Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to discuss our ongoing work on the National Aeronautics and Space Administration's (NASA) space shuttle program. We are currently responding to the Committee's request to review NASA's plans for meeting current and future human capital needs. We plan to finalize our work and report on this issue in the coming months. As a result, my statement today presents our preliminary observations.

NASA budget data shows that, since 1995, shuttle workforce levels have decreased from about 3,000 to about 1,800 full time equivalent employees.[1] NASA based its downsizing efforts on optimistic programmatic assumptions. For example, NASA believed it could reduce its workforce by consolidating contracts for flight, ground, and mission operations under a single private sector contract. In October 1996, NASA awarded this contract. Under the contract, NASA was to provide incentives to eliminate unnecessary work and would no longer be involved in day-to-day shuttle operations. However, because NASA was implementing a number of workforce reduction initiatives, NASA could not directly attribute specific reductions to the contract consolidation. Also, in 1994 NASA froze the shuttle design in the expectation that it would be replaced. NASA now expects to operate the shuttle for at least the next decade. As a consequence, it initiated an upgrade program. In addition, NASA's downsizing coincided with a decreased number of shuttle flights: eight flights in fiscal year 1997, but only four each in fiscal years 1998 and 1999. However, the number of flights is projected to increase substantially as the International Space Station assembly schedule accelerates. NASA plans nine flights in fiscal year 2001. NASA believes this will require more staff.

Today we will focus on the shuttle program's civil service workforce. Specifically, we will (1) summarize the results of studies on the impact of workforce reductions, (2) describe NASA's actions following these workforce assessments, (3) identify challenges NASA faces in the anticipated heavy workload imposed by the International Space Station, and (4) suggest a structured approach NASA can take to analyze human capital challenges.

RESULTS IN BRIEF

Several studies, one as recent as March 2000, have reported that the shuttle program's workforce has been affected negatively by the downsizing, much of which has occurred since 1995. The studies concluded that the existing workforce is stretched thin to the point where there is just one qualified person in many critical areas. NASA has identified 30 critical areas at Kennedy Space Center that do not have sufficient backup coverage. These areas include shuttle range safety systems and solid rocket booster and external tank electrical systems. In addition, the studies found that the workforce is showing signs of overwork and fatigue. For example, indicators including forfeited leave, absences from training courses, and stress-related employee assistance visits are all on the rise. Moreover, the

[1] Full time equivalent is a measure of staff hours equal to those of a full time employee working 40 hours per week over the course of a year.

program's workforce age distribution and skill mix now limit opportunities for mentoring newer staff. For example, throughout the Office of Space Flight, which includes the shuttle program, there are more than twice the number of workers over 60 years of age than under 30 years of age. This jeopardizes the program's ability to "hand off" leadership roles to the next generation.

NASA has responded to the workforce problems in a number of ways. It has terminated its downsizing program and is increasing its budget to provide an additional 95 full time equivalent employees for the shuttle program in fiscal year 2000. NASA has also increased its fiscal year 2001 budget request to provide an additional 278 full time equivalent employees for the shuttle program. In addition, the administrator has directed the agency's managers to consider ways to reduce workforce stress.

NASA faces a number of challenges in addressing the current shuttle workforce imbalance -- especially given the anticipated increased workload. This includes accommodating increased training needs, ensuring adequate staffing levels for its safety upgrade program, attracting and retaining technical skills, dealing with uncertainties related to the future of shuttle privatization and commercialization plans, and achieving a higher projected flight rate.

The challenge of ensuring NASA has the proper mix and number of staff to meet shuttle objectives safely will require a structured approach. GAO's internal control standards for the federal government discuss the importance of human capital management in achieving program results. The Comptroller General has brought additional attention to human capital issues and the importance of long-term planning. In this regard, we recently issued a checklist[2] for agency leaders to use, in order to help them develop human capital strategies. This checklist will allow agency managers "to quickly determine whether their approach to human capital supports their vision of who they are and what they want to accomplish, and to identify those…policies that are in particular need of attention." The checklist follows a five-part framework, including strategic planning, organizational alignment, leadership, talent, and performance culture. The checklist helps to establish linkage between human capital programs and the agency's mission, goals, and strategies. We have provided copies of the checklist to NASA. We believe NASA's attention to human capital issues will be essential to ensuring the agency's ability to achieve the goals of the shuttle program.

RECENT STUDIES HIGHLIGHT SHUTTLE WORKFORCE PROBLEMS

Over the past several years, NASA and its Aerospace Safety Advisory Panel have studied the shuttle program civil service workforce.[3] The studies concluded that the shuttle program workforce has

---

[2] Human Capital: A Self-Assessment Checklist for Agency Leaders, Discussion Draft (GAO/GGD-99-179, September 1999).

[3] Independent Assessment of the Shuttle Processing Directorate Engineering and Management Processes, NASA's Human Exploration and Development of Space Independent Assessment Office (November 4, 1999); Report to Associate Administrator, Office of Space Flight, Space Shuttle Independent Assessment Team (March 7, 2000); and Annual Report for 1999, Aerospace Safety Advisory Panel (February 2000).

suffered significantly from the downsizing, much of which has occurred since 1995. For example, the studies conclude that the workforce may not be sufficient to support the planned shuttle flight rate and many key positions are not sufficiently staffed by qualified workers. In addition, the studies found that stress levels have reached the point of creating an unhealthy workforce. The results of these studies are highlighted below.

In its November 1999 report, NASA's Human Exploration and Development of Space Independent Assessment Office concluded that, even with a relatively low flight rate, the Shuttle Processing Directorate at Kennedy Space Center had the "minimum" workforce necessary to conduct daily business. For example, the report expressed concerns with NASA's ability to perform mandatory shuttle inspections. NASA believed that these inspections could be performed under its flight operations contract. However, after the departure of many inspectors, the agency determined that a substantial number of inspections would still need to be performed in-house. The report also found that NASA provided little evidence of structured training plans for its staff, and the resources to support needed training were inadequate. Given these concerns, the report concluded that NASA might not be able to support higher shuttle flight rates projected in the future.

During the fall of 1999, NASA chartered a team to review the overall shuttle systems and maintenance practices. The team, chaired by the Ames Research Center Director, assessed NASA's standard practices in these areas and concluded that the current workforce was inadequate. In addressing human capital issues, the study noted that important technical areas were understaffed. For example, during a recent shuttle wiring investigation, the team found that "workforce skill shortages created the need to use…personnel inexperienced in wiring issues to perform critical inspections." In addition, the study team found that work stresses had impacted the downsized shuttle workforce. For example, one center employee survey suggested that hypertension, gastrointestinal, and cardiac conditions could have resulted from work-related stress.

In an internal study completed in June 1999, NASA concluded that the Office of Space Flight, which includes the shuttle program, had (1) an inappropriate skill mix for current and future work, (2) a growing lack of younger staff to assume management and technical roles, and (3) an overworked and aging workforce. The study also concluded that there was an overall shortfall of workers. In response, NASA adjusted the agency's workforce targets by providing one new hire for every two additional losses.

In the fall of 1999, NASA decided to build on its earlier workforce study to further define resource requirements. This second phase, completed in December 1999, included an evaluation of stress-related issues. In terms of resources the study found that a "revitalization" of the workforce was required to prevent "significant" safety concerns. For example, at the Kennedy Space Center, the shuttle program has only one qualified person in 30[4] critical systems areas. These areas include shuttle range safety systems and solid rocket booster and external tank electrical systems. In addition, the

[4] This study identified a total of 87 critical systems areas at Kennedy Space Center.

study found that, throughout the Office of Space Flight, there were more than twice the number of workers over 60 years of age than under 30 years of age. This represented a reversal of the age profile just 6 years ago, creating a potential problem in developing future qualified leaders.

As for health issues, the study concluded that the agency was experiencing an "unhealthy" and increasing level of stress. This conclusion was based on multiple indicators including increased forfeited leave, absences from required training, increased payment of overtime, and counseling visits through the employee assistance program. This level of worker stress resulted in (1) problems in concentrating, (2) difficulty in making decisions, (3) inability to cope, (4) insomnia, and (5) anxiety.

Perhaps the most persistent voice stressing the consequences of shuttle workforce downsizing has been NASA's Aerospace Safety Advisory Panel. This Panel is an independent group of experts consisting of nine members appointed by the NASA Administrator. Since 1996, the Panel has examined the potential safety impacts of downsizing and has consistently cautioned that the program has been experiencing an erosion of critical skills, a lack of younger people at entry-level positions, insufficient training opportunities, and a decreasing capacity to accommodate higher space shuttle flight rates for sustained periods. In its 1999 annual report, the Panel recommended that NASA "…address its workforce problems aggressively" to ensure safe operations. It added that "emphasis should be placed on eliminating critical skills shortfalls and recruiting younger [engineers] who can develop into experienced and skilled future leaders."

NASA IS BEGINNING TO ADDRESS WORKFORCE PROBLEMS

In response to the workforce studies, NASA is now implementing actions to address its workforce problems. For example, the agency has terminated its downsizing plans and expects to add 95 full time equivalent employees to the shuttle program in fiscal year 2000 to address critical skill shortages. In addition, in its fiscal year 2001 budget request, NASA is seeking authority to add another 278 full time equivalent employees to the shuttle workforce.

In addition to these immediate actions, NASA's Administrator has announced that the agency will soon begin a joint review with the Office of Management and Budget to identify NASA's overall future workforce needs. According to the Administrator, this review will assess potential tools and approaches for overall personnel management for the agency.

NASA believes the stress-related indicators that were reported in the December 1999 workforce study were critical evidence supporting the need for increasing NASA's workforce. In October 1999, NASA's Administrator directed the agency's highest level managers to consider ways to reduce workplace stress. NASA subsequently included improved health monitoring as an objective in its fiscal year 2001 performance plan.[5] According to the plan, NASA plans to develop and implement

[5] The Government Performance and Results Act of 1993 requires agencies to prepare annual performance plans.

supervisor-specific and individual training to identify, manage, and cope with stress in the workplace.

NASA WILL CONTINUE TO FACE HUMAN CAPITAL CHALLENGES

In dealing with its workforce problems, the shuttle program will have to deal with a number of complicating factors. These include accommodating increased training needs, ensuring adequate staffing levels for its safety upgrade program, attracting and retaining employees with critical skills, dealing with uncertainties related to the future of shuttle privatization and commercialization plans, and achieving a higher projected flight rate.

For example, according to one NASA study, it could take 2 or more years to fully train new engineers, while the current shuttle workload leaves little time for training. Also, the shuttle program has just begun a 5-year safety upgrade initiative. This initiative involves developing modifications to increase the safety of all major components of the shuttle vehicle. According to Johnson Space Center officials, this initiative will require up to three hundred engineers. Moreover, some critically needed skills, such as software engineering will be hard to attract and retain. In August 1999, we reported on this concern as it related to the space station program.[6]

In recent years, NASA has considered ways to maximize private sector involvement in shuttle operations, including transitioning management functions and marketing of payloads for commercial applications.[7] Regarding the future shuttle privatization and commercialization plans, the Human Exploration and Development of Space Independent Assessment Office study noted that strategic planning, workforce deployment, and prioritization will be difficult. The study concluded that NASA "must begin to analyze how its workforce will evolve in the [new] environments and prepare a plan for this evolution." All of these challenges will have to be faced while the program attempts to double its current flight rate. In recent years, NASA has flown four flights a year, but plans to fly nine times in fiscal year 2001, primarily to support the International Space Station assembly.

STRUCTURED APPROACH FOR MEETING HUMAN CAPITAL CHALLENGES IS NECESSARY

We believe NASA must build on its renewed emphasis on a healthy, diverse, and properly deployed shuttle workforce. Our Standards for Internal Control in the Federal Government, as updated in November 1999, address these workforce issues. The standards state that "only when the right personnel for the job are on board and are provided the right training, tools, structure, incentives, and responsibilities is operational success possible."

---

[6] Space Station: Russian Commitment and Cost Control Problems (GAO/NSIAD-99-175, August 17, 1999).

[7] In the past, the shuttle program has performed commercial activities for which it has been reimbursed by the private sector. However, it has been limited from flying reimbursable payloads by federal regulations. NASA is in the process of reviewing these restrictive policies with their initiators with the objective of removing them as obstacles to a fully commercialized shuttle program.

GAO's Comptroller General has made improved human capital management throughout the federal government one of his top priorities. In testimony[8] on March 9, 2000, he stated that "…human capital management recognizes that employees are a critical asset for success, and that an organization's human capital policies and practices must be designed, implemented, and assessed by the standard of how well they support the organization's mission and goals." He also noted that we had recently published a human capital self-assessment checklist that provides a structured approach to identifying and addressing human capital issues. This checklist will allow agency managers "to quickly determine whether their approach to human capital supports their vision of who they are and what they want to accomplish, and to identify those…policies that are in particular need of attention." The checklist follows a five-part framework, including strategic planning, organizational alignment, leadership, talent, and performance culture. It also provides a linkage of human capital programs to the agency's mission, goals, and strategies.

We have applied some of the concepts contained in the checklist during our workforce review at NASA and have provided copies of the checklist to NASA. We have been told that human resource officials are currently using the checklist as a guide in their workforce planning and the agency's ongoing discussions with the Office of Management and Budget. It is our hope that it will enable NASA and other agencies to perform more comprehensive evaluations of their human capital systems in the coming years.

Mr. Chairman, this concludes our formal statement. We would be happy to answer any questions that you or members of the Subcommittee may have.

CONTACT AND ACKNOWLEDGEMENT

For future contacts regarding this testimony, please contact Allen Li at (202) 512-4841. Individuals making key contributions to this testimony included Jerry Herley, John Gilchrist, Fred Felder, and James Beard.

[8] Testimony was given before the Subcommittee on Oversight of Government Management, Restructuring, and theDistrict of Columbia, Senate Committee on Governmental Affairs (GAO/T-GGD-00-77). Also on March 9, 2000, GAO testified on similar human capital concerns related to the Department of Defense. This testimony was given at a joint hearing involving the Subcommittee on Military Readiness, House Committee on Armed Services, and the Subcommittee on Civil Service, House Committee on Government Reform (GAO/T-GGD/NSIAD-00-120).