost and schedule constraints and a lack of rigorous attention to sound process and practices. In addition, NASA experienced extensive negative feedback about the failure of missions developed under the faster, better, cheaper effort.

Q5. GAO, in its reviews of large scale acquisitions in DOD and NASA, has consistently advocated for applying knowledge management principles during system development. Is this the only way to look at the health of an acquisition project, or are their other indicators that also need to be examined?

A5. There are various models that can be used to look at the acquisition approach for a project and all tend to focus on having the processes in place that allow you to gain the knowledge and employ the discipline necessary to manage a project, just as GAO's framework does. Further, many of the metrics we use are incorporated in NASA's acquisition policy for spaceflight systems. Regardless of the type of metrics used, the ability to measure knowledge, processes, and outcomes is critical to achieving improved project outcomes. Metrics provide important indicators for decision makers, as achieving the right knowledge at the right time enables leadership to make informed decisions about when and how best to move into various expensive acquisition phases. Our extensive body of work examining world-class enterprises and the way they operate has validated their value for programs that must deliver a new product to market at a certain time and within a certain investment cost or suffer significant consequences. While knowledge and outcome metrics provide valuable information about the potential problems and health of programs, they

are of limited value if acquisitions do not begin with realistic plans and baselines that are informed by doable requirements and accurate cost and schedule estimates prior to development start.

Q6. In your latest assessment of selected large-scale projects, you identified cases where contractor performance was a challenge. One case involved the buyout of a company. Evidently, NASA had difficulty exerting pressure on the company to get better performance. NASA told GAO that terminating the contract due to poor performance and bringing the work in-house would result in a one-year delay. I find it troubling that NASA is in this box. I recognize that NASA cannot anticipate all mergers and buyouts. What would you recommend be done to avoid NASA being at the mercy of contractors who know NASA's options are limited?

A6. Most of NASA's missions are one of a kind and space development programs that require specialized expertise and are complex and difficult by nature. For this reason, it can be difficult to change contractors in midcourse. Nevertheless, NASA still needs to have a business-oriented culture that provides the appropriate level of oversight and insight into their contractor's activity. This could allow the agency to be proactive in monitoring the work being done by contractors and, in some cases, subcontractors. By doing so, any problems with the contractor's performance or potential delays could be identified sooner and corrective actions could then be put in place.

Questions submitted by Representative Pete Olson

Q1. What are your views about NASA's reliance on Space Act Agreements to fund commercial space capabilities in lieu of the more standard acquisition based on Federal Acquisition Regulations? And going forward, where is the threshold that should compel NASA to discontinue using Space Act Agreements in favor of a FAR-based acquisition?

A1. Other transaction authority enhances the federal government's ability to acquire cutting-edge science and technology, in part by attracting contractors that have not typically pursued government contracts. Other transaction authority was created under the National Aeronautics and Space Act of 1958, commonly referred to as the Space Act, and agreements utilizing NASA's other transaction authority are known as Space Act agreements. NASA uses other transaction authority to enter into a wide range of agreements with numerous entities to advance NASA mission and program objectives including international cooperative space activities under international agreements. Space Act Agreements are agreements other than government contracts, grants, or cooperative agreements and may take a number of forms. Under a reimbursable agreement, the partner pays for work NASA conducts for the partner's benefit. Under a nonreimbursable agreement, each party assumes responsibility for its own costs for a project that furthers NASA's mission. Under a funded agreement, NASA provides funding to the partner to accomplish a NASA mission. These Space Act Agreements are one of the many tools that NASA has to acquire goods and services or establish relationships to advance NASA's mission and program objectives.

A funded Space Act agreement should only be used when NASA cannot use a federal procurement contract or other type of agreement for a transaction. Unfortunately, the Space Act does not establish a threshold as to when to use a Space Act Agreement versus a federal government contract; it is simply based on business judgment. These types of agreements are not federal government contracts and, therefore, generally are not subject to those federal laws and regulations that apply to federal government contracts. Consequently, agreements formed using other transaction authority permit considerable latitude in negotiating agreement terms. For example, Space Act Agreements allow NASA flexibility in negotiating intellectual property and data rights, which generally stipulate each party's rights to technology developed under the agreement. Since these agreements are generally not subject to the certain federal laws and the Federal Acquisition Regulation, they carry the risk of reduced accountability and transparency if not properly managed. Space Act Agreements establish a set of legally enforceable promises between NASA and the other party to the agreement, requiring a commitment of NASA resources such as personnel, funding, services, equipment, expertise, information, or facilities, to accomplish the objectives stipulated in the agreement. Because Space Act Agreements do not have a standard structure based on regulatory guidelines, they can be challenging to create and administer. While NASA has established guidance on how to implement these agreements, in our opinion NASA must have staff with ex-

perience in planning and conducting research and development acquisitions, strong business acumen, and sound judgment to enable them to operate in a relatively unstructured business environment.

Q2. With regard to commercial crew and cargo procurements, NASA's FY2011 budget request states that, "Government requirements are kept to a minimum and are only concerned with assuring safe interaction with the ISS. The partners [meaning commercial launch companies] are not required to follow the standard NASA Program and Project Management Processes and Requirements, NPR 7120.5." In other places, the budget says crew safety won't be compromised and acknowledges the imperative of safety, but otherwise provides no detail. What are your thoughts about NASA's proposal to relieve commercial launch providers from adherence to NPR 7120.5? How difficult would it be for NASA to maintain good insight and oversight?

A2. While NASA Procedural Requirements 7120.5D is not necessary to execute a successful project by a commercial company, it is imperative that NASA establish in its contract or agreement a uniform process and set of metrics that it can use to identify potential problems that could lead to cost, schedule, or performance shortfalls. For example, NASA used a Space Act agreement for the Commercial Orbital Transportation Services (COTS) project and it was not required to follow NASA Procedural Requirements 7120.5D. We reported that NASA used these management requirements as a guide to ensure that it had the proper program authorization and planning documentation in place for the COTS project. Such plans help define realistic time frames, identify responsibility for key tasks and deliverables, and provide a yardstick by which to measure the progress of the effort. NASA developed a program authorization document that outlined NASA's management structure, project objectives, acquisition strategy, project scope, funding profile, and planned program reviews. In addition, the first performance milestone in NASA's agreements with its commercial partners required the partners to develop a program or project management plan that included the overall project schedule with milestones and described how the partner would manage the development process and identify and mitigate risks. Each commercial partner successfully passed this milestone. Furthermore, during the course of our review of the COTS project, we found NASA's management has generally adhered to critical project management tools and activities and the vast majority of project expenditures were for milestone payments to COTS partners. NASA has also taken several steps since the beginning of the COTS project to ensure that risks were identified, assessed, and documented, and that mitigation plans were in place to reduce these risks. NASA has communicated regularly with its partners through quarterly and milestone reviews and provided them with technical expertise to assist in their development efforts and to facilitate integration with the space station.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Joseph W. Dyer (U.S. Navy, Retired), Chair, Aerospace Safety Advisory Panel, National Aeronautics and Space Administration

Questions submitted by Chairwoman Gabrielle Giffords

Q1. The ASAP's latest report says that over 80 percent of NASA facilities are beyond their design life, annual maintenance is underfunded, facilities continue to degrade and facilities failures are starting to impact missions and have safety implications Agency-wide.

A1. The ASAP based its finding that over 80 percent of NASA facilities are beyond their useful life on a recent NASA presentation to the American Council of Engineering Companies. That assessment is consistent with the conditions that we have observed during our regular visits to centers and reviews of NASA activities. Examples of facility shortfalls include: expensive deep space probe assembly bays that lack basic fire protection; a clean room used for spacecraft assembly that shares a room with the dust pad being used to develop Mars Rover extraction techniques (separated by a sheet of plastic); and a Saturn era rocket motor test stand being refurbished for modern propulsion testing, but with insufficient funds to scrape the rust off of the 50 year old steel structure.

Q1a. Is this another neglected area in need of resources?

1a. Yes, this is clearly an area that requires addressing. While the positive attitude of the workers that we meet attempts to transcend the facility conditions, there is no question that lack of proper facilities impacts their productivity and morale, and potentially, the quality of their products.

Q1b. Does the NASA IG know the extent to which NASA's facilities are in need for repair, how much this will cost, and what the priority projects are?

1b. It is our understanding that the NASA IG will respond to you directly on his knowledge of specific facility needs.

Q1c. Is this area likely to receive greater attention with the recent establishment of a Construction and Environmental Compliance account as required by NASA's FY 2010 appropriations?

1c. While funding mechanisms are outside the purview of the ASAP's primary focus, it would appear that having a fenced funding stream dedicated to facility improvements and maintenance would reduce the need to "steal from Peter to pay Paul," or in this case "steal from facilities to pay for mission." The impact on mission will depend directly on how its funding was affected by the Construction and Environmental Compliance account creation, a subject that we have not studied.

Q2. If a decision is made to carry U.S. astronauts on a commercial transportation system in the future, NASA will likely need early warning safety systems. Can you suggest any "time out" indicators that would be capable of providing NASA and the Congress a warning when projected margins of safety are in danger of being reduced?

A2. There are signs that a program is under stress and thus vulnerable to short term or incomplete thinking that increases risk. The most obvious of these follow:

A. When the three principal program metrics—cost, schedule, and performance—no longer align, the program may be in trouble. Cost, schedule, and performance are inevitably linked together. Should one principal metric be altered, either deliberately or inadvertently, and the other two are not adjusted, then there is a probability that something is amiss, e.g., that additional risk or trade-offs are taking place that could impact safety.

B. In a program where oversight by the customer is essential to ensure safety and subsequent certification, a "closed hand" attitude on the part of the executing team (either public or private) such that reasonable outside review is not possible is most certainly a warning signal. The present Shuttle Program is a great example of things done correctly. While such extensive visibility may not be possible for a developmental program, the Shuttle Program sets a good example to be emulated. When programs are open to review (i.e., outside information, ideas, and criticism), they are able to make well informed decisions.

C. Failure of or resistance to witnessed testing is a danger sign of a program in trouble. Testing, especially of critical systems, should be carried out such that they can be witnessed by an appropriate oversight authority. In the best programs, the objective of the test and the expected results are also reviewed by the same oversight authority. Unpredictable data is dangerous data. Data like this demonstrates an incomplete understanding about how a parameter is produced, and the next time the result could be far worse than expected.

D. Key personnel/workforce fluctuations normally precede problems. When key management personnel (i.e., lead engineers, analysts, etc.) begin to leave a program, for reasons that are neither clear nor explainable, this indicates instability in leadership which inevitably leads to uncertainty in the workforce. Sudden lay-offs within the contractor base, even if not in the same program, can indicate a problem. Also, financial instability in a key contractor or subcontractor can indicate potential problems downstream if the needed parts and pieces must be farmed out to another source.

E. Sudden and unanticipated changes in the program's objectives can lead to rapid design changes that can cause things to be missed. "Constancy of purpose" means that the entire team executing the program understands the final objective and makes the myriad daily choices in that direction. If there are changes in the final objective, a full, detailed program review that includes the responsible agency should be mandatory.

F. When the agency representatives who are the "boots on the ground" in the plant begin to be concerned, you can be reasonably certain that there is concern for the program and the decisions that are being made. These representatives play an invaluable role in maintaining cognizance that a contractor's systems (quality, cost, work planning, scheduling, supervision, workforce training and skill set, etc.) are being maintained. These functions are highly valuable for maintaining visibility and oversight in a program. The FAA uses similar representatives and quality assurance personnel in civil aviation programs—they do it differently, but the effect is very similar.

G. A weak relationship between the oversight agency and the contractor is a sure warning sign. A strong "partnership" relationship cannot be overemphasized. This relationship, built on a mutual drive towards a common goal, will be the best protection against unseen risk entering the program. Likewise, the workforce's identification with that same goal helps ensure that the people involved understand the importance of doing their work right and identifying problems so that they can be corrected.

Q3. The ASAP states, in its annual report, that no Commercial Orbital Transportation Services (COTS) provider is currently human-rated qualified and therefore abandoning Ares I for an alternative without the alternative's capability being demonstrated is unwise.

Q3a. How would one go about conducting a safety assessment as the ASAP envisions?

A3,3a. First, NASA must publish safety requirements; the assessment will follow an evaluation of a provider's ability to fulfill those requirements.

Q3b. Who would conduct the assessment and what criteria or guidelines would be used?

A3,3b. Only NASA subject matter experts have the deep knowledge needed to conduct these assessments. Independent entities such as the ASAP, and the representative from, for example, academia and the national academies, should be afforded the insight necessary to attest that NASA undertook a complete, fair and balanced approach.

Q4. In the past, the ASAP has commented on the implications of proposals aimed at reducing the gap in U.S. human space flight launch capability. Now, with reports that the administration is proposing to rely on yet-to-be built commercial crew transportation systems, are there any gap-related issues the ASAP believes Congress should be cognizant of?

A4. Like others involved in the space sector, the ASAP is aware that after the Shuttle's retirement, NASA will not have a NASA-developed human spaceflight capability for several years and will need to rely on others during this period. While there are both short and long term options that NASA can use to fill its requirement for access to the Space Station, those options have advantages and disadvantages

and previously have been reviewed by NASA, your Subcommittee, and others. Considering this, the ASAP continues to caution that if actions are taken to rapidly close the current gap, including delaying the Shuttle's retirement or accelerating the development of alternative vehicles including commercial systems, those actions must not and cannot compromise safety. Required engineering analysis, testing, certification, and verification must be completed, and adequate funding to support these actions must be provided. To do otherwise will only further extend the gap and could further delay exploration beyond low-Earth orbit.

Q5. Your report says that NASA must be fully candid with the public and Congress, and those audiences must fully understand what risks are involved. You urge that risks be communicated clearly to Congress and the public because not doing so is disingenuous and does the Nation a disservice.

Q5a. What was the impetus for this observation?

A5,5a. In the ASAP's 2009 Annual Report, the Panel observed, "NASA has made significant cultural progress evolving and strengthening internal communications as well as communications within the technical community. Internally, the Agency now speaks more plainly, openly discusses risk and risk management, and better ensures dissenting voices are heard. Largely gone is the "spin" noted by the CAIB. External communications has been slower to evolve, and "spin" still remains a part of these communications. The Panel does not believe this practice best serves the Agency." We continue to see NASA's external communicators practicing public affairs techniques that are contrary to the transparency that we believe would better serve the Agency. One small example: While NASA's public affairs staff issued a press release announcing the publication of the ASAP's Annual Report, they did so late on a Friday before a three day weekend. A source that asked not to be identified noted, "This is a technique the public affairs shop uses to minimize press coverage which they believe may cast NASA in a less than favorable light." We are fully confident NASA Administrator Bolden is putting in place policies and processes that will lead to greater transparency. Such transparency is challenging due to the difficulty in communicating highly technical issues to a nontechnical public. Still, NASA must find a way to successfully communicate the level of risk inherent in experimental space flight. The Agency must be supported in doing so by Congress and the Administration.

Q5b. Does the panel project greater risks in space exploration in the future?

A5,5b. Yes. Reaching farther—to the Moon and Mars—brings greater risk because it involves more time and distance in space. More modern design techniques, better materials, and better modeling and simulation tools will serve to reduce risk. The safety impact from commercializing space transportation has yet to be determined and will depend on how well NASA's knowledge can be transferred to the private sector, the sophistication of the acquisition strategy, and the sufficiency of resources provided. The net result remains uncertain.

Q6. Last year, it was reported that the Air Force's 45th Space Wing had performed a study which raised concern about the ability of the crew of Orion to survive an explosion of the Ares I rocket within the first minute of launch. I understand that the Air Force does analyses as part of its responsibilities in providing tracking and safety services for all launches from Kennedy Space Center and Cape Canaveral Air Force Station.

Q6a. During the course of your safety oversight duties, did the ASAP follow up on the Air Force's concern and was it appropriately addressed by NASA?

A6,6a. The ASAP did follow-up on the Air Force's concern during our 1st Quarterly Meeting on February 23, 2010, at MSFC. Data presented by Mr. Anthony Lyons, Deputy of the Flight Performance Systems Integration Group for Constellation, provided an overview of the Constellation Integrated Aborts Assessment. The presentation included a discussion of the 45th Space Wing debris assessment and noted the reasons for the potential differences between that assessment and the Ares integrated risk assessment. The crew safety concern expressed by the 45th Space Wing involved the debris hazard associated with an Ares first stage explosion during ascent. The 45th Space Wing assumed that any intrusion into the debris cloud is 100% fatal. The Ares/Simulation Assisted Risk Assessment (SARA) team used the 45th Space Wing debris catalog to model the explosion scenarios, but also included high-fidelity modeling of the debris flux, detailed thermal analysis, and an accurate Orion trajectory. The Ares modeling indicated that the strike probability would be 0.013 for an abort at 60 seconds mission elapsed time, 12 g Launch Abort System acceleration, and a 2 second abort delay. The Ares results, which have been shared with

the 45th Space Wing, show that the 45th Space Wing and Ares modeling are in close agreement given the same assumptions. The ASAP is satisfied that the Air Force's concern was appropriately addressed by NASA.

Q6b. Is it still an issue?

A6,6b. In the opinion of the ASAP, the differences in the 45th Space Wing and the Ares assessments are not an issue. NASA is ultimately responsible for public safety and astronaut safety and uses the 45th Space Wing to assist them. Staff of the NASA Constellation Program and the 45th Space Wing meet regularly through the Constellation Range Safety Panel and other forums to discuss range safety issues. Results to date show that the Constellation ascent abort design provides for crew survival during all phases of ascent, and that the abort design is sufficiently robust for Preliminary Design Review and allows for further improvements. There is still a considerable amount of ascent abort work to do, including more detailed analyses and the need to determine operationally preferred method of ascent aborts from a risk/complexity perspective.

Q7. In your prepared statement, you say: "The ASAP's advice is to carefully and adequately provide resources and to realistically schedule work We believe both resources and scheduling must include a "management reserve" to accommodate issues that will arise as new designs evolve and working relationships mature." While I believe this to be wise advice, management reserves, as you know, seem to be prime targets for budget cuts. How can NASA best make the case for those management reserves?

A7. In any large program, it is impossible to thoroughly anticipate all future developments and events. In the execution of difficult technical programs, sometimes developments and testing must occur to address areas that are not well understood at the time of project inception. Since the technology answers cannot always be appropriately anticipated, it is important to add in resources, normally funding and time, to account for these unknowns. Sometimes the additional resources are called a "management reserve," or "contingency." This extra funding is prudent, normal, and is targeted appropriately for the issues particular to each given program.

NASA should be in a position to benchmark its reserve, linking the estimated need for funding and time with the level of unknown. Usually, this is summarized as a percentage of the total requested funding. To remove this funding before the unknowns are effectively addressed, is to violate the basics of better management practices that are suggested by today's universities and business leaders. NASA should be in a position to benchmark its reserve with similar large programs, as technology development is usually a part of any large endeavor.

Questions submitted by Representative Pete Olson

Q1. You noted in your statement that the ASAP believes NASA must do a better job communicating "the level of risk inherent in experimental space flight." Would you elaborate on that statement? What do you consider to be the essential elements to convey to the public, and how do you best modulate the message so as not to be counter-productive to the agency's mission, which, by its very nature, carries significant risk?

A1. In order for audiences external to NASA (and by those audiences, the Panel means the public, the Administration, and the Congress) to better understand the level of risk associated with space flight, NASA has to provide more than just a safe or unsafe declaration. While go/no-go decisions must be made by NASA in its everyday operation, the factors that are considered when making these decisions are very complex and not readily apparent to those external to these decision processes. A simple "safe" or "unsafe" description implies a certainty of performance that does not and never can exist. Therefore, when an activity that was declared to be "safe" results in a mishap, external observers may conclude that something must have been done incorrectly and that someone should be blamed because a "safe" process failed. This can negatively impact confidence in NASA's ability to manage its programs and to appropriately allocate resources to programs and projects.

In reality, no operation can ever be 100 percent safe as there is always some element of risk. This message of ever-present risk must be clearly communicated to all stakeholders and audiences as well as defining an acceptable level of safety and its possible consequences. If this is not done, NASA will repeatedly suffer degradation to its reputation and loss of confidence. Clear communication about the undesirable things that can occur, and the likelihood that they will occur, does not now exist.

Communicating the level of risk is certainly not easy because the audiences are diverse in their background as well as their ability to understand and interpret data. This means that the methods used to communicate must be diverse and include not only technical assessments, but also give comparisons to activities that are within the public experience base, such as commercial airline mishaps or automobile accidents. The key here is transparency and candor from the outset. Clear descriptions of the potential hazards involved, their likelihood of occurring in both quantitative and descriptive terms, as well as what risks have been accepted by NASA and why such acceptance was worthwhile—if communicated prior to undertaking an activity—are more likely to prevent accusations of cover-up or dodging responsibility when a mishap does occur. This level of transparency and candor in communicating, "how safe is safe enough?", is much more likely to increase the public's trust and support of NASA and its mission than one that only addresses problems after a mishap has already occurred.

Q2. With regard to commercial crew and cargo procurements, NASA's FY 2011 budget request states that, "Government requirements are kept to a minimum and are only concerned with assuring safe interaction with the ISS. The partners [meaning commercial launch companies] are not required to follow the standard NASA Program and Project Management Processes and Requirements, NPR 7120.5." In other places, the budget says crew safety won't be compromised and acknowledges the imperative of safety, but otherwise provides no detail. What are your thoughts about NASA's proposal to relieve commercial launch providers from adherence to NPR 7120.5? How difficult would it be for NASA to maintain good insight and oversight?

A2. The NASA Commercial Crew and Cargo Program is aimed at encouraging the development of commercial space transportation services and an associated market, with multiple suppliers and customers. NASA would be one of these customers, purchasing transportation services on the open market. In an effort to encourage innovation, NASA is proposing to allow providers to use alternatives to the standard NASA program management approaches. This appears to be a reasonable strategy, as long as the providers are held accountable for meeting NASA's existing and future Human Rating standards where appropriate, applicable safety standards, and International Space Station visiting vehicle requirements. In this regard, the ASAP continues to believe that NASA verification that providers have met these requirements is fundamental and should not be changed. Further, the ASAP continues to also believe that critical vehicle subsystems, such as a crew escape system, be NASA-certified prior to acceptance. The fact that the new approach will first be implemented on cargo delivery missions will allow NASA time to evaluate whether its plan for insight and oversight would be adequate for the much more challenging missions involving crew delivery.

In order for industry to maximize safety in the design of systems that are intended to carry crew, it will be very important for NASA to finalize its proposed human rating requirements as soon as possible. NASA has indicated that it plans to complete an agency and industry-coordinated human rating draft by the end of 2010. The Panel has noted that this timetable has the potential to put NASA behind in building systems currently under development, rather than ahead.