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United States Government Accountability Office

Report to the Subcommittee on Oversight of Government Management, the Federal Workforce, and the District of Columbia, Committee on Homeland Security and Governmental Affairs, U.S. Senate

August 2007

NASA

Progress Made on Strategic Human Capital Management, but Future Program Challenges Remain

GAO

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Why GAO Did This Study

The National Aeronautics and Space Administration (NASA) is engaged in efforts to replace the Space Shuttle with the next generation of human space flight systems and implement the President's space exploration policy. To do this, NASA must recruit, develop, and retain certain critical skills in its workforce, guided by its strategic human capital management plan. GAO was asked to examine the extent to which NASA (1) has aligned its human capital planning framework with its strategic mission and programmatic goals and (2) is recruiting, developing, and retaining critically skilled personnel, given future workforce needs. To address these objectives, GAO reviewed NASA's policies, planning, and implementation documents; reviewed budget documents and performance and accountability reports; and interviewed cognizant agency officials. To assess NASA's efforts to recruit, develop, and retain critically skilled personnel, we analyzed demographics data, and critical skills information; NASA's policy, procedures and guidance for recruiting and hiring; and implementation of information systems programs, and processes that support human capital management and planning. We are not making any recommendations in this report.
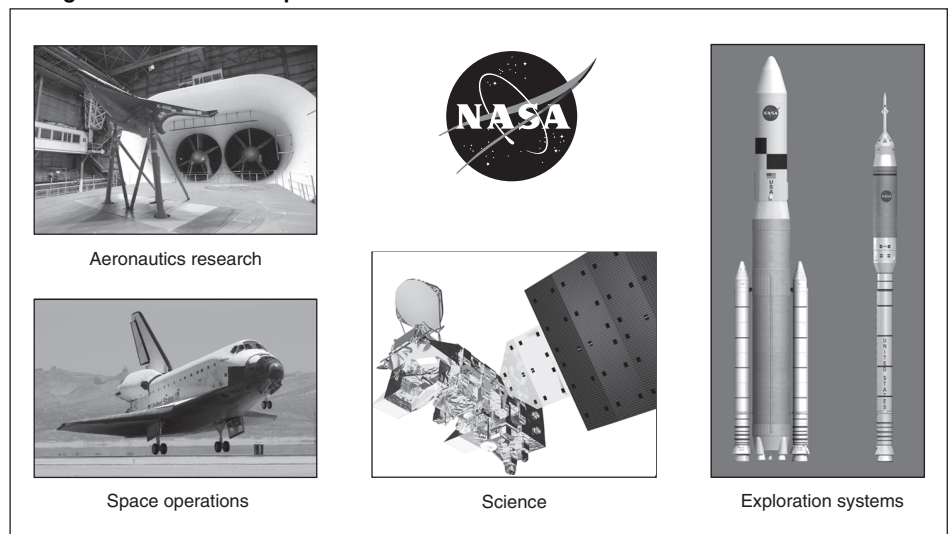
www.gao.gov/cgi-bin/getrpt?GAO-07-1004.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Cristina Chaplain, 202-512-4841, or chaplainc@gao.gov.

What GAO Found

NASA's strategic human capital framework is generally aligned with its strategic mission, outcomes, and programmatic goals. NASA's leaders have set its overall direction and goals and involved its mission directorates and centers in implementing human capital strategy and providing feedback to headquarters. Recently, NASA has been improving its workforce planning information technology matching program requirements with human capital resources. Some centers have been critical of the systems' performance, but others find these tools useful.

NASA attracts and retains critical personnel by using tools such as recruiting and retention bonuses. Recently, NASA has asked Congress for additional human capital flexibilities to help manage its workforce. The centers also have their own programs that address their critical skills shortfalls by training and developing employees. NASA recognizes that critical skills now present in the civil service and contractor Space Shuttle workforce are needed to complete present and future mission objectives, but also understands that additional capability will also be needed in certain areas. Given this, NASA is looking ahead and considering how best to mitigate any potential loss of skills and knowledge that could take place in the period between the Space Shuttle's retirement in 2010 and the resumption of human space flight in 2015.

NASA needs to manage its workforce to maintain core technical capabilities as it works through retirement of the Space Shuttle to enable it to achieve its missions

Aeronautics research

Space operations

Science

Exploration systems

Source: NASA.

Contents

Figures

Abbreviations

Co-op	Cooperative Education Program
CPDF	Central Personnel Data File
FIRST	Foundations of Influence, Relationships, Success, and Teamwork
GAO	Government Accountability Office
NAPA	National Academy of Public Administration
NASA	National Aeronautics and Space Administration
NRC	National Research Council
OPM	Office of Personnel Management
Vision	A Renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration
WICN	Workforce Information Cubes for NASA

United States Government Accountability Office
Washington, DC 20548

August 8, 2007

The Honorable Daniel K. Akaka
Chairman
The Honorable George V. Voinovich
Ranking Member
Subcommittee on Oversight of Government Management,
the Federal Workforce, and the District of Columbia
Committee on Homeland Security and Governmental Affairs
United States Senate

The National Aeronautics and Space Administration (NASA) is in the
midst of a complex transition effort due to the impending retirement of the
Space Shuttle in 2010 and its replacement by the next generation of human
space flight systems such as the Orion Crew Exploration Vehicle, the Ares
family of launch vehicles, and other exploration vehicles. An effort of this
scope has not been attempted since the end of the Apollo program, which
was designed to land humans on the Moon and bring them safely back to
Earth, and the start of the Space Shuttle Program more than three decades
ago. In 2004, the President established a new exploration policy—
A Renewed Spirit of Discovery: The President's Vision for U.S. Space
Exploration (Vision for Space Exploration). The cost of implementing it
over the coming decades will require hundreds of billions of dollars and a
sustained commitment from multiple administrations and Congresses. A
major component of this transition involves NASA's workforce, which
comprises about 18,000 civil servants at various centers across the
country. To meet its future needs, NASA is seeking to maintain certain
critical skills in space exploration, scientific discovery, and aeronautics
research. The agency needs to take action to align its workforce to the
new mission and goals in a timely fashion to help the safe operation of the
shuttle through retirement and a smooth transition to exploration
activities. We reported that strategic human capital management must be
the centerpiece of any serious change in NASA's management strategy.

NASA's workforce challenges are not unique within the federal
government. Federal agencies, as a whole, face new and increasingly
complex challenges in the 21st century. These agencies must transform
their organizations to meet the challenges of long-term fiscal constraints,
changing demographics, evolving governance models, and other factors.
To do so, they must engage in strategic workforce planning, including
systematic assessments of current and future human capital needs and the

development of long-term strategies to fill any gaps. We recently reported that human capital management is a governmentwide high-risk area because federal agencies typically lack a strategic approach to human capital management that integrates human capital efforts with their missions and program goals.

Given the importance of NASA's ability to sufficiently recruit, develop, and retain the staff it needs to execute the agency's missions, you requested that we examine the extent to which NASA (1) has aligned its human capital planning framework with its strategic mission and programmatic goals and (2) is recruiting, developing, and retaining critical science and engineering personnel needed to address future workforce requirements. To assess the alignment of NASA's human capital framework with its strategic mission and programmatic goals, we analyzed a range of policies, planning, and implementation documents; reviewed budget documents and performance and accountability reports; and interviewed cognizant officials in NASA's Office of Human Capital Management, mission directorates, and various field centers. To assess NASA's efforts to recruit, develop, and retain critical science and engineering personnel, we applied our five strategic workforce planning principles (see figure 4). In doing so, we analyzed NASA's (1) demographics data; (2) critical skills information; (3) policies, procedures, and guidance for recruiting and hiring; (4) implementation of information systems, programs, and processes that support human capital management and planning. We also assessed the internal and external challenges that NASA faces in achieving its workforce needs, by conducting interviews with key NASA officials in headquarters and various centers, and researching recent publications on workforce trends affecting NASA. We conducted our work from July 2006 through June 2007 in accordance with generally accepted government auditing standards. Appendix I further discusses our scope and methodology.

Results in Brief

NASA's strategic human capital framework is generally aligned with its strategic mission, outcomes, and programmatic goals. NASA's leaders and human capital managers have taken the lead in setting the agency's overall direction and goals and involving the mission directorates and centers in developing human capital strategy documents. NASA's centers have a clear understanding of how they contribute to the attainment of overall agency goals and provide feedback to headquarters on proposed strategic plans and programmatic guidance. In recent years, NASA has been enhancing its workforce planning information systems that can be used to match programmatic requirements with human capital resources. Many of

these tools have not yet been fully implemented, and thus their effectiveness cannot be determined at this time. However, some centers have raised concerns that these systems do not properly identify skills and competencies needed to meet programmatic goals.

Currently, NASA is able to attract and retain critical science and engineering personnel needed for mission accomplishment by employing a wide variety of human capital tools such as recruiting and retention bonuses. The agency recently requested Congress to amend the National Aeronautics and Space Act of 1958, as amended, and the NASA Flexibility Act of 2004 to authorize NASA to use additional human capital flexibilities so that the workforce might be reduced without having a reduction in force. The centers also have their own programs that address their critical skills shortfalls by training and developing employees. NASA recognizes that the critical skills currently embedded in the civil service and contractor Space Shuttle workforce are needed to safely and successfully complete its mission objectives; some of those skills must then be transferred to the Constellation Program.[1] The current workforce also possesses much of the talent that NASA will need to meet the challenges presented by the Vision for Space Exploration. NASA is mapping the available skills of the Space Shuttle workforce with the skills it will need for future work so that it can better plan and implement workforce reassignments. Furthermore, the gap between the scheduled retirement of the Space Shuttle in 2010 and the resumption of human space flight currently scheduled for 2015 will pose a unique set of challenges, and the agency is developing plans to mitigate the potential loss of critical skills and institutional knowledge. While senior managers at some centers told us that they would like to better prepare for the future, they are currently more focused on implementing human capital programs to address their immediate needs. We are not making any recommendations in this report.

Background

The National Aeronautics and Space Act of 1958, as amended, established NASA as the civilian agency that exercises control over U.S. aeronautical and space activities and seeks and encourages the fullest commercial use

[1]Constellation will develop, demonstrate, and deploy systems that will enable sustained human exploration. These include Orion, which will carry and support crews traveling to low Earth orbit and beyond, the Ares launch vehicles to transport both crew and cargo elements, as well as ground and mission operations support infrastructure.

of space.[2] NASA's mission is to pioneer the future in space exploration, scientific discovery, and aeronautics research. Its activities span a broad range of complex and technical endeavors: from investigating and evaluating the composition and resources of Mars, and working with its international partners to complete and operate the International Space Station, to providing satellite and aircraft observations of Earth for scientific and weather forecasting; to developing new technologies designed to improve air flight safety.

NASA Organization and Staff

NASA is organized under four mission directorates—Aeronautics Research, Exploration Systems, Science, and Space Operations—each of which covers a major area of the agency's research and development efforts:

- **Aeronautics Research** conducts research in aeronautical disciplines and develops capabilities, tools, and technologies that improve aircraft and air transportation system.
- **Exploration Systems** develops systems and supports research and technology development to enable sustained and affordable human and robotic space exploration.
- **Science** conducts the scientific exploration of the Earth, the Sun, the rest of the solar system, and the universe.
- **Space Operations** directs space flight operations, space launches, and space communications and manages the operation of integrated systems in low Earth orbit and beyond, including the International Space Station.

NASA is composed of NASA Headquarters in Washington, D.C., nine centers located around the country, and the contractor-operated Jet Propulsion Laboratory (as shown in figure 1). In addition, NASA partners with academia, the private sector, state and local governments, other federal agencies, and a number of international organizations.

[2]Pub. L. No. 85-568 § 102 (b) and (c) (1958) (codified as amended at 42 U.S.C. §2451(b) and (c). The Department of Defense retains the activities peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the United States. Id. At §102(b) and NASA NPD 1000.0, at 2.

Figure 1: NASA Centers, Workforce, and Projects

Ames Research Center	
Total civil service workforce	1,226
Civil service science and engineering workforce	720
Total contractor workforce	1,130
Projects: Small space craft, supercomputers, and thermal protection systems	

Dryden Flight Research Center	
Total civil service workforce	517
Civil service science and engineering workforce	250
Total contractor workforce	468
Projects: Atmospheric flight research and operations, and serves as the primary alternative landing site for the Space Shuttle and orbital support for the International Space Station	

Jet Propulsion Laboratory	
Total contractor workforce	5,467
Projects: Satellites monitoring the solar system and the lands, oceans, and atmosphere of the planet	

Johnson Space Center	
Total civil service workforce	3,476
Civil service science and engineering workforce	2,409
Total contractor workforce	12,645
Projects: Mission control operations for the Space Shuttle and the International Space Station	

Glenn Research Center	
Total civil service workforce	1,678
Civil service science and engineering workforce	998
Total contractor workforce	1,353
Projects: Spaceflight systems, propulsion, and microgravity science	

Stennis Space Center	
Total civil service workforce	274
Civil service science and engineering workforce	165
Total contractor workforce	1,386
Projects: Rocket propulsion testing and engine testing for NASA's next generation of rockets for lunar and Mars exploration	

Goddard Space Flight Center	
Total civil service workforce	3,321
Civil service science and engineering workforce	1,994
Total contractor workforce	4,838
Projects: Manages and uses a broad range of research platforms that hold scientific instruments to expand knowledge of the Earth and its environment, the solar system and the universe	

Langley Research Center	
Total civil service workforce	1,948
Civil service science and engineering workforce	1,083
Total contractor workforce	1,459
Projects: Aeronautics research, focusing on improving military and civilian aircraft	

Kennedy Space Center	
Total civil service workforce	2,158
Civil service science and engineering workforce	1,290
Total contractor workforce	10,381
Projects: Launch epicenter for the NASA's space program	

Marshall Space Flight Center	
Total civil service workforce	2,550
Civil service science and engineering workforce	1,755
Total contractor workforce	3,583
Projects: Space Shuttle propulsion and technologies, next generation of propulsion systems, oversees science and hardware development for the International Space Station	

Sources: NASA data. Copyright Corel Corp, all rights reserved (map).

Note: The Jet Propulsion Laboratory is a federally funded research and development facility staffed and managed by the California Institute Technology for NASA.

NASA considers itself a mission-driven agency, and its strategic management approach requires all of its organizations to use a program/project management method to manage requirements, schedule,

and budget.[3] NASA's management functions are centralized at its headquarters. NASA manages through its governance structure, which consists of three agency-level management councils (see figure 2.):

- **Strategic Management Council,** which determines NASA strategic direction at the vision and mission level, and assesses the agency's progress;
- **Program Management Council,** guides program and project performance, defining successful achievement of NASA strategic goals and objectives; and
- **Operations Management Council,** which reviews and approves institutional plans.

Figure 2: NASA Strategic Decision Making
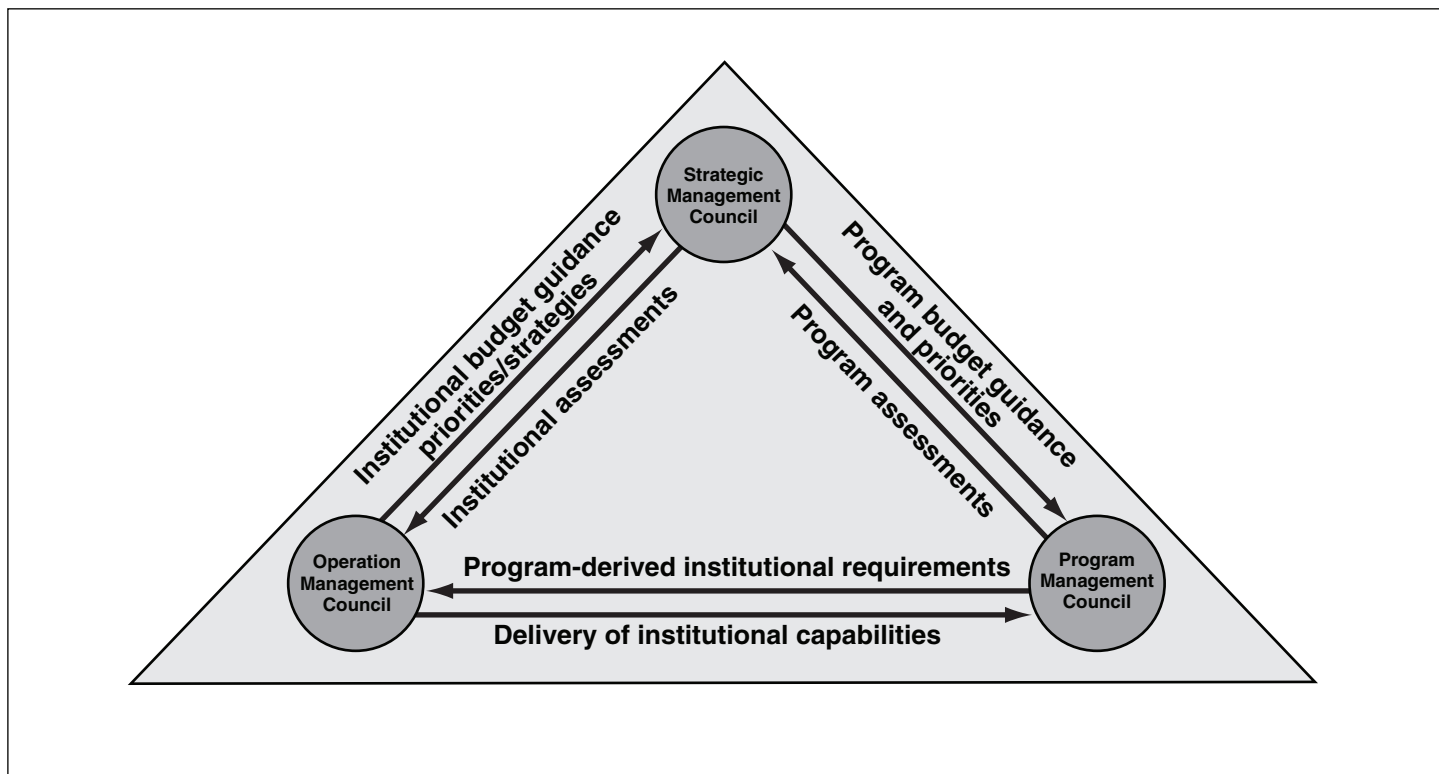
Source: NASA.

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[3]A mission is defined as a core function or job of the agency and is not limited to flight.

GAO-07-1004 NASA Human Capital Plans

The primary roles of the mission directorates include development of strategy and program assessment. While the mission directorates provide direction and oversight to programs, the centers execute programs and projects, including developing approaches for workforce planning that meet agency and center goals. For example, centers develop human capital plans to meet workforce requirements, such as recruiting engineers and developing programs redirecting employees from nonenduring work to new work.

Workforce Trends in the Federal Government and NASA

NASA's efforts are taking place in the context of broader federal workforce trends. Today and in the near term, the federal government is facing a retirement wave and with it the loss of leadership and institutional knowledge at all levels. In 2006, The Office of Personnel Management (OPM) reported that approximately 60 percent of the government's 1.6 million white-collar employees and 90 percent of about 6,000 federal executives will be eligible for retirement over the next 10 years. Agencies not only face a fiercely competitive market for talent but hiring is also affected by uncompetitive salaries in some critical occupations and lengthy hiring processes.

NASA projects that by fiscal year 2012 the total number of personnel needed to meet its strategic goals will decrease from 18,100 to 17,000. Approximately 59 percent of NASA's overall workforce is comprised of scientists and engineers, some 14 percent of whom were eligible for retirement as of the end of fiscal year 2006. According to NASA officials, employees eligible for retirement at NASA tend to stay on longer than is typical in the federal workforce, however. On average, NASA's scientific and engineering employees retire 6.2 years after eligibility, versus 4.6 years for the overall NASA workforce.

In fact, the average age of NASA's science and engineering employee is steadily increasing (See fig. 3 for information on the average age of NASA science and engineering employee and the average of federal governmentwide age). At this time, within the science and engineering workforce, the 55 and over population outnumbers the under-30 population nearly 3 to 1. In time, this will be a concern, as the process of retiring the Space Shuttle will last several years and affect thousands of critically skilled NASA civil service and contractor employees that support the program. We have reported that the safety of the Space Shuttle is largely contingent on NASA's ability to sustain the critically skilled workforce necessary to support Space Shuttle operations through retirement. While the agency is taking advantage of the flexibilities

outlined in the NASA Flexibility Act of 2004[4] to attract highly qualified candidates, continued buyouts and the threat of a reduction in force could create a feeling of instability among its workforce.

Figure 3: The Average Age of the Science and Engineering Workforce in NASA and the Federal Government is Increasing

Average age
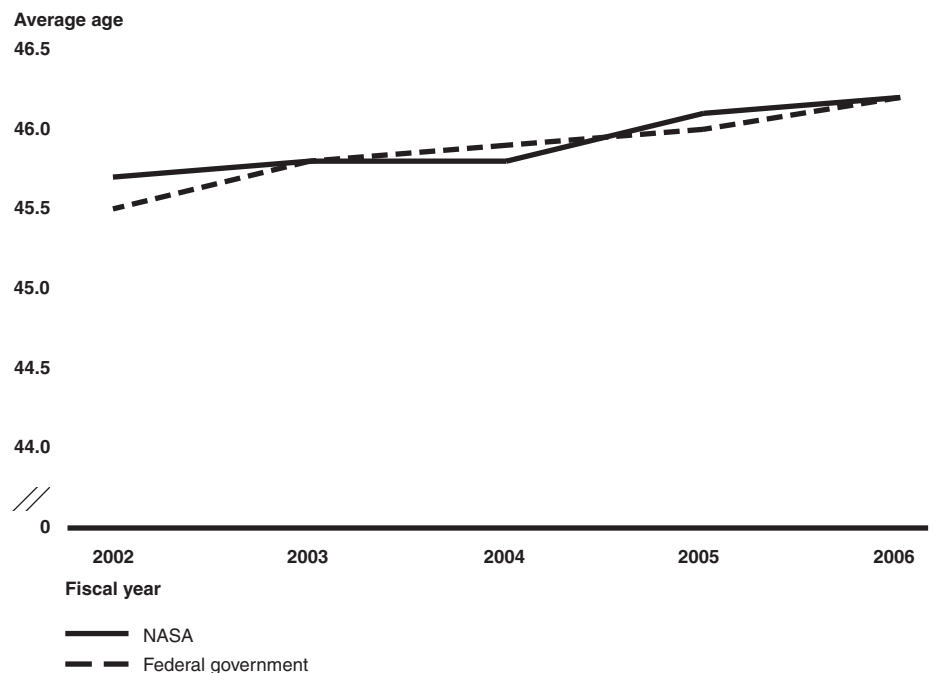
Source: GAO analysis of data from OPM's central personnel data file.

NASA Human Capital Management

In 2005, we reported that NASA had made limited progress toward developing a detailed long-term strategy to retain a critically skilled workforce for shuttle operations, and recommended that the agency implement an approach for identifying the space shuttle program's future workforce needs based upon various possible future scenarios. NASA concurred with our recommendation—acknowledging that shuttle workforce management and critical skills retention will be a major challenge for the agency—and has taken action on this issue. Since we made our recommendation, for example, NASA has developed an agencywide strategic human capital plan and workforce analysis tools to

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[4]Pub. L No. 108-201 (2001) (codified at 5 U.S.C. § 9801, et seq.).

assist it in identifying critical skills needs, along with a human capital plan with a focus on sustaining and transitioning the space shuttle workforce.

Since our report, two recently completed studies contain recommendations on how the agency should address the space shuttle workforce transition. In March 2006, the Senate Appropriations Subcommittee on Commerce, Justice, Science, and Related Agencies and NASA asked the National Academy of Public Administration (NAPA) to assist the agency in planning for the Space Shuttle's retirement and transition to future exploration activities. In February 2007, a NAPA panel recommended that the Space Shuttle Program adopt a RAND model for projecting a core workforce because of its emphasis on "long-term scheduling projections, quantification of core competencies and proficiencies, and analysis of overlapping mission needs."[5] Under the RAND model, an organization maintains a core capability for any competency that will be needed in the future. According to NAPA, this model is useful where a given expertise is not immediately required, but is likely to be needed in the future—in this case, for the Orion Crew Exploration Vehicle.

In 2005, NASA requested assistance from the National Research Council (NRC) to assess the current and future supply of a qualified U.S. aerospace workforce, and identify realistic and actionable solutions to meet identified needs. In April 2007, the NRC reported that the average age of NASA's workers has marched steadily upward over the past decade and a half, and the agency now has a relatively low number of younger workers to assume future leadership roles as older workers retire.[6] It noted that if NASA does nothing to achieve a better age distribution across its workforce, it will suffer gaps in technical leadership and experience, especially if the development dates for key Vision for Space Exploration components slip and highly skilled workers with experience in the Space Shuttle Program retire. The report concluded that if NASA is to avoid a long-term shortage of the required in-house technical expertise in human space flight systems and other areas, it will have to adopt a strategy to

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[5]NAPA, *NASA: Balancing a Multisector Workforce to Achieve a Healthy Organization*, (Washington, D.C.: February 2007). NAPA also recommended that NASA adopt scenario planning into its agencywide workforce planning processes and use the results to inform decisionmaking.

[6]NRC, *Building a Better NASA Workforce: Meeting the Workforce Needs for the National Vision for Space Exploration*, The National Academies Press, (Washington, D.C.: 2007).

address potential long-term shortfalls. The report found that NASA does have programs and methods currently available for meeting its workforce needs.

Strategic Human Capital Management and Workforce Planning

NASA's issues with human capital strategy development are also taking place in the context of broader federal trends. Beginning in 2001, we have designated strategic human capital management as a high-risk area in our biannual high-risk series and performance and accountability series. We reported that serious human capital shortfalls are threatening the ability of many federal agencies to economically, efficiently, and effectively perform their missions.[7] Federal agencies are faced with a workforce that is becoming more retirement-eligible and finding gaps in talent because of changes in the knowledge, skills, and competencies in occupations needed to accomplish their missions.

Studies by several organizations, including GAO, have shown that successful organizations in both the public and private sectors use strategic management approaches to prepare their workforces to meet present and future mission requirements. For example, preparing a strategic human capital plan encourages agency managers and stakeholders to systematically consider what is to be done, how it will be done, and how to gauge progress and results. Federal agencies have used varying frameworks for developing and presenting their strategic human capital plans.[8]

Strategic workforce planning, an integral part of human capital management and the strategic workforce plan, involves systematic assessments of current and future human capital needs and the development of long-term strategies to fill the gaps between an agency's

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[7]GAO, *High-Risk Series: An Update*, GAO-01-263 (Washington, D.C.: January 2001); GAO, *Performance and Accountability Series—Major Management Challenges and Program Risks: A Governmentwide Perspective*, GAO-01-241 (Washington, D.C.: January 2001); GAO, *Major Management Challenges and Program Risks: A Governmentwide Perspective*, GAO-03-95 (Washington, D.C.: January 2003); and GAO, *High-Risk Series: An Update*, GAO-07-310 (Washington, D.C.: January 2007).

[8]For example, in a March 2002 exposure draft, we introduced a strategic human capital model designed to help agency leaders effectively use their people and determine how well they integrate human capital considerations into daily decision making and planning for the program results they seek to achieve. This model is built around four cornerstones: (1) leadership; (2) strategic human capital planning; (3) acquiring, developing, and retaining talent; and (4) results-oriented organizational cultures.

current and future workforce requirements. Agency approaches to such planning can vary with each agency's particular needs and mission. However, our previous work suggests that irrespective of the context in which workforce planning is done, such a process should incorporate five key principles: (1) involve management and employees, (2) analyze workforce gaps, (3) employ workforce strategies to fill the gaps, (4) build the capabilities needed to support workforce strategies, and (5) evaluate and revise strategies. Figure 4 provides a fuller description of each of the five principles.

Figure 4: GAO's Five Key Principles for Effective Strategic Workforce Planning

Principle	Description
(1) Involve top management, employees, and other stakeholders in developing, communicating, and implementing the strategic workforce plan.	**Agencies' top program and human capital leaders set the overall direction, pace, tone, and goals, and involve employees and stakeholders in establishing a communication strategy that creates shared expectations for the outcomes of the process.**
(2) Determine the critical skills and competencies that will be needed to achieve future programmatic results.	**Agencies determine how many personnel have the skills and competencies needed to meet program goals and how many are likely to remain with the agency over time, given retirement and other attrition. Such analysis allows agencies to identify the resources to achieve current and future goals.**
(3) Develop strategies that are tailored to address gaps and human capital conditions in critical skills and competencies that need attention.	**Agencies use strategies, including programs, policies, and practices, to address how the workforce is acquired, developed and trained, deployed, compensated, motivated, and retained. Such strategies help an agency move from the current to future workforce.**
(4) Build the capability needed to address administrative, educational, and other requirements important to support workforce strategies.	**Agencies educate managers and employees about available human capital flexibilities, so that the flexibilities are implemented openly, fairly, and effectively.**
(5) Monitor and evaluate the agency's progress toward its human capital goals and the contribution that human capital results have made toward achieving programmatic goals.	**Agencies use periodic measurement and evaluation to obtain data for identifying shortfalls and revising future workforce planning efforts. Gathering this information helps ensure that human capital strategies work as intended.**

Source: GAO.

Taken together, these five principles can help federal agencies successfully implement strategic workforce planning strategies. Planning, developing, and implementing workforce planning strategies, such as those that involve reshaping the current workforce, can cause significant changes in how an agency implements its policies and programs. It is

essential that agencies determine the skills and competencies that are critical to successfully achieving their missions and goals. This is especially important as changes in national security, technology, budget constraints, and other factors change the environment within which federal agencies operate.

NASA's Strategic Human Capital Framework Is Generally Aligned with Its Strategic Mission, Outcomes, and Programmatic Goals but Some Improvements in Workforce Planning Can be Made

NASA's strategic human capital planning framework is generally aligned with its strategic mission, outcomes, and programmatic goals. We found that many of NASA's efforts related to workforce planning were consistent with effective strategic workforce planning, such as developing effective communication strategies. Other efforts, such as monitoring and evaluating progress toward achieving programmatic goals, are still being developed, but NASA's efforts to identify critical skills needed in the future could be improved.

NASA's Strategies Aligned with Mission

NASA's leaders have generally aligned its human capital management strategies with its agency mission, goals, and organizational objectives, and integrated those strategies into its strategic plans, performance and accountability plans, and budget requests. NASA has developed a strategic human capital plan and workforce strategy plan with input from its mission directorates, centers, and union representatives. NASA's centers have also aligned their human capital programs to support the objectives of the agency. These linkages allow NASA to assess and understand the extent to which its workforce contributes to achieving the overarching mission.[9] Other examples of some key policies and plans that guide NASA's human capital efforts include the following:

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[9]GAO, *Space Shuttle: Actions Needed to Better Position NASA to Sustain Its Workforce through Retirement*, GAO-05-230 (Washington, D.C.: Mar. 9, 2005).

- development of the Strategic Management and Governance Handbook and policy directives that set forth principles by which NASA manages itself and identifies the specific requirements that drive NASA's strategic planning process;
- development of a workforce strategy in April 2006 that identified three underlying workforce principles: building and sustaining 10 healthy centers,[10] maximizing the use of NASA's current human capital capabilities, and evolving to a more flexible workforce that permits NASA's human capital efforts to help carry out the Vision for Space Exploration and science and aeronautics research; and
- the creation of NASA's Workforce Integrated Product Team—which consists of human capital office division directors and selected human resource directors—for day-to-day implementation and tracking of progress and results of human capital initiatives.

NASA's centers have also aligned their programs with agencywide mission and goals, and their human capital approaches support the organizational performance objectives of the agency. For example, the Langley Research developed career path development plans, and proposes defining career development plans for individual employees based upon planned organizational staffing that is driven by current and anticipated work, budget, and center requirements. Similarly, Glenn Research Center has developed a strategic implementation plan that includes internal milestones used to assess the center's progress in meeting agencywide goals.

Developing Effective Communications Strategies

NASA's headquarters' leaders and human capital office have involved the mission directorates and centers in establishing a communication strategy that intended to create shared expectations for the outcome of the workforce planning process. NASA's Workforce Integrated Product Team, for example, solicited input on its white paper on NASA's mission support implementation plan from mission directorates, mission support offices and centers. They also created a document that captured the disposition of comments and included this feedback and the status of the recommendation. The Johnson Space Center hosted a conference for

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[10]NASA's key attributes of a healthy center are: core, clear, stable, and enduring roles and responsibilities; clear program/project management leadership roles; major in-house durable spaceflight responsibility; skilled and flexible blended workforce with sufficient depth and breadth; technically competent and value-centered leadership; capable and effectively utilized infrastructure; and strong stakeholder support.

human resources directors to discuss the redesigning of agency leadership training, and also worked with Marshall Space Flight Center and Glenn Research Center to share training and development program approaches.

All of NASA's centers have regular communication with headquarters human capital office on policy and procedures relating to the workforce planning process through telephone conferences, meetings, e-mails exchange, and video conferences. NASA's centers also communicate with each other to leverage knowledge on key policies and programs. The centers conduct their own communication strategy directly to employees through committees, working groups, town hall meetings, e-mail messages, and center newsletters. The Langley Research Center, for example, sends regular e-mail updates on human capital policy issues to employees, as well as a human capital newsletter. The Glenn Research Center uses the Office of Human Resources and Workforce Planning Personnel Newsletter, the Human Capital Information Environment Steering Committee Review, and Senior Management Meetings to convey relevant information on workforce planning and human capital policies.

Efforts to Monitor and Evaluate Progress toward Achieving Programmatic Goals Are Still Being Developed

In 2007, NASA implemented a new strategic workforce planning governance structure to strengthen the agency's human capital strategic planning capability (see fig. 5). This governance structure has representation from NASA's human resources community, mission directorates, other mission support offices, and the NASA centers. The governance process will be used to align the agency's resources in a manner that ensures the effective utilization of the workforce and skills needed are available to accomplish the agency's mission and will focus on: increasing the level of integration and collaboration across workforce planning functions; improving the quality of information used to make decisions; balancing short and longer-term planning needs.

There are three main components of the Governance Structure: the Agency Governance Group; a Workforce Planning Technical Team; and other issue-specific technical teams as needed. The Agency Governance Group is responsible for surfacing high-risk issues and recommendations to senior management, evaluating the results of planning activities and redirecting resources and efforts to areas of highest priority, and overseeing progress of the operational groups and development of workforce planning capabilities. The Workforce Planning Technical Team is a standing, on-going group that implements workforce planning guidance and policies; helps develop and implement Center workforce planning capabilities; and assists in collecting data in support of workforce

activities undertaken by the team. It is the hub of workforce planning information collection, distribution, and reporting across NASA. The ad hoc technical teams are formed to deal with specific issues. Their purpose is limited to the issue they are tasked with solving, with a defined scope and timeline.

Figure 5: NASA's Strategic Workforce Planning Governance Structure
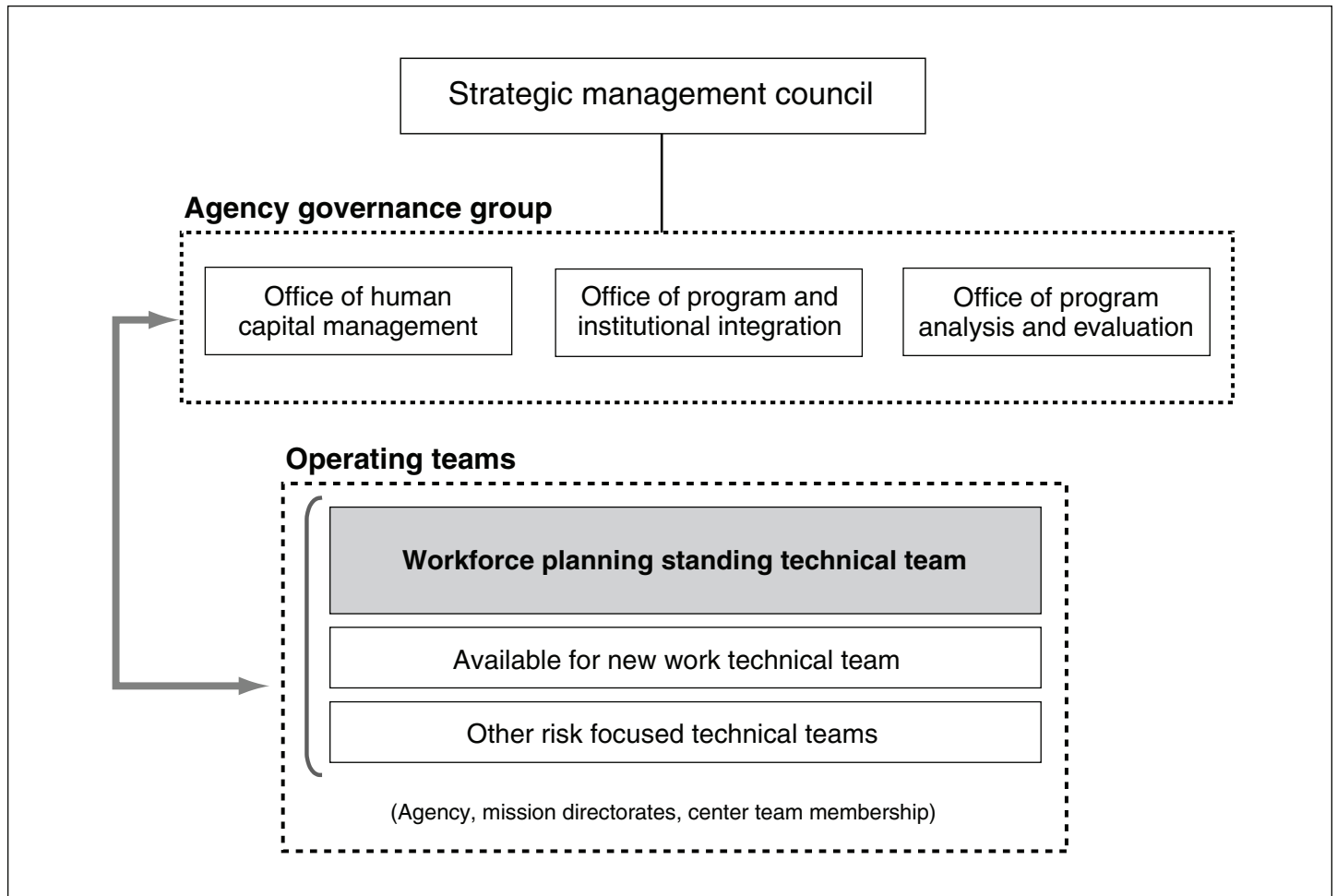
Source: NASA.

In addition, NASA's human capital office has been reengineering work processes and developing tools for workforce planning purposes. For example, according to NASA officials, the Workforce Integrated Management System ties together the agency's budgeting and planning process. The Workforce Integrated Management System is the designated agency workforce planning tool for future workforce requirements, which has various modules such as the Workforce Planning System, the Competency Management System, and others, provides a single repository of workforce and competency planning data for use in NASA's workforce planning decisions and analysis. The Competency Management System is

designed to capture the competencies and skills of NASA's individual employees so that the agency can respond to current and projected workforce requirements, assess center readiness for new activities, locate expertise, and better align projected work with demand.

NASA is also in the process of developing the Human Capital Information Environment, which will integrate NASA's human capital information tools into one Web-enabled portal. This will allow NASA's management to go to one source for information on full-time equivalent vacancies, contractor data, and workforce forecasting tools.

While we have not evaluated these workforce planning tools, center and union officials gave NASA's Competency Management System mixed reviews. Some told us that the system does not correctly capture the skill sets of the workforce, while others found it a useful planning tool.

The Identification of Critical Skills Could Be Improved

Our previous work has found that human capital strategies can work as intended when periodic measurements and evaluation are conducted that obtain data for identifying shortfalls and revising future workforce planning efforts. A 2007 National Research Council report noted that the agency's gap analysis was conducted by NASA headquarters and is not specific enough to determine the number of positions needed in the future at centers where most of the hiring will occur.[11]

NASA conducted a survey to gauge employee sentiments as the agency faces the impending retirement of the shuttle and the onset of Constellation activities.[12] While NASA officials told us that there was an overall "goodwill" towards the agency and the Space Shuttle Program specifically, there were some differences in response by centers and some neutral responses. For example, the survey found that 72 percent of Marshall Space Flight Center respondents indicated they will likely stay through the retirement of the Space Shuttle Program because the nature of Marshall's work is easily transitioned to the Constellation program, but 63 percent of these respondents indicated that they will likely start looking

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[11]NRC, 29.

[12]The survey was sent to over 2900 civil service employees at the Kennedy Space Center, Johnson Space Center, Marshall Space Flight Center, and Stennis Space Center who had charged at least 40 hours to Space Shuttle Program from October 2005 to May 2006 and may have included employees other than scientists and engineers.

for jobs outside the Space Shuttle Program (or retire) starting in 2010 or later. The Kennedy Space Center response was similar to Marshall's, with 69 percent of Kennedy's respondents indicating they would likely stay through the retirement of the Space Shuttle and approximately 60 percent indicating that they would start seeking jobs outside of the program or retire starting in 2010. The Johnson Space Center respondents were slightly different, with 59 percent likely to stay through retirement and 53 percent of respondents likely to seek job elsewhere starting in 2010 or later. At the Stennis Space Center, 71 percent of respondents stated they would stay through the retirement and approximately 71 percent indicated that they would leave Stennis starting in 2010 or later. Finally, NASA told us that a number of the neutral responses in the survey indicate that some level of the workforce is adopting a "wait and see position." These neutral responses make up 13 percent of Kennedy, 19 percent of Johnson, 14 percent of Marshall, and 18 percent of Stennis respondents.

The survey is one step in evaluating how some of the workforce is reacting to ongoing changes. NASA has established metrics to measure or evaluate its progress toward achieving programmatic goals that has been made by its human capital efforts, in particular the impact its programs are having on addressing anticipated problems from the shift from the shuttle to the Constellation program. We have not evaluated the new metrics.

NASA Has Generally Been Effective in Recruiting, Developing, and Retaining Science and Engineering Employees, but Future Uncertainties Could Adversely Affect Its Overall Workforce Capacity

NASA uses a variety of approaches to meet its long-term needs for recruiting, retraining, and sustaining its workforce. In the past 5 years, NASA hired on average about 330 scientists and engineers per year (ranging from 199 to 571), the majority of those hired were engineers, and most of the new hires were for midlevel positions. Recruiting is accomplished using a multifaceted approach at universities and colleges and the private sector, that some centers have found quite successful. The agency has also been granted a number of human capital flexibilities that allow it to offer incentives to attract and retain scientist and engineers. However, the agency as a whole faces challenges in recruiting and retaining highly experienced senior-level engineers in certain specialties. NASA's principal workforce challenge will be faced in the transition to the next generation of human space flight systems.

NASA Recruitment Efforts Use a Combination of Techniques

NASA uses a multifaceted approach to recruiting critically skilled workers, including targeted recruitment activities, educational outreach programs, improved compensation and benefits packages, professional development programs, and streamlined hiring authorities. Despite the array of initiatives used across field centers, they used generally similar approaches for recruiting and retaining critically skilled workers.

Many of NASA's external hires have been entry-level positions through the Cooperative Education Program, which provides centers with the opportunity to develop and train future employees; discover firsthand the abilities of potential employees; ensure they are able to meet professional, technical, and administrative requirements; and achieve a quality workforce. Another source of candidates for NASA are its education programs which help inspire students to pursue careers in science, technology, engineering, and mathematics. These programs help NASA to develop a pipeline of highly trained scientists and engineers in aeronautics and space-related disciplines.

NASA believes its reputation also helps centers recruit by attracting a pool of student applicants for the Cooperative Education Program (co-op). Centers also administer and tailor their own programs for students, such as the Johnson Space Center's efforts with the graduate student research program, fellowships, and the Minority University Research Education Program help create a pipeline of students. These programs assits the center to cultivate ties with local universities and outreach to others with engineering programs that meet the Johnson Center's critical workforce needs. NASA centers use other approaches to stimulated interest in working for the agency. For example, Ames' Education Associates program allows the center to access students and faculty at universities while giving them the opportunity for hands-on learning opportunities within mission-relevant NASA programs and projects. Thus, the program gives Ames' scientists, engineers and managers another way to have direct access to short-term, high quality human capital and the opportunity to tryout potential employees. The Dryden Flight Research Center sponsors fellowships for students in engineering and science to continue their graduate studies. Similarly, centers attend university job fairs and administer student loan repayment programs as a tool to retain their new hires (see table 1 for additional examples). While NASA centers have developed numerous talent development programs, NASA does not generally coordinate these programs across the agency. The agency is missing opportunities to leverage its resources.

Table 1: Examples of Development Programs Used by NASA

Center	Program	Description
All	Foundations of Influence, Relationships, Success, and Teamwork (FIRST)	This is a 1 year part-time program that targets junior employees for leadership development through residential training modules, group projects, on-the-job training, and mentoring.
Glenn	Space Mission Excellence Program	The center—working in coordination with NASA's Academy of Program/Project and Engineering Leadership[a] and Cal Tech — created the center's Space Mission Excellence training program to develop systems engineering skills.
Johnson	Program/Project Management Development	This program is expected to create a well-prepared candidate pool for future program and senior-level project mangers. Development is focused on building leadership and project management competencies through work assignments, mentoring, and coaching. Participants include employees from other Centers.
Langley	Langley Aerospace Research Summer Scholars Program	A summer program which attracts students that are interested in needed or forecasted needed skill areas at the Center according to a NASA official.

Source: GAO analysis of NASA data.

[a]NASA's Academy of Program/Project and Engineering Leadership is operated by NASA's Office of the Chief Engineer to provide support to NASA centers by providing leadership, advice, direction, and support for the development and learning to NASA organizations.

In addition to recruiting, NASA uses a variety of approaches to retain and sustain its workforce. These tools include nurturing NASA's reputation as one of the best places in the federal government to work, pursuing the strategy of building and engaging all 10 NASA centers, establishing an agencywide career development program to foster lifelong learning, and using a number of targeted incentives (e.g., pay and relocation incentives, pay enhancements for candidates in critical positions, and Intergovernmental Personnel Act assignments).

While some centers told us that they are competitive in recruiting students to entry-level positions, the agency faces challenges in recruiting and retaining senior-level employees such as experienced aerospace engineers. For example, NASA is unable to compete with the private sector in recruiting senior management because of its lower salaries and smaller compensation packages, in spite of flexibilities granted to NASA by Congress through the NASA Flexibility Act of 2004, NRC reported. Industry senior-level compensation packages, including recruitment bonuses, far exceed federal government pay scales, which include stock and retirement packages for senior executives in industry that can range

into the tens of millions of dollars.[13] (See app. II for additional information on use of the act.) However, NRC did find that NASA's pay scale is competitive with industry's at the entry and middle levels.

NASA centers have developed several ways to respond to this challenge. According to Langley Research Center officials, for example, enhanced annual leave under the NASA Flexibility Act of 2004 is used to recruit senior executives from outside of the federal government, members of the Senior Executive Service, and senior-level employees so that they can accrue more vacation time. The Johnson Center uses retention bonuses to recruit and retain personnel in hard-to-fill positions that can have undesirable hours, such as mission operations controller positions and physicians. For example, it developed the Gemini flight controller initiative, which has improved retention of controllers. Gemini flight controllers are certified in three systems and work nights and weekends to maintain the International Space Station. The Center had difficulty recruiting and maintaining employees in this area, so it piloted a 2-year program that offered additional training and retention bonuses with 1-year service agreements. To help the Johnson Center retain its medical officers, a Physician's Comparability Allowance is used to make the center more competitive with the private medical community. The Center also uses retention bonuses, but sparingly; these are generally related to specific knowledge retention or transition needs.

Despite the many challenges that NASA faces today, the agency continues to rank as one top places to work in federal government. Additionally, NASA officials told us that the NASA's brand name continues to attract new applicants from colleges and universities throughout the country. Furthermore, NASA officials said that its employees are motivated by the agency's mission. In some cases, this results in employees continuing to work after they become eligible for retirement, and some former employees volunteer their time and expertise after retiring from the agency.

NASA Increased Use of Term Appointments

NASA uses term appointments for most of the agency's new hires of scientists and engineers (see table 2). Term appointments are offers of nonpermanent employment with NASA for a limited amount of time, which is extendable. A NASA term employee, if he or she meets eligibility

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[13]NRC, 37.

criteria, may be converted to a career or career-conditional appointment without going through the competitive examination process normally used to make such appointments. According to NASA officials, job candidates can be offered term appointments up to 6 years, but each center varies the length of appointment. For example, the Langley Research Center offers appointments to all new hires of 2 to 4 years; according to Johnson Space Center officials, it offers appointments to all new term hires for 6 years, but usually converts them to permanent after 2 years; depending on a continuing need for the position and proven performance of the employee on the job; Glenn Space Center converts cooperative program students to 6 year appointments. NASA has increased the used of term appointments for recent science and engineering hires. The use of such appointments for all new hires at NASA has increased from 6 percent in 2002 to 67 percent in 2006, and for entry-level science and engineering positions, from less than 2 percent in 2002 to 42 percent in 2006. Center officials stated that using term appointments generally does not deter applicants.

Table 2: NASA Science and Engineering New Hires by Type of Appointment and Hiring Level

Percent

Fiscal Year	Entry level				Midlevel			Senior level		
	Term	Permanent	Temporary	Intern-Fellow	Term	Permanent	Temporary	Term	Permanent	Temporary
2002	0.4	22.6	0.4	0	1.3	51.3	0	4.3	19.7	0
2003	1.5	20.6	0.5	0	7.0	47.2	0	5.0	18.1	0
2004	4.9	8.1	12.1	2.8	27.1	30.3	2.3	5.1	7.0	0.4
2005	1.2	0.9	0.9	17.3	46.9	11.4	5.2	5.6	7.4	3.1
2006	10.0	1.2	1.5	11.2	54.3	8.6	3.8	2.7	5.9	0.9

Source: GAO analysis of NASA data.

Note: Entry level refers to GS-01 through GS-11, midlevel refers to GS-12 through GS-14, and senior level GS-15 or higher.

NASA Has Development Programs in Place to Enhance Existing Capacity

NASA's centers also invest in professional development and mentoring programs to help meet specific performance needs and help centers create cohesive cultures for new employees. For example, according to Glenn Space Center officials, it uses the Advancing Careers and Employee Success program as a formal mentoring effort designed to match interested staff with more seasoned personnel who serve as mentors and engage in activities such as designing developmental assignments and networking opportunities. The centers also use additional programs that include opportunities for formal and on-the-job training, individual

development plans, and rotational assignments for students to gain different work experiences during their co-op, periodic consultations with senior managers, periodic formal assessments, and mentoring relationships with other employees. For example, the Johnson Center's co-op students have rotational assignments, formal mentors that provide guidance, and performance feedback during the course of their co-op assignments.

NASA Is Taking Efforts to Develop Long-Term Solutions

NASA recognizes the challenges it faces in its transition into the future from the present, and has submitted to Congress a Human Capital Plan for Mission Execution, Transition, and Retirement of the Space Shuttle program. This focuses on retaining critical workforce skills needed for safe and successful mission execution and the smooth transition of Shuttle workforce skills to other agency programs. Currently NASA is mapping the shuttle workforce to Constellation Program work in a document that will reflect the planned migration of the employees, phased to correspond to key milestones in both programs. According to NASA, the first mapping is scheduled to be completed in September 2007 and will be revised as the shuttle flight manifest schedules are updated and Constellation Program needs are further defined. The agency estimates that many of the employees currently working on the Space Shuttle Program will be working on other agency programs such as the International Space Station or Constellation Systems Program.

NASA decided to maintain program management and systems engineering competencies within the civil service workforce to enable it to have the capabilities it needs to develop programs and projects for its missions. However, NASA does expect to use prime contractors in the development of major systems such as launchers, upper stages, and crew vehicles. It sees its role as the manager of the interfaces between major systems. In order to accomplish this, NASA will develop strategic workforce plans to align its workforce with the current and planned work of the agency. Specifically, centers will need to determine whether the composition of their workforce has the needed competencies to accomplish its tasks. Centers will need to reshape their workforce to meet changes in workforce demand as projects progress or are completed.

Human Capital Challenges in Retiring the Space Shuttle Program and Transitioning to Constellation Activities

The gap between the scheduled retirement of the Space Shuttle in 2010 and the resumption of human space flight currently scheduled for 2015 will pose a unique set of challenges. NASA must realign where necessary and plan for a workforce that will not be quite as large after the retirement of the Shuttle Space Program. Technology funding must be redirected to major development activities, programs canceled, aeronautics program funding reduced, the science program restructured and planned funding reduced. All these redirections, restructurings, and cancellations will contribute to NASA's "uncovered capacity" problem.[14] The agency plans to use its civil service workforce to sustain its core technical capabilities. This is a long-standing workforce challenge for NASA, particularly since it must balance the workload across NASA centers to maximize the effectiveness of the overall organization.

Recognizing that its workforce is its most critical asset and it must continue to have the scientific and technical expertise necessary to be a leader in aeronautics, earth and space science, and technology, NASA has tried, over the last several years, to address its workforce problems by using employee buyouts to rebalance its workforce and establishing hiring guidelines that emphasize filling vacancies from within the agency. The agency recently requested Congress to amend the National Aeronautics and Space Act of 1958, as amended, and the NASA Flexibility Act of 2004 to authorize NASA to use additional human capital flexibilities so that the workforce might be reduced without having a reduction in force.

NASA is also attempting to ensure that its field centers can accomplish their missions through a focus on required core capabilities, to be accomplished by directing all research, technology development, and programs and projects, to the maximum extent possible, to the centers. While improving workforce planning to better prepare for challenges in the future is definitely an agencywide priority, some senior center officials told us that they are currently focused on implementing immediate human capital programs. To the agency's credit, some centers have created knowledge management programs. For example, the Johnson Space Center recently appointed a Chief Knowledge Officer who is developing efforts to capture the experiences and knowledge of senior employees in engineering, management, and administration who may retire in the near

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[14]The term "uncovered capacity" means that there is a quantity of available employee work time that is in excess of the quantity that programs require and for which they have agreed to pay.

future. In addition, the Johnson Space Center has an active Oral History Program that captures the experience of those individuals who first developed the technologies used in previous space flight programs, including life sciences and astromaterials. Participants include managers, engineers, technicians, doctors, astronauts, and other employees of NASA and aerospace contractors who occupied key roles during the Mercury, Gemini, Apollo, Skylab, and Space Shuttle programs. The Glenn Research Center's Knowledge Management Working Group, has piloted programs that record interviews with their senior managers to retain some of their work experiences, and the center uses the Advancing Careers and Employee Success mentoring program and shadowing of senior engineers by recently hired engineers to transfer knowledge.

Concluding Observations

NASA has placed considerable emphasis on human capital management and addressing challenges that the agency has been facing in recruiting, retaining, and developing critical personnel. At the headquarters level, this has involved strategic planning to align agency goals with actions taken by the centers such as the introduction of new information systems to enhance workforce planning. At the center level, this has involved the application of new ways to attract and develop staff. Taken together, these actions represent credible progress in enhancing the workforce and preparing for the future. However, there are challenges ahead for NASA that will test its ability to sustain its progress—notably the retirement of the shuttle program and the expansion of exploration activities. The magnitude of these changes and their implication for future workforce needs will require NASA to accurately measure its progress, identify gaps or obstacles that need to be addressed, and sustain a high degree of coordination with its centers and work is just getting under way. The extent to which NASA can anticipate these challenges and lay the groundwork for addressing them will greatly affect its ability to negotiate them in the future.

Agency Comments and Our Evaluation

We provided draft copies of this report to NASA for review and comment. NASA provided written comments and they are included in appendix III. Separately, NASA provided technical comments, which have been addressed in the report, as appropriate.

We will send copies of the report to NASA's Administrator and interested congressional committees. We will also make copies available to others upon request. In addition, the report will be available at no charge on GAO's Web site at http://www.gao.gov.

Should you or your staff have any questions on matters discussed in this report, please contact me at (202) 512-4841 or chaplainc@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix IV.

Cristina Chaplain, Director
Acquisition and Sourcing Management

Appendix I: Scope and Methodology

To assess the alignment of the National Aeronautics and Space Administration's (NASA) human capital framework with its strategic mission and programmatic goals, we analyzed a broad range of NASA's policy, planning, and implementation documents; reviewed budget documents and performance and accountability reports; and interviewed officials in NASA's Office of Human Capital Management, Office of the Chief Financial Officer, Office of Program Analysis and Evaluation, Office of the Chief Engineer, Office of Diversity and Equal Opportunity, Office of Education, the Aeronautics Research Mission Directorate, and the Space Operations Mission Directorate and attended NASA Advisory Council meetings. We did not evaluate how well the various NASA plans, programs, systems and teams (such as the Available for New Work Technical Team) actually functioned. We visited 3 of NASA's 9 centers—the Glenn Research Center, the Johnson Space Center, and the Langley Research Center. We collected data from the following centers—the Ames Research Center, the Dryden Flight Research Center, the Goddard Space Flight Center, the Kennedy Space Center, the Marshall Space Flight Center, and the Stennis Space Center. Finally, we conducted interviews at the National Research Council.

To assess NASA's efforts to effectively recruit, develop, and retain critically skilled science and engineering staff we applied our five strategic workforce planning principles.[1] In doing so, we analyzed NASA's (1) demographics data; (2) critical skills information; (3) NASA's policy, procedures and guidance for recruiting and hiring; (4) implementation of information systems, programs, and processes that support human capital management and planning. Specifically, we interviewed NASA Center managers about the supply and demand for critically skilled workers, examined NASA's efforts to develop a "pipeline" for recruiting these personnel and reviewed its application of new flexibilities and authorities under the NASA Flexibility Act of 2004. Also, we interviewed NASA officials responsible for workforce and strategic human capital planning to determine how NASA plans to address future challenges in managing its science and engineering workforce. We also analyzed and compared NASA's science and engineering workforce and strategic human capital planning efforts with GAO's principles of effective human capital management. In addition, we interviewed NASA officials responsible for

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[1]GAO, *Human Capital: Key Principles for Effective Strategic Workforce Planning*, GAO-04-39 (Washington, D.C.: Dec. 11, 2003). Also see GAO, *Securities and Exchange Commission: Some Progress Made on Strategic Human Capital Management*, GAO-06-86 (Washington, D.C.: Jan. 10, 2006).

workforce and strategic human capital planning to determine how NASA plans to address future challenges in managing its science and engineering workforce. We also analyzed and compared NASA's science and engineering workforce and strategic human capital planning efforts with principles of effective human capital management. In addition to obtaining NASA officials' views and concerns regarding future human capital challenges, we analyzed data from the Office of Personnel Management's (OPM) Central Personnel Data File (CPDF), which is its database of federal civilian employees, and we reviewed data from NASA's Workforce Information Cubes for NASA (WICN) which is a workforce reporting and monitoring system. Specifically, to assess the potential for retirements in the next few years in NASA's science and engineering workforce, we analyzed CPDF data on NASA employees—as of September 30, 2006. We limited our analysis to science and engineering occupational categories that comprise NASA's science and engineering workforce. We analyzed CPDF separations and demographic data (on the ages and years of service) and NASA's WICN data for scientists and engineers in order to identify the extent to which NASA's experienced science and engineering workforce is eligible for and thus has the potential for retiring in the near future. We did not independently verify the CPDF data on NASA's science and engineering occupation series employees for the year we reviewed. However, we previously reported that data from the CPDF for key variables used in this study—occupation, agency/subagency, birth date, and service computation date—were 99 percent accurate.[2] Moreover, we compared the CPDF results for NASA employees to data from NASA's WICN system. CPDF data is limited to federal Executive Branch civilian employees, and excludes the Board of Governors of the Federal Reserve, intelligence agencies, National Imagery and Mapping Agency, Office of the Vice President, Postal Rate Commission, Tennessee Valley Authority, U.S. Postal Service, White House Office, Federal Bureau of Investigation, Public Health Service's Commissioned Officer Corps, Non-appropriated fund employees and foreign nationals overseas, and the Judicial Branch. Legislative Branch CPDF data is limited to the Government Printing Office, U.S. Tax Court, and selected commissions. To assess the reliability of the data we received from NASA's WICN system we (1) reviewed system documentation, (2) interviewed knowledgeable agency officials, (3) performed manual data testing for missing data, outliers, and obvious errors, (4) compared the data to CPDF results, and (5) reviewed the SQL

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[2]See GAO, *OPM's Central Personnel Data File: Data Appear Sufficiently Reliable to Meet Most Customer Needs*, GAO/GGD-98-199 (Washington, D.C.: Sept. 30, 1998).

code that produced the data. We determined the data we used from the CPDF and NASA's WICN system to be sufficiently reliable for our purpose. We leveraged previous GAO work on the retirement of the Space Shuttle Program and the subsequent transition of its workforce to the Constellation program.[3]

We conducted our work from July 2006 through June 2007 in accordance with generally accepted government auditing standards.

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[3]GAO, *Space Shuttle: Actions Needed to Better Position NASA to Sustain Its Workforce through Retirement*, GAO-05-230 (Washington, D.C.: Mar. 9, 2005). Also see GAO, *NASA: Issues Surrounding the Transition from the Space Shuttle to the Next Generation of Human Space Flight Systems*, GAO-07-595T (Washington, D.C.: Mar. 28, 2007).

Appendix II: Use of Human Capital Authorities by NASA

The NASA Flexibility Act of 2004 provides new human capital authorities to NASA to enable the agency to address its workforce challenges.[1] The NASA Flexibility Act of 2004 requires that the agency submit a report to Congress for 6 fiscal years, beginning in fiscal year 2004, summarizing NASA's use of these authorities during each preceding fiscal year. Below is a summary of NASA's use of these flexibilities and those under another authority during fiscal years 2004 through 2006.

Table 3: NASA's Use of Human Capital Flexibilities

		Fiscal Years		
		2004	**2005**	**2006**
Recruitment, redesignation, and relocation bonuses				
Recruitment, redesignation, and relocation bonuses paid-*addressing a critical need:*	Total amount of bonuses paid	$23,000	$300,746	$102,565
	Total number of bonuses paid	2	23	7
	Percentage of amount of bonuses awarded to supervisors and management officials	None	27.8%	12.7%
	Average percentage used to calculate the total average bonus amount	14.8%	12.9%	14.5%
Recruitment, redesignation, and relocation bonuses paid-*not addressing a critical need:*	Total amount of bonuses paid	None	$239,610	$93,231
	Total number of bonuses paid	None	24	12
	Percentage of amount of bonuses awarded to supervisors and management officials	None	18.7%	None
	Average percentage used to calculate the total average bonus amount:	None	12.7%	7%
Combined recruitment, redesignation, and relocation bonuses paid	Overall total amount of bonuses paid	$23,000	$540,356	$195,796
	Number of bonuses paid to address both critical and noncritical needs	2	47	19
	Percentage of the total amount of bonuses awarded to supervisors and management officials	None	23.8%	6.7%
	Average bonus amount represented as a percentage of salary	14.8%	12.8%	9.6%

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[1]Pub. L. No. 108-201 (2004).

		Fiscal Years		
		2004	**2005**	**2006**
Retention bonuses				
Retention bonuses paid-*addressing a critical need:*	Total amount of bonuses paid	$15,577	$66,419	$106,461
	Total number of bonuses paid	1	4	5
	Percentage of amount of bonuses awarded to supervisors and management officials	None	None	None
	Average percentage used to calculate the total average bonus amount	23%	17.9%	18%
Retention bonuses paid-*not addressing a critical need:*		None	None	None
Term appointments				
	Total number of term appointments converted	None	5	77
	Number of conversions that were made to address a critical need	None	1	64
Pay Authority for Critical Positions	Positions for which rate of basic pay was fixed	None	None	None
	Positions for which rate of basic pay was terminated	None	None	None
Science and Technology Scholarship Program	Number of scholarships awarded	None	None	None
	Number of scholarship recipients appointed	None	None	None
Distinguished scholar appointment authority				
	Distinguished scholar appointment	None	1	None
	Distinguished scholar appointments made to address a critical need	None	1	None
Travel and transportation expenses of certain new appointees				
	Average amount paid per appointee	$34,078	$22,368	$19,902
	Largest amount paid to any appointee	$151,200	$124,282	$61,039
Annual leave enhancements				
	Total number of employees awarded enhanced annual leave	18	103	98
	Employees serving in a position addressing a critical need	15	69	73
	Average amount of additional annual leave earned: hours per pay period	2	2.8	2
	Employees serving in a position not addressing a critical need	3	34	25
	Average amount of additional annual leave earned: hours per pay period	2.4	2.4	1.4

		Fiscal Years		
		2004	**2005**	**2006**
Limited appointments to Senior Executive Service positions				
	Number of limited appointments to Senior Executive Service positions	None	3	4
	Number of such appointments made to address a critical need	None	1	0
Qualifications pay				
	Number of employees whose pay was set	2	11	31
	Number of times pay was set to address a critical need	2	9	14
Recruitment,relocation, and retention bonuses paid under the Federal Workforce Flexibility Act of 2004[b]				
Recruitment incentives	Total amount paid	None	$408,633	$466,480
	Total number	None	41	60
	Percentage of amount of bonuses awarded to supervisors/manager	None	48.8%	37.3%
	Average percentage used to calculate the total average bonus amount	None	11.6%	8.5%
Relocation incentives	Total amount paid	None	$627,420	$642,326
	Total number	None	35	34
	Percentage of amount of bonuses awarded to supervisors/manager	None	66.9%	70.2%
	Average percentage used to calculate the total average bonus amount	None	16.5%	17.5%
Retention incentives	Total amount paid	None	$15,000	$194,616
	Total number	None	1	8
	Percentage of amount of bonuses awarded to supervisors/managers	None	100%	78%
	Average percentage used to calculate the total average bonus amount	None	11%	17.4%

Source: NASA Data.

[a]Pub. L. No. 108-411 (2004).

Appendix III: Comments from NASA

National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

July 19, 2007

Reply to Attn of: Office of Human Capital Management

Christina T. Chaplain
Director
Acquisition and Sourcing Management
Government Accountability Office
Washington, DC 20548

Dear Ms. Chaplain:

Thank you for the opportunity to review your draft report entitled, "NASA: Progress Made on Strategic Human Capital Management but Future Program Challenges Remain" (GAO-07-1004). This draft report contains no recommendations to NASA, and we have provided technical corrections, via separate correspondence, that GAO has agreed to make.

If you have any questions, or require additional information, please contact Steve Golis on (202) 358-1211 or Timothy Sullivan on (202) 358-2222.

Sincerely,

Toni Dawsey
Assistant Administrator
  for Human Capital Management

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Cristina Chaplain (202) 512-4841 or chaplainc@gao.gov

Acknowledgments

In addition to the contact named above, Jim Morrison, Assistant Director; Christopher Kunitz; Masha P. Pastuhov-Purdie; Jose A. Ramos; Sylvia Schatz; Rebecca Shea; Robert Swierczek; and Gregory H. Wilmoth made key contributions to this report.