

**AUDIT  
REPORT**

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**FASTER, BETTER, CHEAPER: POLICY,  
STRATEGIC PLANNING, AND HUMAN  
RESOURCE ALIGNMENT**

March 13, 2001

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National Aeronautics and  
Space Administration

**OFFICE OF INSPECTOR GENERAL**

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## **Acronyms**

FBC	Faster, Better, Cheaper
GAO	General Accounting Office
GPRA	Government Performance and Results Act
ISO	International Organization for Standardization
JPL	Jet Propulsion Laboratory
MCO	Mars Climate Orbiter
MPL	Mars Polar Lander
NIAT	NASA Integrated Action Team
NPD	NASA Policy Directive
NPG	NASA Procedures and Guidelines
OIG	Office of Inspector General
OMB	Office of Management and Budget

W

March 13, 2001

TO: A/Administrator

FROM: W/Inspector General

SUBJECT: INFORMATION: Faster, Better, Cheaper: Policy, Strategic Planning, and Human Resource Alignment  
Report Number IG-01-009

The NASA Office of Inspector General (OIG) conducted an audit of the Implementation of Faster, Better, Cheaper (FBC) policies for acquisition management at NASA. By using FBC to manage programs/projects, NASA has attempted to change not only the way project managers think, but also the way they conduct business. Therefore, we considered FBC a management policy that should be defined, documented in policy documents, and incorporated into the strategic planning process. Although NASA has been using the FBC approach to manage projects since 1992, NASA has neither defined FBC nor implemented policies and guidance for FBC. Without a common understanding of FBC, NASA cannot effectively communicate its principles to program/project managers or contractor employees. In addition, the Agency has not incorporated sufficient FBC goals, objectives, and metrics into NASA's strategic management process. Therefore, missions completed using FBC are outside the strategic management and planning process, and progress toward achieving FBC cannot be measured or reported. Finally, NASA has not adequately aligned its human resources with its strategic goals. As a result, the Agency cannot determine the appropriate number of staff and competencies needed to effectively carry out strategic goals and objectives for its programs.

## **Background**

The intent of FBC was to decrease the amount of time and cost for each mission and to increase the number of missions and overall scientific results obtained on each mission. In 1999, after the failure of four missions that used the FBC approach for project management, you commissioned several independent reviews to examine FBC and mission failures, search for root causes, and recommend changes. In March 2000, you tasked the NASA Integrated Action Team (NIAT), led by NASA's Chief Engineer, to define a plan to mitigate the root causes for the failures that were identified in the reports

issued by the independent review teams. The NIAT effort and our audit work were performed concurrently and resulted in two separate reports.

### **Recommendations**

We recommended that NASA define FBC and develop policies and guidance to describe its implementation. Documenting FBC definitions, policies, and guidance will facilitate communication to program/project managers and contractors and strengthen accountability for program results. We also recommended that NASA fully incorporate FBC into the strategic management process. By including FBC as part of the strategic management and planning process, progress toward achieving FBC can be measured or reported. In addition, we recommended that NASA align its staffing with strategic goals. This will allow NASA to determine the appropriate number of staff and competencies needed to effectively carry out strategic goals and objectives for its programs.

### **Management's Response and OIG Evaluation**

Management partially concurred with developing policies and guidance to define FBC and describe its implementation. Management stated that FBC should not be a separate subset of management policies. However, management plans to include the definition of FBC and appropriate changes resulting from the NIAT report in NASA policy documents, as appropriate.

NASA also only partially concurred with the recommendations to align staffing with strategic goals because management does not view FBC as the cause for the staffing issues identified. However, NASA plans to develop a workforce plan for each Center that will link staffing, funding resources, mission and activities and core competencies. In addition, the fiscal year 2002 Performance Plan will include a discussion of Agency human resources.

While the above actions are considered responsive to our recommendations, NASA nonconcurred with the recommendation to fully incorporate FBC into the strategic management process stating that the current coverage of FBC in the strategic management process is adequate. For the reasons discussed in the report, we maintain our position that the current coverage is not adequate. Accordingly, we asked NASA to reconsider its position and provide additional comments. Given your strong commitment to FBC, I hope you will consider fully implementing our remaining recommendations.

Details on the status of the recommendations are in the findings sections of the report.

**[original signed by]**

Roberta L. Gross

Enclosure

Final Report on Audit of Faster, Better, Cheaper: Policy, Strategic Planning, and Human Resource Alignment

**FINAL REPORT**  
**AUDIT OF FASTER, BETTER, CHEAPER: POLICY, STRATEGIC**  
**PLANNING AND HUMAN RESOURCE ALIGNMENT**

W

March 13, 2001

TO: AE/Chief Engineer  
AI/Associate Deputy Administrator  
F/Associate Administrator for Human Resources and Education  
Z/Associate Administrator for Policy Plans

FROM: Assistant Inspector General for Auditing

SUBJECT: Final Report on the Audit of Faster, Better, Cheaper: Policy Strategic  
Planning and Human Resource Alignment  
Assignment Number A0002400  
Report Number IG-01-009

The subject final report is provided for your use and comment. Please refer to the Executive Summary for the overall audit results. Our evaluation of your response is incorporated into the body of the report.

We request that management provide additional information for recommendation 2 as described in the report by May 14, 2001. The corrective action planned for recommendations 1, 3, 4, and 5 were responsive. Please notify us when action has been completed on the recommendations, including the extent of testing performed to ensure corrective actions are effective. All recommendations will remain open for reporting purposes until agreed-to corrective actions are completed.

If you have questions concerning the report, please contact Mr. Daniel Samoviski, Program Director, Earth and Space Science Audits, at (301) 286-6890, or Ms. Esther Judd, Program Manager/Auditor-in-Charge, at (301) 286-3359. We appreciate the courtesies extended to the audit staff. The final report distribution is in Appendix J.

**[original signed by]**  
Russell A. Rau

Enclosure

cc:

B/Acting Chief Financial Officer

B/Comptroller

BF/Director, Financial Management Division

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M/Associate Administrator for Space Flight

R/Associate Administrator for Aerospace Technology

S/Associate Administrator for Space Science

Y/Associate Administrator for Earth Science

GSFC/100/Director, Goddard Space Flight Center

JPL/180-800/Director, NASA Management Office, Jet Propulsion Laboratory

JSC/AA/Acting Director, Lyndon B. Johnson Space Center

MSFC/DA01/Director, Marshall Space Flight Center



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# NASA Office of Inspector General

IG-01-009  
A0002400

March 13, 2001

## Faster, Better, Cheaper: Policy, Strategic Planning, and Human Resource Alignment

### Executive Summary

**Background.** Since 1992, NASA has sought ways to manage programs and projects using an FBC philosophy<sup>1</sup> without compromising safety. This has translated into the launch of large numbers of relatively small, low-cost spacecraft. Conceptually, the FBC approach was intended to minimize the impact of a failed spacecraft on missions while maximizing the amount of science that could be accomplished with limited resources.

**Objectives.** The overall objective was to evaluate the implementation of the FBC policies for acquisition management at NASA. Specifically, we assessed the policies and procedures issued by NASA, including the Enterprises<sup>2</sup> and Lead Centers,<sup>3</sup> related to FBC acquisition management and implementation of FBC acquisition policies and procedures by NASA program and project management. Details on the objectives, scope, and methodology are in Appendix A.

**Results of Audit.** The FBC initiative has changed the way NASA does business, but it has not been adequately defined in NASA's policies and guidance or strategic planning process. In addition, the Agency has not established a clear linkage between mission staffing and the accomplishment of strategic goals.

- NASA Headquarters has not developed adequate policies or guidance for implementing FBC. The lack of policies and guidance weakens accountability for results and could affect mission success (Finding A).

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<sup>1</sup>NASA refers to FBC as a management philosophy. However, by using FBC to manage programs/projects, NASA has attempted to change not only the way project managers think, but also the way they conduct business. Therefore, we considered FBC a management policy that should be defined, documented in policy documents, and incorporated into the strategic planning process. Hereafter, the report refers to FBC as a policy.

<sup>2</sup>NASA established four Strategic Enterprises (Human Exploration and Development of Space, Space Science, Earth Science, and Aerospace Technology) to function as primary business areas for implementing NASA's mission and serving its customers. Each Enterprise has a unique set of strategic goals, objectives, and implementation strategies that address the requirements of the Agency's primary customers. On September 29, 2000, NASA announced the restructuring of the Office of Life and Microgravity Sciences and Applications. This restructuring moved some functions from the Human Exploration and Development of Space Enterprise to a new Enterprise, Biological and Physical Research, which focuses on scientific research.

<sup>3</sup>In general, each NASA program is assigned to a Lead Center that is responsible for implementation, accountability for meeting schedule and budget guidelines, and safety and reliability standards.

- NASA has not sufficiently incorporated FBC into its strategic planning and management process. As a result NASA's FBC goals do not receive sufficient visibility and NASA cannot measure or report its progress in achieving FBC objectives (Finding B).
- NASA has not adequately incorporated strategic human resources management into the Agency's strategic or performance plans. Hence, NASA has not determined the appropriate number of staff or competencies needed to effectively carry out its strategic goals and objectives for its programs, most notably the FBC Mars Program, and may lose core competencies<sup>4</sup> (Finding C).

**Recommendations.** NASA should develop policies and guidance to define FBC and address how it is to be implemented at NASA, fully incorporate FBC into key strategic management documents and report the results in the annual performance report, and align human resources with strategic goals.

### **Management's Response and Evaluation of Response**

**Management's Response.** Management partially concurred with the recommendation to develop policies and guidance to define FBC and describe its implementation. Also, management partially concurred with the recommendations to align human resources with strategic goals. Management nonconcurred with the recommendation to fully incorporate FBC into key strategic management documents and report the results in the annual performance plan. The complete text of management's response is in Appendix I.

**Evaluation of Response.** Although management partially concurred as noted above, we consider its planned actions responsive to the intent of the recommendations regarding (1) developing policies and guidance to define FBC and describe its implementation and (2) describing in the Implementation Strategy sections of the NASA Annual Performance Plan the ways in which the Agency is implementing human resources management.

Management's planned actions are also responsive to the recommendation to develop a workforce strategy that will assess human resources management issues and to develop meaningful data and data systems on which to base decisions tied to all aspects of human resource management. Details on the Agency's actions are in the findings sections of the report.

Management did not provide corrective actions in response to the recommendation to align human resources with strategic goals. However, the planned actions described in response to the recommendation to develop a workforce strategy that will assess human resources management issues will meet the intent of this recommendation.

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<sup>4</sup>The Office of Personnel Management defines core or essential competencies in, "Looking to the Future: Human Resources Competencies," Part 2, dated September 1999, as the foundation of knowledge and skills that result in effective and/or superior performance.

Regarding management's nonconcurrence with the recommendations to fully incorporate FBC into key strategic management documents and report the results in the annual performance plan, we request that management reconsider its position, based on our evaluation in the finding section of the report and provide additional comments.

A detailed evaluation of management's comments is provided with each recommendation in the body of the report.

## Introduction

The FBC approach to NASA project management is an outgrowth of both internal and external pressures on the Agency. The internal pressures stemmed from the multibillion dollar NASA missions of the past that took decades to move from concept to operation and return of data. The external pressures included the Government-wide initiative to do more with less and the desire to identify more effective public/private sector interaction.

In 1992, the NASA Administrator challenged all of NASA, including industry and academia, to use an FBC approach to project management. In a 1992 speech to NASA employees, the Administrator stated, "... tell us how we can implement our missions in a more cost-effective manner. How can we do everything better, faster, cheaper, without compromising safety?" By initiating FBC project management, the Agency intended to maximize the overall amount of science obtained on a mission while minimizing the impact of a failed spacecraft.

During the period 1996 through 2000, there were 6 mission failures out of 25 missions that were clearly associated with exploring the boundaries stimulated by FBC. NASA lost four of those missions, the Wide Field Infrared Explorer,<sup>5</sup> Mars Climate Orbiter (MCO),<sup>6</sup> Mars Polar Lander (MPL),<sup>7</sup> and the twin Deep Space 2 micro-probes<sup>8</sup> in 1999. As a result of these failures,<sup>9</sup> NASA commissioned several independent reviews to examine FBC and mission failures, search for root causes, and recommend changes.

The FBC Task review, initiated by NASA in July 1999, studied the Agency's implementation of FBC through a series of interviews and workshops.<sup>10</sup> The objectives of the review included defining FBC, developing FBC "Rules of Engagement," and providing recommendations for improving FBC implementation at NASA. Although NASA has not developed a formal definition of FBC, the FBC Task final report<sup>11</sup> defined FBC as "attempting to improve performance by being more efficient and innovative, and

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<sup>5</sup>The Wide-Field Infrared Explorer's mission objective was to conduct a deep infrared, extra-galactic science survey. The Wide-Field Infrared Explorer was launched on March 4, 1999, and was observed to be tumbling at a rate higher than expected during its initial pass over a ground station in Alaska. After significant recovery efforts, the mission was declared a loss on March 8, 1999.

<sup>6</sup>The MCO was designed to operate in a polar orbit for up to 5 years to study the weather and serve as a telecommunications relay link for the Mars Polar Lander and other missions.

<sup>7</sup>The MPL was to land on Mars and study volatiles (volatile material consists of carbon dioxide and water, both vapor and ice) and climate history during its 90-day mission. The MPL was designed to send its data to MCO for relay to Earth, a plan eliminated by the loss of the MCO although the MPL had the capability to communicate directly to Earth.

<sup>8</sup>Deep Space 2 was a technology mission to demonstrate microprobe technology for future applications in exploring various solid bodies in our solar system. The microprobes and the MPL were integrated on a common cruise stage for the trip from Earth to Mars.

<sup>9</sup>Appendix B provides further information on these mission failures.

<sup>10</sup>Mr. Tony Spear, former JPL project manager who is considered an expert on FBC, headed the review.

<sup>11</sup>On March 13, 2000, the FBC Task review team issued a final report that summarized the results of its review.

it applies to everything and everyone," and added that "there is an intangible element; there is team spirit associated with doing FBC and people are the most important ingredient."

In October 1999, NASA chartered an MCO Mishap Investigation Board<sup>12</sup> to assess and report on the actual or probable cause of the MCO mission failure and expanded the review after the subsequent loss of the MPL. Additionally, NASA commissioned a Mars Program Independent Assessment Team<sup>13</sup> to perform an in-depth review of and report on the entire Mars Program. The Mars Program Independent Assessment Team's report, dated March 14, 2000, defined FBC as: (1) creating smaller spacecraft and more frequent missions, (2) reducing cycle time by eliminating inefficient and redundant processes, (3) utilizing new technology, (4) accepting prudent risk where warranted by return, and (5) utilizing proven engineering and management practices to maximize success. Common findings of the three reports included: (1) inadequate risk management tools; (2) inadequate training and mentoring of new employees; (3) problems observed but not communicated; and (4) in some cases, unsound engineering and management principles with respect to timely, independent peer review of scientific and technical approaches.

In March 2000, NASA tasked the NASA Integrated Action Team, led by NASA's Chief Engineer, to define a plan to mitigate the root causes for the failures that were identified in four reports on NASA management<sup>14</sup> and to enhance the probability of future success. The NASA Integrated Action Team is defining action plans that respond to the report recommendations that pertain to the Agency's approach to managing programs and projects. When it was created, the NASA Integrated Action Team planned to report its results by August 2000. The report was not issued until December 18, 2000, after the draft of this report was issued.<sup>15</sup>

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<sup>12</sup>The NASA Office of Space Science established the MCO Mishap Investigation Board on October 15, 1999. On November 10, 1999, the Board issued a "Phase I" report that focused on identifying the root cause and contributing factors of the MCO failure. On January 3, 2000, NASA broadened the Board's investigation to include developing lessons learned and recommendations to benefit future NASA missions. The Board reported its findings in, "Report on Project Management in NASA," dated March 13, 2000.

<sup>13</sup>The Agency established this team to review and analyze success and failures of the Mars and Deep Space 2 Missions, as well as related reports commissioned by NASA.

<sup>14</sup>The four reports on NASA management are the "Space Shuttle Independent Assessment Team Report to the Associate Administrator for the Office of Space Flight," dated March 7, 2000; the "NASA Faster, Better, Cheaper Task Final Report," dated March 13, 2000; the "Report on Project Management in NASA by the Mars Climate Orbiter Mishap Investigation Board," dated March 13, 2000; and the "Mars Program Independent Assessment Team Summary Report," dated March 14, 2000.

<sup>15</sup>Although we had discussions with the Chief Engineer, in general terms, about the NIAT report contents, we were not permitted to review the report prior to the issuance of our draft report. Therefore, the draft of this report did not reflect the corrective actions that have been planned as a result of the NIAT report.

## Findings and Recommendations

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### Finding A. Faster, Better, Cheaper Policies and Guidance

At the time we issued our draft report, NASA Headquarters had not defined FBC, developed adequate policies and guidance for implementing FBC,<sup>16</sup> or provided adequate guidance on what the Agency considers an acceptable level of risk. NASA considered FBC to be a philosophy that did not need to be formalized into written Agency policies or guidance. Without written policies or guidance, NASA cannot effectively communicate FBC to program/project managers and contractors which could negatively affect mission success, weaken accountability for results, and lead to increased cost and delays.

#### Development of Policy and Guidance

Federal policy and guidance requires agencies to develop management structure, including policies, methods, and procedures, when reengineering agency programs and operations. In addition, NASA internal guidance requires that policy statements, guidance, and implementing instructions be documented. The Federal and Agency requirements follow:

**Office of Management and Budget.** Office of Management and Budget (OMB) Circular A-123, "Management Accountability and Control,"<sup>17</sup> dated June 21, 1995, states that as Federal employees develop and implement strategies for reengineering agency programs and operations, agencies should design management structures that help ensure accountability for results and that include appropriate, cost-effective controls. The Circular states that management controls are the organization, policies, and procedures used to reasonably ensure that programs achieve their intended results and that reliable and timely information is obtained, reported, and used for decision making.

**General Accounting Office.** The General Accounting Office (GAO), "Standards for Internal Control in the Federal Government,"<sup>18</sup> dated November 1999, states that internal control is a major part of managing an organization and comprises the plans, methods, and procedures used to meet missions, goals, and objectives and in doing so, supports performance-based management.

**International Organization for Standardization.** The U.S. version of the International Organization for Standardization (ISO)<sup>19</sup> standards requires organizations to document their procedures and to document compliance with those procedures to attain ISO

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<sup>16</sup>The NIAT issued a report on December 18, 2000, that describes actions that, if taken, would provide adequate policies and guidance for FBC. However, the NIAT report was not available for our review until after we issued the draft of this report.

<sup>17</sup>OMB Circular A-123, issued under the authority of the Federal Managers' Financial Integrity Act of 1982, provides guidance to Federal managers on improving the accountability and effectiveness of Federal programs and operations by establishing, assessing, correcting, and reporting on management controls.

<sup>18</sup>GAO "Standards for Internal Control in the Federal Government," AIMD-00-21.3.1, defines internal control and explains internal control objectives and standards.

<sup>19</sup>The ISO is a worldwide federation of national standard-setting organizations.

certification. NASA policy<sup>20</sup> is for all NASA Centers and Headquarters to obtain ISO 9001 certification. NASA uses the U.S. version of ISO 9001, which is known as Q9001-1994.<sup>21</sup> To receive ISO certification under Q9001-1994, an organization must establish "process control" to ensure that processes are established and carried out under controlled conditions. Controlled conditions include documented procedures and compliance with those documented procedures.

**NASA Policy.** NASA requires that its policy statements, guidance, or implementing instructions be documented as NASA Policy Directives (NPD's)<sup>22</sup> and/or NASA Procedures and Guidelines (NPG's)<sup>23</sup> as the means to effectively and efficiently convey instructions to employees, customers, and suppliers.

NPD 1400.1F, "NASA Directives System," dated July 19, 1999, states that NASA shall document its policy statements, guidance, or implementing instructions in the NASA Directives System, which consists of NPD's and NPG's. In relation to these directives, NPG 1400.1B, "NASA Directives System Procedures and Guidelines," dated April 25, 2000, states that the objectives of directives management are to document Agency and Center policies, procedures, and guidelines and to provide Agency managers with the means to effectively and efficiently convey instructions to employees, customers, and suppliers.

### **NASA FBC Policies and Guidance**

FBC is a management policy that needs to be institutionalized into the Agency's management structure. Although NASA has attempted to provide some guidance on implementing FBC, the guidance is not sufficient to successfully implement FBC and does not substitute for formal policy and guidance. Specifically, NASA has not issued policies and guidance that:

- define FBC,
- establish procedures and methodology on how NASA employees at all levels should implement FBC, or

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<sup>20</sup>NASA Policy Directive 8730.3, "NASA Quality Management System Policy (ISO 9000)," dated June 8, 1998, states that NASA policy is "to obtain and maintain third party certification to the ISO 9001 standard for all key processes at each of the NASA Centers and Headquarters."

<sup>21</sup>The American Society for Quality Control issued Q9001-1994, "American National Standard: Quality Systems -- Model for Quality Assurance in Design, Development, Production, Installation, and Servicing," on August 1, 1994. This American National Standard establishes a quality assurance model by which a supplier can demonstrate its capability. Although the standard applies to suppliers, NASA has adapted it to apply to the Agency. The American Society for Quality Control is the American National Standards Institute member body that is responsible for quality management and related standards. The American National Standards Institute is the U.S. member body of the ISO.

<sup>22</sup>NPD's are policy statements that describe "what" is required by NASA management to achieve NASA's vision and mission.

<sup>23</sup>NPG's are the "how to" instructions and guidelines that implement NASA policy.



- provide adequate information on what the Agency considers an acceptable level of risk and how risk should be balanced against schedule and cost in an FBC environment.

**NASA Policy Documents.** Only one NASA policy document mentions FBC. NPG 7120.5A, "NASA Program and Project Management Processes and Requirements,"<sup>24</sup> dated April 3, 1998, briefly refers to FBC, but does not define it or provide procedures or methodologies in sufficient detail to be useful for FBC implementation.<sup>25</sup> The preface of NPG 7120.5A states that "[t]ailoring<sup>26</sup> is a mechanism to encourage innovation and achieve "faster, better, cheaper" products while meeting the expectations of the customer" and that the results of tailoring are to be documented in program commitment agreements, program plans, and project plans. However, the NPG does not explain how this should be accomplished in relation to FBC.

Also, Section 1.1.2 of the NPG mentions FBC, but does not provide guidance on how employees should implement it:

Today, a major emphasis is being placed on executing projects "better, faster, cheaper," and these projects differ significantly from earlier large, lengthy development projects. The disciplined approach of program and project management is now being applied to technology development programs to enable future Agency missions. The reinvention of Government initiative also allows streamlined, new ways of doing business that should be incorporated into the NASA methodology.

**Administrator's Memorandum.** After several Mars Program missions failed in 1999,<sup>27</sup> the NASA Administrator issued a memorandum on February 7, 2000, that discusses ensuring mission safety and reducing risk by appropriately balancing resources and requirements.<sup>28</sup> Although the memorandum does not define FBC or discuss procedures and methodologies for its implementation, the memorandum mentions FBC in relation to good project management. However, the Agency has not incorporated the principles of the memorandum into an NPG or NPD.

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<sup>24</sup>The purpose of NPG 7120.5A is to establish the management system for processes, requirements, and responsibilities for implementing NPD 7120.4B, "Program/Project Management," dated December 6, 1999.

<sup>25</sup>NASA plans to revise NPG 7120.5A. The revisions will be based on input from the NASA Office of Inspector General as well as the recommendations of the NASA Integrated Action Team. The NASA Integrated Action Team was tasked to define a plan to mitigate the root causes of NASA's recent mission failures and enhance the probability of future mission success.

<sup>26</sup>"Tailoring" is defined in NPG 7120.5A as the documentation and approval of the adaptation of the NPG 7120.5A process and requirements to specific program or project needs.

<sup>27</sup>The MCO mission was launched on December 11, 1998, and was lost in September 1999; the MPL and Deep Space 2 missions were launched on January 3, 1999, and were lost in December 1999. Appendix B provides further information on these mission failures.

<sup>28</sup> The memorandum is entitled "Clarification on Cost Consideration in Project Management." Appendix C provides excerpts from the memorandum's enclosure.

**FBC Task Review.** The FBC Task review defined FBC and identified "Rules of Engagement for FBC Projects."<sup>29</sup> The definition and Rules of Engagement provide prudent, common sense guidance on how to successfully implement FBC. At the time we issued a draft of this report, the Agency had not yet refined the definition and the Rules of Engagement in developing formal NASA policy and/or guidance on FBC.

### **Plans for Additional Agency FBC Policies and Guidance**

When we issued a draft of this report, the Agency had not yet developed specific FBC policies and guidance and had no future plans to do so. NASA considered FBC to be a philosophy that was sufficiently accommodated by NPG 7120.5A<sup>30</sup> through "tailoring." NASA relied on NPG 7120.5A, the Administrator's February 2000 memorandum, and the results of the FBC Task review to communicate FBC policy throughout the Agency.

### **Enterprise and Center FBC Policies and Guidance**

As part of this audit, we contacted representatives for the Space Science Enterprise<sup>31</sup> and the Earth Science Enterprise and for Goddard Space Flight Center (Goddard), Jet Propulsion Laboratory (JPL), Lyndon B. Johnson Space Center (Johnson), and George C. Marshall Space Flight Center (Marshall). We asked these representatives to develop Enterprise and Center responses to questions<sup>32</sup> about FBC policies, procedures, plans, and guidelines and to document how FBC has been incorporated into their strategic management process. In addition, we interviewed Earth and Space Science program/project managers at Goddard and Marshall about FBC and its implementation at those Centers.

**NASA Strategic Enterprises.** As discussed earlier, some minimal guidance on FBC exists, but Space Science and Earth Science Enterprise representatives stated that NASA Headquarters had not developed policies, procedures, or guidance that specifically address FBC. In addition, the Space Science and Earth Science Enterprises have not developed policy or guidance of their own to implement FBC.

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<sup>29</sup>The FBC Task review final report, Attachment A, "Rules of Engagement for FBC Projects," lists 14 rules that include: (1) form and motivate an excellent team, a mix of experience and bright energetic youth bringing enthusiasm and new methods; (2) establish a challenging but realistic mission target; (3) size mission scope within resources to provide for acceptable risk and adequate reserves; and (4) test, test, test, and test as you fly. Appendix D of this report lists the 14 rules.

<sup>30</sup>The NASA Administrator assigned the NASA Chief Engineer stewardship responsibility for the "Provide Aerospace Products and Capabilities" crosscutting process, including responsibility for NPG 7120.5A.

<sup>31</sup>The NASA Strategic Plan established a framework for making management decisions by separating the Agency's programs into the following four strategic Enterprises: Human Exploration and Development of Space, Space Science, Earth Science, and Aerospace Technology. On September 29, 2000, NASA announced a restructuring of the Office of Life and Microgravity Sciences and Applications. This restructuring moved some functions from the Human Exploration and Development of Space Enterprise to a new Enterprise, Biological and Physical Research, which focuses on scientific research.

<sup>32</sup>We used questionnaires to obtain information on FBC implementation from the Space Science and Earth Science Enterprises and from Goddard, Marshall, and JPL. In addition, we used telephone interviews to obtain information from Marshall and Johnson. See Appendix A for further details.

**NASA Centers.** Center representatives also stated that they have not received any guidance from NASA Headquarters on how to implement FBC. Goddard and Marshall project managers indicated that they developed their own informal procedures to implement what they considered an FBC approach. JPL representatives stated that reengineering of the project development processes at JPL has produced new policies, procedures, and processes to effect the evolution of JPL's FBC concept. JPL is also reviewing and enhancing its policies and procedures on peer review and mission assurance in operations, consistent with its understanding of FBC. During our review, we noted one JPL directive that provides specific guidance on FBC. JPL D-13277, "Risk/Requirements Trade-Off Guidelines for Faster, Better, Cheaper Missions," dated February 1998, provides guidance for a subset of 22 product assurance activities<sup>33</sup> that have been deemed critical in a recent study to prioritize them.

### **Implementation of FBC**

Without written policies or guidance that address FBC management policy, NASA cannot effectively communicate FBC goals and implementation procedures to program/project managers and contractors. This lack of direction could jeopardize mission success, weaken accountability for results within NASA, and lead to additional cost and delays. Program/project managers are ultimately responsible for the success of their programs/projects and, therefore, should be provided with clear policies and guidance regarding FBC. Some program/project managers have developed their own definitions and policies for implementing FBC but may not be accomplishing the goals and objectives envisioned by the NASA Administrator.

**Mission Success.** Insufficient policies, procedures, and guidance can adversely affect mission success. The Mars Program Independent Assessment Team<sup>34</sup> reviewed three successful<sup>35</sup> and three failed Mars Program missions.<sup>36</sup> As part of the review, the team found that NASA had not defined FBC or established implementation policy and/or procedures, and as a result, project managers were left to establish FBC policy for their projects. The team's report states:

... NASA, JPL, and [the Mars Program contractor] have not completely made the transition to FBC. They have not documented the policies and procedures that make up their FBC approach; therefore, the process is not repeatable. Rather, project managers have their own and sometimes different interpretations. This can result in missing important steps and keeping lessons learned from others who could benefit from them .... The [Mars Program Independent Assessment Team] believes, that while 100 percent

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<sup>33</sup>Examples of the 22 product assurance activities are: acoustic noise, pyrotechnic shock, and flight electronic parts inspection.

<sup>34</sup>The Mars Program Independent Assessment Team, established by the NASA Administrator, reviewed the Mars Program and identified lessons learned for use in the future Mars Program. The review emphasized the strengths and weaknesses of individual projects within the Mars Program and the relationships among the participants. The team started the review in January 2000 and issued its report in March 2000.

<sup>35</sup>The three successful Mars Program missions reviewed were the Mars Global Surveyor, Mars Pathfinder, and Deep Space 1.

<sup>36</sup>The three failed Mars Program missions reviewed were the MCO, MPL, and Deep Space 2. See also footnotes 6, 7, and 8.

mission success is not a realistic target, with the right policies and procedures in place, and with a commitment to follow them, the vast majority of future FBC missions will be successful.

Appendix E compares key attributes of the six FBC missions as reported by the Mars Program Independent Assessment Team. The comparison shows that the each mission interpreted FBC differently. Agencywide policies and guidance would help ensure that all NASA program/project managers implement FBC in a consistent, prudent manner.

Without policies and guidance for FBC implementation, NASA project managers may not appropriately balance cost and schedule against risk. The MCO Mishap Investigation Board<sup>37</sup> found that as implementation of FBC at NASA evolved, the focus on cost and schedule reduction increased risk beyond acceptable levels on some NASA projects. Agencywide policies and guidance for FBC could clarify acceptable tradeoffs between cost and schedule reduction, risk, and other subjective areas of FBC.

## **Conclusion**

Insufficient policies and guidance can adversely affect accountability for results. Without sufficient FBC policies and guidance, NASA cannot establish clear lines of responsibility for managing risk under FBC. Further, If NASA managers do not have policies and guidance on how to implement FBC, they may stray from sound management practices and subsequently have to redo project work to mitigate risk, which can lead to added cost and schedule delays.

## **Recommendation, Management's Response, and Evaluation of Response**

- 1. The NASA Associate Deputy Administrator, in coordination with the Chief Engineer, should develop policies and guidance in NPG 7120.5A and other appropriate NPD's and NPG's to define FBC and to describe its implementation.**

**Management's Response.** Partially Concur. The definition of FBC and appropriate changes resulting from the NIAT report will be included in revision B of NPG 7120.5 and other NASA policy documents as appropriate. However, FBC should not be a specific subset of current management policies. The complete text of management's response is in Appendix I.

**Evaluation of Response.** The planned actions are responsive to the recommendation. The recommendation is resolved, but will remain undispositioned and open until the corrective actions described in the NIAT report have been completed.

During our audit field work, we discussed the implementation of FBC with program and project managers. A recurring theme in those discussions was that no guidance was provided by NASA Headquarters to explain how to implement FBC. So the program and

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<sup>37</sup>The Board presented its findings in, "Report on Project Management in NASA," dated March 13, 2000.

project managers were implementing their interpretation of what they thought was FBC. It is not our intention that management segregate FBC programs and projects and establish separate policies for these programs and projects, rather that the Agency develop sufficient policies and guidance on FBC so program and project managers have a clear understanding of how FBC can be applied in their program or project.

## **Finding B. NASA Strategic Management for Faster, Better, Cheaper**

NASA has not sufficiently incorporated FBC goals, objectives, or metrics into its strategic management process. NASA considers FBC to be a management philosophy, applicable to all Agency organizations, that does not require coverage in the strategic management process, including related plans and reports. Also, the recent FBC Task review was the only FBC planning NASA management performed. As a result, NASA's attempt to complete missions in a faster, better, and cheaper manner is outside the strategic management and planning process, and progress toward achieving FBC cannot be measured or reported.

### **Federal and Agency Strategic Planning Requirements**

Federal and NASA guidance require the Agency to describe in its strategic planning documents the operational processes and implementation strategies it plans to use to achieve goals and objectives.

**Government Performance and Results Act.** The Government Performance and Results Act of 1993 (GPRA)<sup>38</sup> requires agencies to prepare strategic plans. The strategic plans are to include a description of how the goals and objectives are to be achieved, including a description of the operational processes, skills and technology, and the human, capital, information, and other resources required to meet those goals and objectives.

**Office of Management and Budget.** OMB Circular A-11, "Preparation and Submission of Budgets," dated July 2000, requires that agency strategic plans describe the processes, skills, technologies, and various resources that will be used to achieve the general goals and objectives.

**NASA Directives.** NPG 1000.2, "NASA Strategic Management Handbook,"<sup>39</sup> dated February 2000, Section 3.4, states that Enterprise Strategic Plans will elaborate on their respective missions and goals, in alignment with NASA's Strategic Plan,<sup>40</sup> with detailed objectives, implementing strategies, and brief descriptions of their principal programs and/or processes.

**FBC Task Review.** The FBC Task review<sup>41</sup> was the only FBC planning NASA management had performed at the time of our audit field work. The FBC Task review concluded, as part of its definition of FBC, that FBC "applies to everything and everyone."

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<sup>38</sup>GPRA provides for the establishment of strategic planning and performance measurement in the Federal Government.

<sup>39</sup>The NASA Strategic Management Handbook describes the strategic management roles and relationships of NASA's various organizational elements, from the Administrator to all NASA employees. NASA's Strategic Enterprises, Agencywide Functional Offices, and Crosscutting Processes are the framework for NASA's Strategic Management System. (See footnote 70 for details on Crosscutting Processes).

<sup>40</sup>NPG 1000.2, Section 3.3, states that NASA's Strategic Plan articulates the Agency's vision, goals, and objectives as well as Agencywide strategies for achieving them.

<sup>41</sup>Finding A contains additional information on the FBC Task review objectives and results.

## **Alignment of NASA Strategic Management and FBC**

FBC is a management policy that should be institutionalized into the Agency's management structure. NASA does not cover FBC goals in adequate detail in its current strategic management documents. NASA strategic management documents include a handbook, a strategic plan, performance plan, performance report, Enterprise strategic plans, and Center implementation plans.<sup>42</sup> FBC coverage in these documents is inconsistent, insufficient, and in some cases nonexistent and does not align with the NASA Strategic Plan. There is no direct link for FBC from the Agency Strategic Plan to the Enterprise Strategic Plans and then to the Center Implementation Plans.

For example, NASA does not adequately cover the publicized FBC goals of its Discovery Program,<sup>43</sup> a major Space Science Enterprise program, in its current strategic management documents. NASA has publicly announced the Discovery Program goals of reducing average development cost to below \$150 million (1992 dollars) per mission and average development-to-launch time to below 36 months per mission. However, the NASA FY 2001 Performance Plan does not mention these goals, although the FY 1999 Performance Plan does (see Appendix F). Additionally, the FY 1999 Performance Plan and Report include performance targets relating to the Discovery Program's FBC goals,<sup>44</sup> but the FY 2001 Performance Plan does not.

## **NASA Considers Current Coverage of FBC Adequate**

NASA management considers the current FBC coverage in strategic management documents satisfactory despite the fact that there is limited FBC coverage for the Space Science and Earth Science Enterprises and no FBC coverage for the Human Exploration and Development of Space and Aerospace Technology Enterprises. However, the FBC coverage is inadequate for strategic planning purposes because, contrary to the FBC Task's definition of FBC, that it applies to everything and everyone, FBC has not been applied to all Enterprises.<sup>45</sup> The Center implementation plans also do not provide sufficient FBC coverage. None of the strategic planning documents provide FBC goals and objectives or strategies the Agency will use to achieve the goals and objectives. In addition, there is no discussion of metrics to measure progress toward the goals. The FBC Task final report, which is considered an FBC implementation plan, also does not discuss metrics.

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<sup>42</sup>Appendix F provides definitions for each strategic management document and an analysis of FBC coverage in those documents .

<sup>43</sup>The Discovery Program is an ongoing NASA program of frequent, small, planetary missions that perform high-quality scientific investigations. The program seeks to reduce total mission and life-cycle costs and to improve performance through the use of new technology and control of design, development, and operations costs. Examples of Discovery missions are the Lunar Prospector, the Mars Pathfinder, and the Near Earth Asteroid Rendezvous missions.

<sup>44</sup>The FBC performance targets were in the "Provide Aerospace Products" and "Capabilities Crosscutting Process" sections of the NASA FY 1999 Performance Plan and Performance Report.

<sup>45</sup>The Biological and Physical Research Enterprise was established on September 29, 2000, and is not included in the strategic management documents discussed in this report.

## **Insufficient Strategic Management Hinders FBC Implementation**

NASA is not using strategic management documents to describe operational processes and implementation strategies the Agency plans to use to achieve the goals and objectives of FBC. This has resulted in inadequate performance measures and accountability within NASA's Strategic Enterprises. In addition, NASA cannot measure its progress in achieving the objectives of FBC through its performance plan or report this progress to internal and external organizations. This is especially true for the Human Exploration and Development of Space and Aerospace Technology Enterprises' sections of the NASA FY 2001 Performance Plan, which do not address FBC.

### **Conclusion**

NASA should fully incorporate FBC policy into its strategic management process. NASA has not established adequate FBC goals, objectives, and metrics. According to the FBC Task report, FBC applies to everything and everyone. However, this does not mean that FBC goals, objectives, and metrics need to be equally and uniformly established for each Enterprise, program, or project in NASA. The degree to which FBC is applied to an Enterprise depends on the nature of the Enterprise's mission. At a minimum, the NASA performance plan should describe how each Enterprise will incorporate FBC into its implementation strategy. Also, the FBC goals and performance targets should be in the form of trends. For example, a performance target "faster" could be to decrease the average mission development time by a stated percentage.

### **Recommendation, Management's Response, and Evaluation of Response**

- 2. The Associate Administrator for Policy and Plans, in coordination with the Enterprise heads, Chief Engineer, and the Chief Financial Officer, should fully incorporate FBC into the strategic management process, including all key documents. Specifically, the NASA annual performance plans should fully describe each Enterprise's implementation strategy for achieving FBC.**

**Management's Response.** Nonconcur. Management responded that the Agency has already appropriately reflected FBC in its strategic documentation by the challenging goals that are communicated in the Agency and Enterprise Strategic Plans. NASA's Strategic Plan 2000 states we will "conduct more frequent missions for fewer dollars" and "do more with less as we strive to achieve our mission in ways that are faster, better, cheaper."

**Evaluation of Response.** Management's comments are nonresponsive. Although FBC is mentioned in various documents as noted in Appendix F of this report, the intent of our recommendation is that the documents should contain a clearer description of what FBC is and how it affects program and project management. In addition, top-level documents should flow down to program plans so that the roles and responsibilities of FBC are defined and responsible individuals can be held accountable for the results. Our



interviews of representatives from Goddard, Johnson, JPL, and the Offices of Earth Science and Space Science indicated that adequate guidance had not been received from NASA Headquarters on how FBC should be implemented. Program/project personnel stated that the program plans were tailored to their interpretation of FBC. The approach of communicating FBC implicitly through challenging goals is not getting a clear message to the program/project managers. Therefore, we disagree with management's position that FBC is appropriately reflected in strategic documentation and maintain our position that the FBC should be fully incorporated into all key documents. We request that management reconsider its position and provide additional comments.

## **Finding C. Fact-Based Human Resource Management**

NASA has not adequately incorporated strategic human resources management into its Strategic or Performance Plans, which directly impacts FBC program and project management. Faced with budget cuts and downsizing since the mid-1990's, NASA has focused on overall staff reduction and has not given sufficient consideration to the alignment of human resources<sup>46</sup> with its strategic goals. Hence, NASA has not determined the appropriate number of staff and competencies needed to effectively carry out strategic goals and objectives for its programs, most notably the FBC Mars Program, and may lose core competencies.

### **Strategic Human Resources Management Is Essential**

As required by the Federal Managers' Financial Integrity Act of 1982, the GAO issued standards for internal control in Government. The standards define the minimum level of quality acceptable for internal control in Government and provide the basis against which internal control is to be evaluated. GAO recognized that effective management of human resources is essential to achieving results and is an important part of internal control. As part of workforce planning, management should consider how best to retain valuable employees, plan for their eventual succession, and ensure continuity of needed skills and abilities.

A renewed focus on internal control was prompted by the GPRA, which requires agencies to clarify their missions, set strategic and annual performance goals, and measure and report on performance toward those goals. Internal control plays a significant role in helping managers achieve those goals.

If the Government is to continue to successfully and effectively improve its operations, agency heads must make a conscious effort to integrate strategic human resources management into their agencies' planning and decision-making process.<sup>47</sup>

### **Federal Requirements**

GPRA requires the linkage between strategic goals and the human resources needed to accomplish goals. The current OMB Circular A-11 places increased emphasis on describing human resources and training initiatives. A recent Presidential memorandum also requires that human resource management be fully integrated into agency planning. In addition, GAO stated in a recent review that NASA's Performance Plans could be improved by linking the strategic goals to specific resources.

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<sup>46</sup>Human resource alignment means integrating decisions about employees with decisions about the results the organization is trying to obtain.

<sup>47</sup>The Office of Personnel Management's Office of Merit Systems Oversight and Effectiveness, provides detailed explanations for this type of integration in the publication on Strategic Human Resources Management: Summary Report of a Roundtable Discussion, October 22, 1998.

**GPRA.** GPRA requires Federal agencies to prepare strategic plans. The strategic plans are to include a description of how goals and objectives are to be achieved, including a description of the operational processes, skills and technology, and the human, capital, information, and other resources required to meet those goals and objectives.

**Office of Management and Budget.** OMB Circular A-11 requires that agency strategic plans describe the processes, skills, technologies, and various resources that will be used to achieve the general goals and objectives. In addition, the Circular requires that the annual plan include performance goals covering major human resources strategies, such as recruitment, retention, skill development, and training.

**Presidential Memorandum.** On June 12, 2000, the President directed the heads of agencies to fully integrate human resources management into agency planning, budgeting, and mission evaluation processes and to clearly state specific human resources, management goals, and objectives in the organization's strategic and annual performance plans. Administration officials anticipate that substantial numbers of Federal employees could retire in the next 5 years and are looking for better ways to manage a potential staffing crisis.

**GAO Review.** GAO reviewed and reported on NASA's Fiscal Year 1999 and 2000 Performance Plans.<sup>48</sup> GAO determined that the plans complied with the requirements of GPRA, but that the plans could be improved by linking the strategic goals to specific resources rather than NASA's higher level presentation of identifying funding requirements by Enterprise. By not linking strategic goals to the human resources that accomplish the goals, NASA has no assurance that staffing is aligned with strategic goals and that the workforce is used appropriately and managed effectively.

### **Linking Strategic Goals and Human Resources**

NASA has not adequately addressed human resources management in the Agency Strategic Plan, the Enterprise Strategic Plans, or the Center Implementation Plans.<sup>49</sup> None of these plans show a clear linkage between strategic goals and the human resources needed to accomplish the goals. Also, the Agency and Enterprise Strategic Plans do not consider strategic human resource management issues such as how best to retain valuable employees, plan for their eventual succession, and ensure continuity of needed skills and abilities.

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<sup>48</sup>The GAO reported its results in "Managing for Results Observations on NASA's Fiscal Year 1999 Performance Plan," GAO/NSIAD-98-181, dated June 1998; and "Observations on NASA's Fiscal Year 2000 Performance Plan for Fiscal Year 2000," NSIAD-99-186R, dated July 20, 1999.

<sup>49</sup>Appendix A discusses the documents we reviewed, Appendix F provides definitions for each of the strategic management documents, and Appendix G discusses the analysis of human resources coverage in NASA's strategic management documents.

## **Impetus for NASA Downsizing Efforts**

Since NASA was established in 1958, its civil service workforce has fluctuated widely. In 1967, during the Apollo program, the workforce numbered about 35,900. By 1992, as a result of workforce reductions, the workforce totaled about 25,000. After 1992, NASA's workforce decreased again due to the Government-wide National Performance Review<sup>50</sup> and the NASA internal "Zero-Base Review." The FBC management process also affected the workforce by encouraging program managers to do more with less.

**National Performance Review.** In 1993, the National Performance Review recommended a reduction of Federal employees by 1999. As part of its reinvention process, NASA substantially reduced total personnel through a series of management actions, including two employee buyouts. The two buyouts resulted in a reduction of civil service staffing by more than 2,600. Other factors, including attrition, reduced the total civil service full-time staffing level at NASA from 24,030 in January 1993 to 21,060 in April 1995.

**Zero-Base Review.** In May 1995, an internal NASA review, the "Zero-Base Review," introduced proposals to enable the Agency to meet the additional \$5 billion reduction in funding set by the 1996 budget. Under the review team's findings, NASA's total civil service employment level would be cut to approximately 17,500 by the year 2000. This would be the lowest level of civil servants at NASA since 1961. In addition, the budget reductions would cut an estimated 25,000 contractor personnel.

**FBC Management Process.** Unlike the National Performance Review and the Zero-Base Review, the FBC management process did not specifically prescribe staff reductions. It did, however, increase the total number of missions and shorten the development time. Because FBC encouraged managers to do more with less, additional staff was not added to handle the increased workload.

## **Effects of NASA's Downsizing Efforts**

If Federal downsizing was only about reductions in personnel, workforce data shows that NASA has been successful. However, the downsizing was to occur in conjunction with reinvention. Mission-critical employees were to be retained, while positions no longer consistent with the Agency's future goals were to be eliminated.

By 1998, the effects of NASA's downsizing efforts began to take their toll. The downsizing affected program delivery because managers could not recruit new staff to correct skill imbalances and to bring new ideas to the workforce. In addition, the Agencywide buyouts encouraged the loss of highly experienced managers and created a void in management and technical expertise. Staffing problems began to surface in such

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<sup>50</sup>In 1993, the Vice President led a team of career Government executives and outside management consultants to create a Government that works better and costs less. This initiative is called the National Performance Review.

efforts as the NASA Workforce Restructuring Plan<sup>51</sup> and Core Capability Assessment.<sup>52</sup> The effects of NASA's downsizing came to a national attention in late 1999, when NASA had three unsuccessful missions in the Mars Program.<sup>53</sup> The MCO mission failed in September 1999. The mishap investigation report<sup>54</sup> identified inadequate operations staffing and inadequate training as contributing causes for the failure. In December 1999, the MPL was lost and the twin Deep Space 2 probes disappeared. The Mars Program Independent Assessment Team<sup>55</sup> concluded that both the MCO and MPL had inadequate resources to accomplish requirements (see Appendix E).

## **Human Resource Challenges Throughout NASA**

Although the human resource management problems associated with the FBC Mars Program have been the most widely publicized, we noted that similar problems exist for other NASA programs. As part of this audit, we contacted representatives at Goddard, JPL, Johnson, and Marshall as well as the Offices of Space Science and Earth Science. We asked these representatives to discuss human resource management issues such as skill assessment, recruitment, training, and the effect the FBC approach has had on managing human resources. The representatives identified recruiting, hiring, and retaining employees as areas of concern (see Appendix H). In addition to the staffing concerns that have been identified in conjunction with FBC, staffing of the Expendable Launch Vehicle Program Office and the Space Shuttle has been raised in reports issued by the NASA Office of Inspector General and GAO, respectively.

**NASA Office of Inspector General Report.** On February 23, 2000, the NASA Office of Inspector General issued, IG-00-009, "Staffing of the Expendable Launch Vehicle Program Office at the Kennedy Space Center." The report notes that the Office of Space Flight did not integrate strategic human resources management into the staff planning of the Expendable Launch Vehicle Program Office at Kennedy. As a result, the Expendable Launch Vehicle Program Office may be unable to meet current customer demand without the use of overtime and compensatory time.

**GAO Report.** The GAO issued, GAO/NSIAD/GGD-00-186, "Space Shuttle: Human Capital and Safety Upgrade Challenges Require Continued Attention," on August 15, 2000. Although the report makes no recommendations, it notes that NASA recognizes

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<sup>51</sup>The Workforce Restructuring Plan outlines the actions NASA has taken and plans to take during the transition to a civil service workforce that is both smaller and more focused on research and development. This is the last of three such reports NASA submitted to the House and Senate Committees on Appropriations to meet the requirement set forth in the Conference Report accompanying H.R. 3666, the FY 1997 VA-HUD-Independent Agencies Appropriations Bill (House Report 104-812). The Conference Report required NASA to provide a Workforce Restructuring Plan annually upon submission of each of the Agency's budget requests for FY's 1998 through 2000.

<sup>52</sup>The NASA-wide Core Competency Assessment was undertaken in FY 1999 to define the requisite NASA workforce skills in all critical areas to accomplish Agency missions.

<sup>53</sup>Appendix B provides a brief summary of the Mars Program failures.

<sup>54</sup>The results of the mishap investigation are documented in the Phase I Report Mars Climate Orbiter Mishap Investigation, dated November 10, 1999.

<sup>55</sup>See footnote 13.

that "in-house workforce reductions had gone too far [and] that NASA has discontinued downsizing and begun to address critical staffing needs [in the Space Shuttle program]."

### **Alignment of Human Resources with Strategic Goals**

The FBC Task review and the Administrator's recent comments focus on relevant staff issues but do not recognize that resources should be linked to Agency and Enterprise strategic goals in order to determine the appropriate number and skills of required staff. In addition, there have been several efforts that have focused on linking resources at the Center-level and more recently, the Agency has discussed developing an Agencywide approach.

**FBC Task Review.** In March 2000, the FBC Task review report recommended that NASA place higher priority on people acquisition, motivation, and training. The report further noted that NASA is experiencing a talent drain due to retirements, downsizing, and the loss of employees to industry. In congressional testimony that same month, the FBC Task review leader emphasized placing a higher priority on acquisition, motivation, staff training, incentives, and mentoring.<sup>56</sup>

**Administrator's Comments.** In congressional testimony, the NASA Administrator stated that NASA is at a time of major cultural change and rapid increase in the number of programs under way.<sup>57</sup> The programs were staffed with next-generation program managers without, in some instances, ensuring that they had been adequately trained and mentored, both in terms of lessons learned and the use of revolutionary new tools and techniques.

At a Senior Management Council meeting, the NASA Administrator also stated that he had concerns that NASA is not adequately training the new teams running the new programs. He further stated that people do not usually fail in jobs but that management usually fails because it did not match the right person with the right skills to job requirements and then properly train and coach them.<sup>58</sup> The Administrator also indicated that NASA would be hiring an additional 1,850 people in the next 2 years.<sup>59</sup> Hiring additional staff may ease some of the problems NASA is currently experiencing. However, the only way to ensure that the workforce is adequate is by aligning staffing with the Agency strategic goals and by ensuring that the right number of people possessing the necessary skills are available to accomplish the strategic goals.

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<sup>56</sup>Mr. Tony Spear led the FBC Task Review. On March 22, 2000, he presented testimony on NASA management to the Senate Subcommittee on Science, Technology, and Space.

<sup>57</sup>On March 22, 2000, the Administrator presented testimony on NASA management to the Senate Subcommittee on Science, Technology, and Space.

<sup>58</sup>The Administrator presented his staffing concerns in a January 6, 2000, Senior Management Council Meeting.

<sup>59</sup>At a February 7, 2000, Senior Management Council meeting, the Administrator indicated that additional staff would be hired.

**Center-Level Efforts.** Langley Research Center, Glenn Research Center, and Ames Research Center have reached the staffing reduction goals established by the Zero Base Review and have initiated hiring efforts.<sup>60</sup> As part of their workforce planning efforts, these Centers assessed competency and strategic requirements and have made attempts to align staffing with Center requirements. These Centers developed their approaches independently of each other; consequently, they vary from Center to Center. However, these Center-level efforts may be a starting point for reviewing lessons learned and developing an Agencywide approach, which we believe is necessary.

**Agencywide Effort.** Representatives of the NASA Office of Human Resources and Office of Chief Engineer have discussed changing the approach of NASA's core competency effort from solving near-term personnel shortcomings at a Center level to one that will take an Agencywide view of aligning staffing with the Agency's long-term strategic goals. However, NASA has not yet determined when this effort will begin or the composition of the team that will address these issues.

## **Workforce Planning**

In the current environment of budget cuts, downsizing, and an aging Federal workforce, workforce planning is extremely important in relation to increasing the Federal agencies' overall ability to achieve their missions. NASA has gone from a workforce that it considered too large to a workforce that it now considers too small, and staffing levels have remained low due to NASA's FBC management policy. NASA should develop a workforce transition plan that will identify current and future required skill sets, determine how the workforce can obtain these skills, and set action plan milestones.<sup>61</sup> The workforce plan should complement the strategic planning process and not be a separate effort. Workforce planning will assist in correcting the skill imbalances across the Agency and will help align human resources with strategic goals. This will change NASA's focus from recruiting more people to recruiting the right people. Developing and implementing a workforce plan will bring NASA more in line with GPRA and the Presidential memorandum to fully integrate human resources into strategic plans.

## **Conclusion**

NASA's focus has been on workforce reduction since the mid-1990's. NASA's FBC management policy continued to keep staffing levels low even though staffing shortfalls were identified. Recently, NASA has reversed this trend with plans to increase staffing. However, without linking staffing decisions to the Agency's strategic goals and objectives, NASA cannot determine the appropriate skills or number of staff to meet Agency goals and objectives. The understaffing of the MCO and MPL missions serves as an example of the effect that inadequate human resources can have on the

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<sup>60</sup>We reviewed information relating to the efforts of Langley Research Center, Glenn Research Center, and Ames Research Center; however, other Centers may also be performing similar efforts.

<sup>61</sup>Although few agencies have strong workforce planning systems in place, the Social Security Administration has developed a methodology to predict the number of actual retirements and is developing a workforce transition plan as described.

accomplishment of strategic goals and objectives. NASA must incorporate strategic human resources management into all aspects of strategic planning to ensure that Agency goals can be achieved. In addition, NASA can strengthen its Performance Plan by fully portraying how NASA's strategies and resources will help the Agency achieve its performance goals and be more in line with the emphasis placed on human resources in the current OMB Circular A-11 and the recent Presidential memorandum.

### **Recommendations, Management's Response, and Evaluation of Response**

- 3. The Associate Administrator for Policy and Plans, in coordination with the Enterprise heads and the Center Directors, should align human resources with strategic goals in Enterprise Strategic Plans and Center Implementation Plans.**
- 4. The Associate Administrator for Policy and Plans, in coordination with the Enterprise heads, should describe in the Implementation Strategy sections of the NASA Annual Performance Plan how the Agency is implementing human resources management.**
- 5. The Associate Administrator for Human Resources and Education, in coordination with the Enterprise heads and Center Directors, should develop a workforce strategy that will assess human resources management issues (that is, recruitment, training, awards, bonuses, promotions, retention, and succession planning) and develop meaningful data and data systems on which to base decisions tied to all aspects of human resource management.**

**Management's Response.** Partially Concur. NASA strongly disagrees that FBC is responsible for keeping staff levels low. The reduction in workforce and the skill imbalance created by such a reduction combined with the increase in workload are largely responsible for the challenges in staffing. However, the recommendations do touch on issues that NASA agrees are very important.

The Enterprises are responsible for and do align human resources with Enterprise and Center plans. Agency budget, program/project planning, and other Enterprise planning processes include, as an integral element, consideration of resource needs (human, fiscal, and facilities).

The Agency developed the fiscal year 2002 Performance plan with the knowledge resulting from the Mars failures, the FBC reports, and the NIAT activity and will discuss NASA human resources at a level that is appropriate for NASA's outcome-oriented Agencywide Performance Plan.

NASA has conducted a core capability assessment and other similar activities that while helpful, resulted in solving near-term human resource issues. However, the Agency has begun a follow-on strategic resource planning activity, based on the Centers' future vision



and mission, taking into account workforce and facilities needed. The result will provide a plan for each Center that links staffing, funding resources, mission and activities and core competencies.

The complete text of management's response is in Appendix I.

**Evaluation of Response.** Our report attributes the low staff levels at NASA to a combination of the National Performance Review and the Zero-Base Review. In addition, our report states that FBC did not prescribe staff reductions, but increased the workload and encouraged managers to do more with less. As stated in management's response to this report, "the FBC emphasis resulted in a threefold increase in the number of programs and projects that required more project managers and systems engineers." It is not our intent to imply that FBC was the sole cause for the staffing problems but that it contributed to the conditions identified.

Management did not provide planned corrective actions for Recommendation 3. However, we consider the actions described in management's response to Recommendation 5 sufficient to also meet the intent of Recommendation 3. Therefore, this recommendation is considered resolved, but will remain undispositioned and open until the corrective actions described below have been completed.

Although management did not fully concur with Recommendation 4, the planned actions are responsive to the intent of the recommendation. The recommendation is resolved, but will remain undispositioned and open until the corrective actions have been completed.

Based on further discussions with management on Recommendation 5, management will assess the human resources management issues noted in the recommendation. In addition, NASA is developing a database to track the workforce plan data. Therefore, the recommendation is resolved, but will remain undispositioned and open until the corrective actions have been completed.

## **Appendix A. Objectives, Scope, and Methodology**

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### **Objectives**

The overall objective was to evaluate the implementation of the FBC policies for acquisition management at NASA. Specifically, we assessed the policies and procedures issued by NASA, including the Enterprises and Lead Centers, related to FBC acquisition management and implementation of FBC acquisition policies and procedures by NASA program and project management.

### **Scope and Methodology**

The audit included a review of NASA's FBC philosophy. We reviewed the history of FBC and the guidance that NASA has issued. We sent questionnaires to points of contact at Goddard, Marshall, JPL, Johnson, and the Space Science and Earth Science Enterprises to gain an understanding of FBC policies, procedures, plans, and guidelines and of whether FBC has been incorporated into NASA's strategic management. We interviewed program and project personnel at Goddard and Marshall to obtain their understanding of FBC and implementation processes at those Centers. In addition, we reviewed the FBC Task review final report, NASA mishap/failure investigation reports, and congressional testimony on those reports. We did not review the action plans being developed by the NASA Integrated Action Team. The NASA Integrated Action Team planned to report its results by August 2000; however, it was not issued until December 21, 2000, after the draft of this report was issued.

We did not rely on computer-processed data to achieve the audit objectives.

### **Government Performance and Results Act**

The Government Performance and Results Act of 1993 (GPRA) directs Executive Branch agencies to develop a customer-focused strategic plan, align agency programs and activities with concrete missions and goals, manage and measure results to justify appropriations and authorizations, and design budgets that reflect strategic missions. GPRA also requires agencies to prepare annual performance plans that establish the connections between the long-term strategic goals outlined in their strategic plans and the day-to-day activities of program managers and staff. Finally, GPRA requires that each agency report annually on the extent to which it is meeting its annual performance goals and the actions needed to achieve or modify goals that have not been met. We found that FBC has not been adequately documented in NASA's policies and guidance or strategic plan. In addition, there is not a clear linkage between staffing and the strategic goals of the Agency.

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## Management Controls Reviewed

We reviewed the following management controls:

- NASA's strategic planning documents:
  - NASA's Fiscal Year 1998 Strategic Plan with 1999 Interim Adjustments
  - NASA's Fiscal Year 2000 Strategic Plan Concurrence Draft, dated June 5, 2000<sup>62</sup>
  - NASA's Fiscal Year 1999 Performance Report
  - NASA's Fiscal Year 2000 and 2001 Performance Plans
  - Earth Science Enterprise Strategic Plan 1998-2002, dated October 1998
  - Space Science Enterprise Strategic Plan, dated November 1997
  - Aerospace Technology Enterprise Strategic Plan 1995-2000, dated April 1995
  - 1996 Human Exploration and Development of Space Enterprise Strategic Plan, dated January 1996
  - Ames Research Center - Center Implementation Plan, dated January 2000
  - Dryden Space Flight Center - Center Implementation Plan, dated March 1, 1998
  - Glenn Research Center - Center Implementation Plan, FY 2000
  - Goddard Space Flight Center - Center Implementation Plan, dated October 1998
  - Jet Propulsion Laboratory - Center Implementation Plan, FY 2000
  - Johnson Space Center - Center Implementation Plan, dated September 1997
  - Kennedy Space Center - Center Implementation Plan, dated February 2000
  - Langley Research Center - Center Implementation Plan, 2000
  - Marshall Space Flight Center - Center Implementation Plan, dated September 1998
  - NASA Procedures and Guidelines (NPG) 1000.2, "NASA Strategic Management Handbook," March 5, 1999
- Government Performance and Results Act of 1993
- Office of Management and Budget (OMB) Circular A-11, "Preparing and Submitting Budget Estimates," dated July 19, 1999
- OMB Circular A-123, "Management Accountability and Control," dated June 21, 1995
- General Accounting Office, "Standards for Internal Control in the Federal Government," dated November 1999
- NASA Policy Directive (NPD) 1400.1F, "NASA Directives System," dated July 19, 1999
- NPG 1400.1B, "NASA Directives System Procedures and Guidelines," dated April 25, 2000
- NPG 7120.5A, "NASA Program and Project Management Processes and Requirements," dated April 3, 1998

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<sup>62</sup>The "NASA's Fiscal Year 2000 Strategic Plan," NPD 1000.1b, was issued in final form on September 27, 2000. We reviewed the final version and found no changes that would impact the findings in our report.

## **Appendix A**

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We considered management controls to be adequate except that FBC has not been adequately documented in NASA's policies and guidance or strategic planning process. In addition, there is not a clear linkage between staffing and the strategic goals of the Agency.

### **Audit Field Work**

We performed audit field work from February through November 17, 2000. We performed the audit in accordance with generally accepted government auditing standards.

## Appendix B. Summary of Mars Program Failures

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The Mars Climate Orbiter (MCO) was launched in late 1998, followed by the Mars Polar Lander (MPL) and Deep Space 2 launched in early 1999. The MCO did not achieve Mars orbit because of a navigation error, resulting in the spacecraft entering the Mars atmosphere instead of going into the planned orbit. The "MCO Mishap Investigation Board Phase I Report," dated November 10, 1999, provides details on the cause of the failure and corrective action. The following is a summary of the MCO findings.<sup>63</sup>

Spacecraft operating data needed for navigation were provided to the Jet Propulsion Laboratory navigation team by prime contractor Lockheed Martin in English units rather than the specified metric units. This was the direct cause of the failure. However, it is important to recognize that space missions are a "one strike and you are out" activity. Thousands of functions can be correctly performed and one mistake can be mission catastrophic. Mistakes are prevented by oversight, test, and independent analysis, which were deficient for MCO.

Specifically, software testing was inadequate. Equally important, the navigation team was understaffed, did not understand the spacecraft, and was inadequately trained. Navigation anomalies (caused by the same units error) observed during cruise from Earth to Mars were not adequately pursued to determine the cause, and the opportunity to do a final trajectory correction maneuver was not utilized because of inadequate preparation.

MPL and the two Deep Space 2 microprobes were integrated on a common cruise stage for the trip from Earth to Mars. Separation of the microprobes and the lander was planned to occur about 10 minutes prior to the planned Mars landings. The design of the lander precluded any communications from the period shortly before separation from the cruise stage until after Mars landing. The planned communications after landing did not occur, resulting in the determination that the MPL mission had failed. Extensive reviews, analyses, and tests have been conducted to determine the most probable cause of the MPL failure. This is documented in the "Report on the Loss of the Mars Polar Lander and Deep Space 2 Missions." Several possible failure causes are presented, which include loss of control due to spacecraft dynamic effects or fuel migration, local characteristics of the landing site beyond the capabilities of the lander, and the parachute covering the lander after touchdown. Extensive tests have demonstrated that the most probable cause of the failure is that spurious signals were generated when the lander legs were deployed during descent. The spurious signals gave a false indication that the lander had landed, resulting in a premature shutdown of the lander engines and the destruction of the lander when it crashed into the Mars surface.

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<sup>63</sup>This summary is in the "Mars Program Independent Assessment Team Summary Report," dated March 14, 2000.

## Appendix C. Clarification on Cost Considerations in Project Management

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On February 7, 2000, the NASA Administrator issued a memorandum, "Clarification on Cost Consideration in Project Management." The memorandum states that, "resources, including cost, must be balanced against mission requirements and the project's return on investment." The Administrator provided further clarification in an enclosure to the memorandum. Excerpts from this enclosure follow:

Faster, better, cheaper does not mean breaking the rules of good project management....

We all must recognize that restructure or cancellation is a better course of action than proceeding with a project with an unacceptably high level of risk.

Cost constraints must never be used as an excuse for making a decision that violates good technical and management practices. Thorough systems engineering, technical peer review, simulation and modeling, quantitative risk analysis, design for system robustness, verification and validation tests, contingency operations, and telemetry during critical operations should be implemented on every project. While managing cost, projects should focus on safety and mission success and risk management.... However, we must never take unnecessary risks to save dollars.

NASA's project management philosophy entrusts our Project Managers with great responsibility and decision-making authority within the bounds of the project agreements. We also hold Project Managers accountable for successfully planning and executing our missions. This responsibility includes taking those necessary steps to ensure mission safety and reduce risk by appropriately balancing resources and requirements in achieving success in innovative scientific and technological missions....

## Appendix D. Rules of Engagement for FBC Projects

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The FBC Task review recommended that NASA establish the following "Rules of Engagement for FBC Projects."<sup>64</sup>

Form and motivate an excellent team, a mix of experience and bright energetic youth bringing enthusiasm and new methods.

Go to the best sources of expertise in NASA, industry, and academia.  
Certify each team.

Co-locate physically and/or electronically; do concurrent engineering.

Team with Mission Assurance to develop the Project Mission Assurance Plan.

Establish a challenging but realistic mission target.

Establish up-front agreements and maintain them.

Size mission scope within resources to provide for acceptable risk and adequate reserves.

Develop a thorough Project Plan according to NPG 7120.5A, tailoring its rules/guidelines to each project's needs.

Conduct rigorous system and subsystem engineering to established standards (like JPL's Design Standards).

Conduct continuous, rigorous risk assessment and mitigation throughout development and operations. Establish/maintain a mission risk signature.

Balance use of available and advanced technology to maximize Mission Success.

Establish/maintain metrics for mission risk and technical/cost/schedule performance.

Test, test, test and test as you fly.

Then train, train, train. Flight operations teams must contain key members of the development team.

Best Project Development to Flight Operations arrangement: Designers become testers become operators.

Work openly and candidly inside the team with thorough communication. Communicate openly and candidly externally to the project.

Support yearly independent formal reviews, but also peer review all key decisions, results, and events, responding to all action items.

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<sup>64</sup>The FBC Task review team reported its "Rules of Engagement for FBC Projects" as Attachment A to its final report issued on March 13, 2000.

## Appendix E. FBC Mars Missions Showed Disparity in Management, Resources, Process, and Execution

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The attributes of the six FBC missions reviewed by the Mars Program Independent Assessment Team showed that the project managers were not implementing FBC in a consistent manner. Agencywide FBC policies and guidance would help ensure a more consistent, prudent implementation of FBC. The table below summarizes information on the six FBC missions reviewed in the Mars Program Independent Assessment Team report, dated March 14, 2000.

Attributes	Mars Global Surveyor	Mars Pathfinder	Deep Space 1	MCO	MPL and Deep Space 2 (2 Projects on One Spacecraft)
<b>Mission Results</b>	Success	Success	Success	Failure	Failure
<b>Project Manager</b>	Experienced	Experienced	Inexperienced (but offset by Jet Propulsion Laboratory (JPL) and partnering*)	Separate Project Managers for Development, Flight, and Operations	Separate Project Managers for Development, Flight, and Operations
<b>Requirements</b>	Stable	Stable	Stable (but requirements descoped due to delays)	Overly challenging goals	Overly challenging goals
<b>Project Office Staffing</b>	Adequate	Adequate	Adequate with JPL and partners	Inadequate	Inadequate
<b>Cost and Schedule Margins</b>	Adequate	Adequate	Schedule adequate (but cost not mentioned)	Inadequate	Inadequate
<b>Engineering Principles Utilized</b>	Sound	Sound	(Not rated)	Inadequate	Inadequate
<b>Continuity from Development to Operations</b>	Yes	Yes	Yes (but experienced development problems)	No (for example, separate project managers)	No (for example, separate project managers)

\* The Deep Space 1 mission leveraged capabilities with various partners. The mission's partners included other NASA Centers, other Government organizations, and industry.



## Appendix F. Analysis of FBC Coverage in NASA's Strategic Management Documents

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NASA does not cover FBC in adequate detail in its strategic management process and documents. NASA strategic management documents include a handbook, a strategic plan,<sup>65</sup> a performance plan,<sup>66</sup> a performance report,<sup>67</sup> Enterprise Strategic Plans,<sup>68</sup> and Center Implementation Plans.<sup>69</sup> Although these documents mention FBC-related concepts intermittently, there is no direct link of a NASA management plan for FBC from the Agency Strategic Plan to the Enterprise Strategic Plans and then to the Center Implementation Plans.

**NASA Strategic Plan.** Although the 1998 NASA Strategic Plan with 1999 Interim Adjustments, dated March 5, 1999, provides some coverage, the coverage is not sufficient. The Space Science Enterprise section mentions FBC but does not provide an implementation strategy or specifics. Also, the Earth Science Enterprise section does not mention FBC but does mention some FBC-related concepts such as development of advanced technology to reduce cost. The Human Exploration and Development of Space and Aerospace Technology Enterprise sections do not mention FBC or related concepts. In the "Framework" section, the plan states that "effective implementation of [the Crosscutting Processes]<sup>70</sup> will help us deliver better products and services and cut development time and costs in current and future programs." In the "Crosscutting Processes" section, the plan states that "NASA is making significant progress in achieving our mission and goals of doing business faster, better, and cheaper while never compromising safety. Throughout the Agency, there are hundreds of examples of programs, projects, and management systems being delivered with better service and at lower costs."

Also, the draft NASA 2000 Strategic Plan, dated June 5, 2000, which is under review by NASA offices for concurrence, does not provide any coverage of FBC.

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<sup>65</sup>The NASA Strategic Plan articulates the Agency's vision, mission, goals, and objectives, as well as Agencywide strategies for achieving them.

<sup>66</sup>Annual performance plans, required by GPRA, establish performance goals and measures covering a given fiscal year and provide the direct linkage between an agency's longer term goals and day-to-day activities.

<sup>67</sup>Annual performance reports, required by GPRA, report on the degree to which the performance goals contained in the annual performance plan were met.

<sup>68</sup>Enterprise Strategic Plans elaborate on their respective mission and goals, in alignment with NASA's Strategic Plan, with detailed objectives, implementing strategies, and brief descriptions of their principal programs and/or processes. Appendix A contains a list of the strategic management documents reviewed.

<sup>69</sup>The Center Implementation Plans define the relationship of the Agency and Enterprise strategic plans to the Centers' missions, Center of Excellence responsibilities, program-specific assignments, and support activities. These plans also ensure alignment of the institutional, program, and functional activities at the Centers with the Enterprise (Lead Center, Supporting Center) and functional (Principal Center) assignments. Appendix A contains a list of the strategic management documents reviewed.

<sup>70</sup>NASA established Crosscutting Processes to provide support systems that enable each Enterprise to develop and deliver Agency products and services to internal and external customers. All activity within NASA is contained within one or more of these four Crosscutting Processes: provide aerospace products and capabilities, generate knowledge, communicate knowledge, and manage strategically.

**Enterprise Strategic Plans.** From 1995 through 1998, each Enterprise issued a strategic plan. None of the strategic plans provide sufficient FBC coverage. Also, because the strategic plans have not been updated, they are not linked to the current NASA Strategic Plan.

Only one of the Enterprise Strategic Plans contains a direct reference to FBC and related metrics. The "Space Science Enterprise Strategic Plan," dated November 1997, contains a chart entitled "The Space Science Enterprise: Faster, Better, Cheaper," which states that, "The Enterprise will fly missions faster and cheaper, continuing to reduce mission costs and development time and increase the flight rate. The continued application of the highest scientific standards and peer review will ensure that these missions are better as well." The chart displays three performance measures, average spacecraft development cost, average development time, and annual flight rate, for three periods: 1990 to 1994, 1995 to 1999, and 2000 to 2004.

The other three Enterprise Strategic Plans mention FBC-related concepts but do not provide specifics or a link to the NASA Strategic Plan. The "Earth Science Strategic Enterprise Plan 1998-2002," dated October 1998, contains a section entitled "Doing Business in New Ways," which mentions meeting science objectives in cost-effective ways and shortening development time, reducing cost, and facilitating the development of commercial capabilities as new ways of doing business. The Human Exploration and Development of Space Strategic Plan, dated January 1996, mentioned the following FBC-related strategies: develop innovative advanced technology to support human exploration and explore revolutionary space transportation systems and technologies to improve capabilities and radically reduce the cost of human space flight. The Aerospace Technology Enterprise "1995-2000 Strategic Plan," dated April 1995, briefly mentions new ways of doing business as in "finding new ways of doing business is essential for making leadership affordable."

**Center Implementation Plans.** The Center implementation plans do not provide sufficient FBC coverage. Plans for only two Centers, Ames Research Center (Ames) and John F. Kennedy Space Center (Kennedy), only briefly mention FBC. All Center implementation plans describe Center contributions to applicable Enterprise strategic goals and objectives, some of which relate to FBC concepts. However, because the Enterprise Strategic Plans do not provide sufficient FBC coverage, the Center Implementation Plans, which flow down from the Enterprise Strategic Plans, do not provide sufficient FBC coverage either.

The Ames plan, dated January 2000, states that the FBC challenge requires Ames to research automated reasoning for autonomous systems that will enable a new generation of spacecraft to do more exploration at a much lower cost than traditional approaches. The Kennedy plan, dated February 2000, lists a goal to "continually enhance core

## Appendix F

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capabilities (people, facilities, equipment, and systems) to meet NASA objectives and customer needs for faster, better, cheaper development and operations of space systems." All Center implementation plans mentioned at least one FBC-related concept, usually advanced technology development.

**Performance Plan.** The NASA FY 2001 Performance Plan, dated February 7, 2000, does not provide sufficient coverage of FBC. The Earth Science and Space Science Enterprise performance plans mention FBC as part of the Enterprises' implementation strategies. The Space Science Enterprise performance plan mentions FBC and related performance measures, but the other three<sup>71</sup> Enterprises, Earth Science, Human Exploration and Development of Space, and Aerospace Technology do not include FBC related performance measures. The performance plan for the Space Science Enterprise provides two performance measures relating to cost and schedule, but this type of measure could exist in the absence of FBC. The performance plan for the Space Science Enterprise contains an implementation strategy section, which states:

Program managers are encouraged to shorten the development time of technologies and missions, explore new conceptual approaches, streamline management, and incorporate innovative methods and technologies to enhance efficiency and effectiveness with maintaining safety. Continuing investment in long-term, high-payoff, technologies, such as advanced miniaturization, intelligent systems, autonomous operations, and simulation-based design, are key to implementing the Space Science mission. Collaborative efforts with other Federal agencies ... as well as international partners, play a key role in the implementation strategy of the Enterprise.

For the Space Science Enterprise, the performance plan gave "target" metrics on cost/schedule for each of two objectives. For the "Solve Mysteries of the Universe" objective, the target is to "Successfully develop and launch no less than three of four planned missions within 10% of budget and schedule." For the "Explore the Solar System" objective, the target is to "Successfully develop and launch no less than one of two missions within 10 percent of budget and schedule.

For the Earth Science Enterprise, the performance plan implementation strategy section states, "Program managers are encouraged to accept prudent risk, shorten development time of technologies and missions, explore new conceptual approaches, streamline management, and incorporate innovative methods to enhance efficiency and effectiveness," but does not provide related performance measures.

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<sup>71</sup>The Biological and Physical Research Enterprise was established on September 29, 2000, and is not included in the strategic management documents discussed in this report.

The GAO observed in a 1999 report that the NASA FY 2000 Performance Plan did not adequately explain the FBC approach in the implementation strategy sections of the plan.<sup>72</sup>

**Performance Report.** The NASA FY 1999 Performance Report does not mention FBC, but does evaluate the FY 1999 results for several FBC-related performance targets contained in the NASA FY 1999 Performance Plan.<sup>73</sup>

First, the report evaluates two FBC-related performance targets for the Provide Aerospace Products and Capabilities<sup>74</sup> crosscutting process. One performance target was to "reduce the 5-year average spacecraft cost for Space Science and Earth Science Enterprise missions to \$200 million from \$590 million." The report concluded that this target was not achieved, stating that the 5-year average spacecraft cost was reduced to \$210 million, which was not quite enough to achieve the target reduction. The other performance target was to "reduce the 5-year average spacecraft development time for Space Science and Earth Science missions to 5 years, 2 months from 8 years, 3 months." The report concluded that this target was achieved, stating that the 5-year average development time was reduced to 5 years, which is 2 months below the target.

In addition, the report evaluates one FBC-related performance target for the Space Science Enterprise. The performance target was to "successfully launch seven spacecraft, within 10 percent of budget, on average." The report concluded that this target was achieved, stating that, with the inclusion of the Chandra X-ray Observatory, seven spacecraft have been successfully developed and launched with a 3.8 percent average overrun.

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<sup>72</sup>In NSIAD-99-186R, "Observations on NASA's Fiscal Year 2000 Performance Plan," dated July 20, 1999, the GAO observed that the implementation strategies in the plan tended to outline philosophies rather than describe enabling actions. GAO stated that the performance plan does not clearly explain the application of the FBC approach to spacecraft development in the Space Science and Earth Science implementation strategy sections. GAO stated that, at a minimum, NASA should have included an explicit discussion of what is involved in applying the FBC approach and how the establishment of "prudent risk" is part of it.

<sup>73</sup>GPRA requires that NASA prepare its first annual performance plan for FY 1999.

<sup>74</sup>The Provide Aerospace Products and Capabilities crosscutting process is the means by which NASA's Strategic Enterprises and their Centers deliver systems (grounds, aeronautics, and space); technologies; data; and operational services to NASA customers.

## Appendix G. Analysis of Human Resource Coverage in NASA's Strategic Planning Documents

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NASA has not adequately addressed human resources management in its strategic management process and documents. NASA's strategic management documents include a handbook, a strategic plan, a performance plan, a performance report, and Enterprise Strategic Plans and Center Implementation Plans. None of the planning documents shows a clear linkage between strategic goals and the human resources needed to accomplish the goals.

**NASA Strategic Plan.** The 1998 NASA Strategic Plan with 1999 Interim Adjustments contains a limited discussion on human resources. The Plan highlights people as a NASA value<sup>75</sup> and states that the Agency's greatest strength is its workforce. In addition, the "Crosscutting Processes" section of the Plan includes a process objective to optimize Agency investment strategies and systems to align human, physical, and financial resources with customer requirements, while ensuring compliance with applicable statutes and regulations. The NASA's Fiscal Year 2000 Strategic Plan Concurrence Draft discussion of human resources, while revised from the previous year, does not provide much additional detail. The Plan continues to highlight people as a NASA value, but has revised the "Crosscutting Processes" section. The objective now states that NASA should invest wisely in the Agency's use of human resources, developing and drawing upon the talents of all NASA's people. The Plan does not provide any further explanation to show how these human resource ideas will be used to the accomplishment of NASA's overall strategic goals.

**Enterprise Strategic Plans.** Unlike the Agency's overall strategic plan, none of NASA's Enterprise Strategic Plans<sup>76</sup> present the NASA values<sup>77</sup> or the strategic management of crosscutting processes. In addition, there is no discussion of the resources that will be used to accomplish the overall strategic goals of the Enterprise. The Aerospace Technology Strategic Enterprise Plan, however, does discuss its commitment to people in Section VIII, "Implementation Strategies and Principles."

**Center Implementation Plans.** While the Enterprise Strategic Plans do not present NASA values or the strategic management of crosscutting processes, these concepts were discussed, to varying degrees, in the Center Implementation Plans. All the Center Implementation Plans,<sup>78</sup> except Dryden, Johnson, and Marshall, present Center values, but only the Langley Research Center plan presented people as a value similar to

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<sup>75</sup>Values articulate basic management policies and should define a customer-oriented approach for producing and delivering Government services. A statement of values might include such topics as respect for individuals (customers and employees), ethical and professional standards, and quality services.

<sup>76</sup>Appendix A contains a list of the titles and dates of the plans reviewed.

<sup>77</sup>Values provide a foundation of beliefs for the mission. Values also serve as a test of criteria for judging the quest and guide decisions and the selection of strategies. They are common beliefs that can be embraced by the whole organization. When implemented, they can be powerful instruments for changing the organizational culture and motivating employees.

<sup>78</sup>See Appendix A.

NASA Strategic Plan. The other Centers, however, included values that were related to employees or mentioned employees in the explanation of the values presented. In addition, most Center Implementation Plans discussed crosscutting processes. However, the staffing focus was on workforce reduction and maintaining diversity during downsizing and not on the linkage between the strategic goals and the resources needed to accomplish the goals. Only Dryden and Goddard developed strategies and objectives that discussed reward recognition and performance systems, training, and recruitment. While the narrative of the Institution<sup>79</sup> section of the Jet Propulsion Laboratory (JPL) plan highlights a strategy to attract, reward, and retain a highly skilled, diverse workforce, the related performance objective focuses on the number of training hours an employee receives and does not discuss the other attributes.

**Performance Plan.** NASA's Fiscal Year 1999 Performance Plan lists an objective to optimize investment strategies and systems aligning human, physical, and financial resources with customer requirements, while ensuring compliance with applicable statutes and regulations. The performance targets for functions related to human resources are:

- reduce the civil service workforce level to below 19,000;
- maintain a diverse NASA workforce throughout the downsizing efforts; and
- reduce the number of Agency lost workdays.

The Fiscal Year 2000 Performance Plan includes similar information and shows that a new target for the reduction of civil service workforce as below 18,200.

The targets do not show how a reduction in staff will align the human resources with customer requirements. In addition, there is an effort to maintain diversity through downsizing, but there is no target to ensure maintaining the proper skills mix through downsizing. The reduction is Agencywide and does not identify occupations, Centers, or Enterprises where excess staffing is occurring. The plan also does not discuss why NASA has excess staff. If excess staff exist because goals have changed and programs have been cancelled, then there should be a clear link to the Center, the Enterprise, and occupations that are targeted for reduction.

The plan presents human resource information in the form of budget amounts for civil servant full-time equivalents.<sup>80</sup> Although this presentation is at the Agency-level and the Enterprise-level, it does not provide detail on how funds will be spent to ensure that the workforce is of adequate size and possesses the skills and abilities to accomplish

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<sup>79</sup>Institutional processes encompass policy decisions, allocation of common resources, approval of the Center's institutional operations budgets, and recommendations on proposed capital investments including fund source.

<sup>80</sup>The Office of Personnel Management defines a full-time equivalent as being equal to a work year of 2,080 hours.

## Appendix G

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the Agency and Enterprise strategic goals and objectives. Also, the plan does not discuss planning for the future workforce changes in size and skill mix and the changes that may adversely affect or enhance the Agency's ability to accomplish its strategic goals and objectives.

**Performance Report.** The NASA Fiscal Year 1999<sup>81</sup> Performance Report reflects that most of the targets presented in the Performance Plan for 1999 were achieved. The plan also states that NASA considers the reduction of staff an improvement to the alignment of human resources and to be consistent with the goals, objectives, and strategies in NASA's Strategic, Implementation, and Performance Plans. However, the report does not explain how the targets link to the strategic objectives and goals.

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<sup>81</sup>NASA's performance report for fiscal year 2000 is not due to Congress until March 2001.

## Appendix H. Analysis of NASA's Human Resource Issues

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Representatives at Goddard, Jet Propulsion Laboratory (JPL), Johnson, and Marshall as well as the Office of Space Science and Earth Science have addressed human resource management issues such as skill assessment, recruitment, training, and the effect the FBC approach has had on managing human resources.<sup>82</sup>

**Skills Assessment and Recruitment.** In response to our questionnaire related to the effect the FBC approach has had on managing human resources, all NASA Center representatives we contacted responded that they continually assess skill needs. Although the Office of Space Science continually assesses Center human resources, representatives noted that it is almost impossible to maintain and recruit the skilled workforce necessary to ensure achievement of program goals. The Office of Space Science has found it particularly difficult to replace retirees with similarly skilled people. In addition, the Office of Space Science representative stated that there does not seem to be an adequate pipeline of journeyman-level managers to replace retirees. Successful ongoing recruiting, hiring, and retaining of workforce with the required expertise has become a critical management concern at JPL due to the extreme competitiveness found in the high-tech market. Goddard and Marshall representatives indicated that they have isolated areas in which hiring has been challenging. Johnson indicated that it had a shortfall in skills a year ago, but was authorized to hire an additional 100 people which has remedied the shortfall. The Office of Earth Science stated that the recruitment process offers many challenges particularly when relocation and specialty skills are involved. Retaining skilled personnel is a continuous and challenging activity.

**Training and Compensation.** Training is also a concern. JPL representatives stated that the demand on its employees' time, due to significant workload and schedule commitments, has made it increasingly difficult for employees to attend relevant training and workshops. Johnson noted that it experienced the same problem in 1999. Marshall is experiencing an increased need for additional emphasis and funding on retraining and cross-training. In addition, the Office of Space Science noted that the lack of authorization over the last several years to use promotions and other methods to reward employees makes it difficult to counter the lure of employment opportunities in industry.

**FBC Impact on Human Resource Management.** Representatives from the Office of Space Science and the Office of Earth Science stated that FBC has caused adjustments in management's approach. The Office of Space Science indicated that while its Headquarters staff has been reduced, the Office continues to have the same review and reporting requirements that it had when the office staff was larger. The Office of Earth Science noted that the change from a few large missions to a greater number of small missions increases the level and amount of management. JPL representatives stated that

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<sup>82</sup>We analyzed the responses provided by NASA representatives but did not review trends in their staffing and budget levels as part of our analysis.



## Appendix H

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in response to the FBC approach, JPL will review how all work gets done and the development of new administrative processes. In addition, JPL indicated that it has established a high-level Future Program Council.<sup>83</sup>

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<sup>83</sup>The Future Program Council deliberates the undertaking of any new commitments and reviews all proposed projects regarding adequate funding, facilities, and workforce including management oversight.

## Appendix I. Management's Response

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National Aeronautics and  
Space Administration  
**Office of the Administrator**  
Washington, DC 20546-0001



JAN 9 2001

TO: W/Assistant Inspector General for Auditing

FROM: AE/Chief Engineer  
F/Associate Administrator for Human Resources and Education  
Z/Associate Administrator for Policy and Plans

SUBJECT: Agency Response to Draft Report on Audit of Faster, Better, Cheaper:  
(FBC) Policy, Strategic Planning, and Human Resource Alignment;  
A0002400

REFERENCES: Enhancing Mission Success - A Framework for the Future; A  
Report by the NASA Chief Engineer and the NASA Integrated  
Action Team; December 21, 2000.

Statement by D. Goldin to Committee on Science, House of  
Representatives; June 20, 2000

Thank you for the opportunity to review the subject document. The following represents an integrated Agency response. We appreciate the effort that the Office of the Inspector General (IG) has expended to recommend improvements in this area. However, we are concerned about the implication the report makes about FBC being a policy applicable to a subset of NASA activity. It is important to raise this as a concern because the approach, findings and conclusions seem to be influenced by the assumptions that support such an implication.

Starting in 1992, NASA laid out a course of action that embraced the goals of faster, better, cheaper, to guide the formulation of programs. The Agency, and Enterprise strategic and implementation plans have continued to evolve to reflect such course of action. The evolution of NPG 7120.5 over the last decade has captured the policies necessary to manage the broad spectrum of programs and projects reflected in these strategic and implementation plans. The IG report, however, reflects a narrow interpretation of FBC that would lead to seeking specific policies relative to FBC, as opposed to evaluating the strategic plans and other documents that are indeed in place as a reflection of the FBC course of action.

Notwithstanding such an important distinction, the recommendations do touch upon important areas that the Agency has recognized as requiring attention, and has been taking proactive steps to correct.

Below (shown in quotes) is the "Assessment of Faster, Better, Cheaper" section of the NASA Integrated Action Team (NIAT) report signed by the Administrator on December 21, 2000. It provides a picture of the origins and evolution of the FBC.

"As first introduced in NASA in 1992, FBC reflected a management approach intended to stimulate innovative development and application of technology, streamline policies and practices, and energize and challenge a workforce to continue to safely and successfully undertake bold new missions in an era of diminishing resources. It emphasized the following:

- Distribution of risk by moving from single high-cost, long-development time missions to multiple low-cost, shorter development time missions, when compatible with objectives,
- Accountability and responsibility for success that is clearly placed with the implementing teams at NASA's Centers, as well as within industry and academia,
- Efficiency in process and methodology, and exploitation of new yet mature technology to enable and enhance new and challenging science and technology programs and projects consistent with short development cycles.

The above principles were overarching, and were intended to stimulate NASA to strive to be "Faster, Better, Cheaper". In some instances, the principles were applied well and resulted in mission success. Programs such as Explorers, Discovery, Earth Science System Pathfinder, and New Millennium, were reinvented to capitalize on smaller, less costly, and technologically challenging approaches to achieve the scientific and technological objectives. In other instances, notably Mars '98, Lewis, and Clark, attempts to apply these principles resulted in mission failure.

FBC promoted prudent risk taking to push the technical and programmatic boundaries. Process constraints were minimally controlled to stimulate innovation. Resources were highly constrained and guidance on the boundaries of innovation and risk taking was lacking, thereby engendering a variety of approaches to adapting to this new paradigm. At the same time, other changes occurred that exacerbated the potential difficulties associated with the adaptation.

The FBC emphasis resulted in a threefold increase in the number of programs and projects, particularly in small science payloads. This required more project managers and systems engineers. During this same period, NASA reduced its civil service workforce by 24 percent from Fiscal Year (FY) 1993 through FY 1999, causing both a loss in corporate knowledge and a substantially increased workload on the remaining employees. Losses also occurred within the vitally important aerospace industry workforce. Technical complexity, primarily in software utilization was increasing as well. These changes in practice, skills, and knowledge of the

workforce, coupled with the demand for innovation in aerospace science and technology, particularly the revolution in information technologies, presented a tremendous challenge to NASA.

Despite these challenges, NASA's overall mission success rate in the 1990's remained impressively high. Greater than 97% of the budgetary investment in flight missions resulted in successful outcomes. However, the success rate for missions clearly associated with exploring the boundaries stimulated by the FBC approach was approximately two out of three.

As evidenced by the successes of the Agency, the underlying principles of FBC, have applicability to all that the Agency does if properly applied. Therefore the governing process by which the Agency guides execution of its programs and projects does not currently differentiate projects that are FBC and those that are not. Instead, it relies upon a careful assessment on a case by case basis to establish the risk posture associated with a particular mission or endeavor. NASA's work is and will continue to be inherently high risk. Therefore, the goal is to strive for the reduction of residual risk to that inherent in the challenge of the science or technology mission without compromising safety considerations. In this light, we do not see a need for differentiation of FBC projects. Rather, we must ensure that there is adequate guidance for decision-making and risk management for all projects."

Specifically, in response to the recommendations contained in the report, we provide the following response.

**IG Recommendation 1:** The NASA Associate Deputy Administrator, in coordination with the Chief Engineer, should develop policies and guidance in NPG 7120.5A and other appropriate NPD's and NPG's to define FBC and to describe its implementation.

**NASA Response: Partially Concur.** NASA does not agree with the implication that FBC should be a specific subset of current management policies. Despite this disagreement, the Agency is taking action that we believe is consistent with the intent of the recommendation.

The Chief Engineer's Office has issued the NIAT report, which defines a set of actions with broad applicability to the wide range of NASA programs and projects. The actions represent a system level approach to further enhancing the probability of mission success in NASA. The actions are organized along 5 major themes as follows: Developing and Supporting Exceptional People and Teams; Delivering Advanced Technology; Understanding and Controlling Risk; Ensuring Formulation Rigor and Implementation Discipline; and Improving Communication. The report defines the FBC philosophy, and provides the basic tenets for its implementation.

The definition of FBC and appropriate changes resulting from the NIAT report will be included in revision B of NPG 7120.5, and other NASA policy documents as appropriate.

**IG Recommendation 2:** The Associate Administrator for Policy and Plans, in coordination with the Enterprise heads, Chief Engineer, and the Chief Financial Officer, should fully incorporate FBC into the strategic management process, including all key documents. Specifically, the NASA annual performance plans should fully describe each Enterprise's implementation strategy for achieving FBC.

**NASA Response: Non-Concur.** We believe that the Agency has already appropriately reflected FBC in its strategic documentation. The implementation of FBC is reflected in NASA's current strategic management process – from the challenging goals communicated in the Agency and Enterprise Strategic Plan to the implementation plans in Program and Projects. The NASA Strategic Plan 2000 states that “we will conduct more frequent missions for fewer dollars, thereby enabling increased opportunities for research, exploration, and discovery.”, and “collectively these efforts [referring to the goal and objectives of the PAPAC process] will further the Agency's ability to do more with less as we strive to achieve our mission in ways that are faster, better, cheaper.” The particular set of implementation approaches is reflected in the Program and Project Plans, which while they are a part of NASA's Strategic Management System documents, do not appear to have been reviewed as part of this audit.

Annual performance plans do not contain Enterprise-by-Enterprise implementation strategies; this is contained in the Program and Project Plans, as is appropriate for implementation-level detail. Current Enterprise performance targets are developed from program and project planning as appropriate.

**IG Recommendation 3:** The Associate Administrator for Policy and Plans, in coordination with the Enterprise heads and the Center Directors, should align human resources with strategic goals in Enterprise Strategic Plans and Center Implementation Plans.

**IG Recommendation 4:** The Associate Administrator for Policy and Plans, in coordination with the Enterprise heads, should describe in the Implementation Strategy sections of the NASA Annual Performance Plan how the Agency is implementing human resources management.

**IG Recommendation 5:** The Associate Administrator for Human Resources and Education, in coordination with the Enterprise heads and Center Directors, should develop a workforce strategy that will assess human resources management issues (that is recruitment, training, awards, bonuses, promotions, retention, and

succession planning) and develop meaningful data and data systems on which to base decisions tied to all aspects of human resource management.

**NASA Response to Recommendations 3, 4 and 5: Partially Concur.**

Recommendations 3, 4, and 5 seem to stem from the perspective that FBC is responsible for "keeping the staffing low", which NASA strongly disagrees with. The reduction in workforce, and the skill imbalance created by such reduction, combined with the increase in workload are largely responsible for the challenges in staffing, and not the FBC. However, the recommendations do touch on issues that NASA agrees are very important. The following paragraphs provide insight into actions that are being undertaken by the Agency in these areas.

Recommendation 3. The Enterprises are responsible for and do align human resources with Enterprise and Center plans. Agency budget, program/project planning, and other Enterprise planning processes include, as an integral element, consideration of resource needs (human, fiscal, and facilities). The Strategic Management Handbook NPG 1000.2 describes in paragraphs 2.2.4.1 through 2.2.4.3 the responsibility of the Capital Investment Council in reviewing and making recommendations relative to Agency capital investments and execution of programs. The Office of Human Resources' Functional Leadership Plan, part of the overall Agency strategic planning process described in NPG 1000.2, was developed after extensive discussion with the Enterprises on what, from a human resources perspective, will be needed to facilitate achievement of Agency and Enterprise goals and objectives.

Recommendation 4. The FY02 Performance Plan, a responsibility of the Chief Financial Officer, was developed with the knowledge resulting from the Mars failures, the FBC reports, and the NIAT activity, and will discuss NASA human resources at a level that is appropriate for NASA's outcome oriented Agencywide Performance Plan.

Recommendation 5. In 1998, under the auspices of the Chief Engineer's Office, the Agency conducted a core capability assessment that focused on the physical and staffing needs of the Enterprises and Centers of Excellence. This, and other similar activities, while very helpful, resulted in tactically-oriented decisions related to solving near-term human resource issues.

The Agency has embarked on a follow-on strategic resource planning activity, based on Centers' future vision and mission, taking into account workforce and facilities needed. This activity, led by the Associate Deputy Administrator, involves the active participation of the Enterprises and Centers and support from the Office of Human Resources and Education, the Office of the Chief Financial Officer, and the Office of the Chief Engineer. The result will provide a plan for each Center that

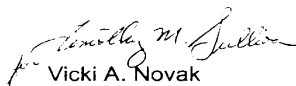
links staffing, funding resources, mission and activities, and core competencies. This is being undertaken in the context of overall Agency planning (future strategies and the resources needed to realize them).

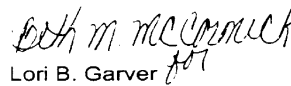
In addition, we believe that the report contains incomplete information or inaccuracies that we consider significant.

- The report refers to a FBC failure rate of 7 failures out of 16 missions. NASA data shows that during the period of 1992 through the end of 1999 there were 6 mission failures of 19 missions clearly associated with exploring the boundaries stimulated by FBC, or approximately two out of three, as quoted in the NIAT report. This data is consistent with the testimony provided by the NASA Administrator to the House of Representatives Committee on Science on June 20, 2000. His statement included the following: "...since 1992, NASA has launched approximately 150 missions and payloads, including launch of 55 scientific spacecraft, 44 Shuttle missions, and many Shuttle science and technology payloads." .... "During this period, there were 10 failures: 6 spacecraft, one anomaly-shortened Shuttle mission requiring a payload reflight, and 3 significant payloads...".
- In several instances, the report quotes NASA management as making generic statements, such as "FBC is a simple management philosophy" and "NASA considers the guidance provided in the Administrator's February 2000 memorandum and the results of the FBC task review to be sufficient policy and planning for FBC". We do not agree that these general statements accurately reflect the position of NASA management.

Thank you again for the opportunity to review this draft audit report. This response has been reviewed and concurred upon by the Office of Human Resources and Education, the Office of Policy and Plans, and the Enterprises. We would like to discuss the draft report and our response at your convenience. The point of contact for this audit is the NASA Deputy Chief Engineer for Systems Engineering, Mr. Orlando Figueroa. Mr. Figueroa can be reached at (202) 358-1120.

  
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## Appendix I

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cc:  
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Z/Ms. Garver  
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A/Administrator  
AA/Chief of Staff  
AE/Chief Engineer  
AI/Associate Deputy Administrator  
B/Acting Chief Financial Officer  
B/Comptroller  
BF/Director, Financial Management Division  
G/General Counsel  
H/Associate Administrator for Procurement  
HK/Director, Contract Management Division  
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### **NASA Centers**

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Acting Director, Lyndon B. Johnson Space Center  
Director, Marshall Space Flight Center  
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### **Non-NASA Federal Organizations and Individuals**

Assistant to the President for Science and Technology Policy  
Deputy Associate Director, Energy and Science Division, Office of Management and Budget  
Branch Chief, Science and Space Programs Branch, Energy and Science Division, Office of Management and Budget  
Director, Acquisition and Sourcing Management Team, General Accounting Office  
Professional Staff Member, Senate Subcommittee on Science, Technology, and Space

**Chairman and Ranking Minority Member – Congressional Committees and Subcommittees**

Senate Committee on Appropriations

Senate Subcommittee on VA, HUD, and Independent Agencies

Senate Committee on Commerce, Science, and Transportation

Senate Subcommittee on Science, Technology, and Space

Senate Committee on Governmental Affairs

House Committee on Appropriations

House Subcommittee on VA, HUD, and Independent Agencies

House Committee on Government Reform

House Subcommittee on Government Management, Information, and Technology

House Subcommittee on National Security, Veterans Affairs, and International Relations

House Committee on Science

House Subcommittee on Space and Aeronautics

**Congressional Member**

Honorable Pete Sessions, U.S. House of Representatives

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**Report Title:** Impact of the Boeing Company's Restructuring on NASA

**Report Number:** \_\_\_\_\_ **Report Date:** \_\_\_\_\_

*Circle the appropriate rating for the following statements.*

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
1. The report was clear, readable, and logically organized.	5	4	3	2	1	N/A
2. The report was concise and to the point.	5	4	3	2	1	N/A
3. We effectively communicated the audit objectives, scope, and methodology.	5	4	3	2	1	N/A
4. The report contained sufficient information to support the finding(s) in a balanced and objective manner.	5	4	3	2	1	N/A

*Overall, how would you rate the report?*

- |           |      |
|-----------|------|
| Excellent | Fair |
| Very Good | Poor |
| Good      |      |

*If you have any additional comments or wish to elaborate on any of the above responses, please write them here. Use additional paper if necessary:* \_\_\_\_\_

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*How did you use the report?* \_\_\_\_\_

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*How could we improve our report?* \_\_\_\_\_  
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*How would you identify yourself? (Select one)*

Congressional Staff	Media
NASA Employee	Public Interest
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Government: _____	Federal: _____ State: _____ Local: _____

*May we contact you about your comments?*

**Yes:** \_\_\_\_\_ **No:** \_\_\_\_\_  
**Name:** \_\_\_\_\_  
**Telephone:** \_\_\_\_\_

Thank you for your cooperation in completing this survey.

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