

GAO

Report to the Chairman, Subcommittee
on Strategic Forces, Committee on
Armed Services, House of
Representatives

September 2006

DEFENSE SPACE ACTIVITIES

Management Actions Are Needed to Better Identify, Track, and Train Air Force Space Personnel





Highlights of [GAO-06-908](#), a report to the Chairman, Subcommittee on Strategic Forces, Committee on Armed Services, House of Representatives

Why GAO Did This Study

The Department of Defense (DOD) relies on space to support a wide range of vital military missions. Many factors contribute to DOD success in space activities, and having sufficient quantities of space-qualified personnel to design, oversee, and acquire space assets, on which DOD expects to spend about \$20 billion in fiscal year 2007, is critical to DOD's ability to carry out its mission. The individual services are responsible for providing adequately qualified space personnel to meet mission needs. The Air Force provides over 90 percent of the space personnel to DOD's mission, but has not identified the space acquisition workforce. This report examines the extent to which (1) the Air Force's space acquisition workforce is managed using a strategic workforce management approach, (2) there are sufficient numbers of Air Force space acquisition personnel to meet DOD's national security needs, and (3) the Air Force's space acquisition personnel are adequately qualified for their positions. For its analysis, GAO identified the space acquisition workforce as those Air Force scientists, engineers, and program managers with experience developing space assets.

What GAO Recommends

GAO makes recommendations to DOD to take actions to better manage its limited pool of space acquisition personnel. DOD concurred or partially concurred with the recommendations. www.gao.gov/cgi-bin/gettrpt?GAO-06-908.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Davi M. D'Agostino at (202) 512-5431 or dagostinod@gao.gov.

DEFENSE SPACE ACTIVITIES

Management Actions Are Needed to Better Identify, Track, and Train Air Force Space Personnel

What GAO Found

While DOD and the Air Force have not achieved consensus about whether the space acquisition workforce should have a designated career field or a separate workforce strategy, the Air Force is responsible for strategically managing this segment of its workforce as it has for other workforce groups, such as pilots and navigators. The Air Force has done needs assessments on certain segments of its space workforce, but has not done an integrated, zero-based needs assessment of its space acquisition workforce. Such a strategic assessment would help inform the Air Force's planned force reduction that will result in a decrease of 40,000 active personnel and a 25 percent reduction of contractor support over 5 years. However, the Air Force is not using a zero-based needs assessment that includes the entire space acquisition workforce—unclassified and classified programs and military, civilian, and contractor personnel—as part of its force reduction planning and process improvement efforts. Such an assessment would identify if there are skill and competency gaps. As a result, the Air Force may not be able to manage the impact of its force reductions on the space acquisition workforce or take actions to mitigate the impact to ensure this workforce meets national security space needs.

In the absence of an integrated, zero-based needs assessment of its space acquisition workforce and a career field specialty, the Air Force cannot ensure that it has enough space acquisition personnel or personnel who are technically proficient to meet national security space needs. The Air Force has a shortage of midgrade and senior officers who play vital management and oversight roles in space acquisition. At the Space and Missile Systems Center (SMC), 37 percent of the critical acquisition positions were vacant as of April 2006 and about 50 percent of the center's workload was being done by contractors. Also, the National Reconnaissance Office (NRO) depends on Air Force personnel to fill many of its key space acquisition positions. Continuing shortages may hamper SMC's and NRO's ability to meet mission needs and highlight the Air Force's need to strategically manage its space acquisition workforce.

The technical proficiency of the Air Force's space acquisition workforce also may not be adequate to meet national security needs. At SMC, the percentage of space acquisition officers with the highest acquisition certification level dropped from 28 percent in 1996 to 15 percent in 2005. Reasons for the lower certification levels include NRO priority in selecting personnel, the lack of a space acquisition specialty, limited training, and the decline of personnel coming into the Air Force with technical degrees. Although required by law, the Air Force has not developed a career field for officers to develop space systems. Without a specialty to identify these personnel and increased space acquisition-related education and training, the Air Force may not be able to strategically manage its workforce and ensure personnel can effectively develop space systems.

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Abbreviations

AFSC	Air Force Specialty Code
APDP	Acquisition Professional Development Program
CLM	Continuous Learning Module
DAU	Defense Acquisition University
DAWIA	Defense Acquisition Workforce Improvement Act
DOD	Department of Defense
FFRDC	Federally Funded Research and Development Center
NRO	National Reconnaissance Office
NSF	National Science Foundation
NSSI	National Security Space Institute
SETA	Scientific and Engineering Technical Assistance
SMC	Space and Missile Systems Center

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United States Government Accountability Office
Washington, DC 20548

September 21, 2006

The Honorable Terry Everett
Chairman
Subcommittee on Strategic Forces
Committee on Armed Services
House of Representatives

Dear Mr. Chairman:

The Department of Defense (DOD) relies on space to support a wide range of vital military missions, including intelligence collection; battlefield surveillance and management; global command, control, and communications; and navigation assistance. Having sufficient quantities of space-qualified personnel—the “space cadre”—available to design, acquire, and oversee the production of space assets, on which DOD expects to spend about \$20 billion in fiscal year 2007, is critical to DOD’s and the individual warfighter’s ability to carry out their missions. In order to ensure that access to space remains reliable and unfettered, DOD has stated that it will improve responsive space access; satellite operations; and other space-enabling capabilities, such as the space industrial base, space science and technology efforts, and space-qualified personnel.

Congress has long been concerned about DOD’s management and organization of space activities, and it chartered a commission in 1999—known as the Space Commission—to review national security space activities. In its January 2001 report, the Space Commission noted that DOD needs a total force composed of well-educated, motivated, and competent personnel to work on space operations, requirements, and acquisition, but that DOD was not yet on course to develop the space cadre the nation needs.¹ The commission warned that many experienced personnel were retiring and that recruitment and retention of space-qualified personnel was a problem. In implementing the commission’s recommendations, the Secretary of Defense gave the services the responsibility to develop and maintain sufficient quantities of space-

¹ Department of Defense, Space Commission, *Report of the Commission to Assess United States National Security Space Management and Organization* (Washington, D.C.: Jan. 11, 2001).

qualified personnel.² To better manage its space systems and acquisition of major space programs, DOD issued a directive that established an Executive Agent for Space in June 2003 to develop, coordinate, and integrate plans and programs for space systems and for the acquisition of space major defense acquisition programs.³ Currently, the Under Secretary of the Air Force serves as the DOD Executive Agent for Space. In February 2004, DOD issued its space human capital strategy that set overall goals for developing and integrating space personnel, and that year Congress also directed the Secretary of the Air Force to establish and implement policies and procedures to develop a career field for Air Force officers with technical competence in space-related matters.⁴

We have previously reported on DOD's space human capital strategy and efforts by the military departments to develop their space personnel.⁵ In our first report, issued in August 2004, we recommended that DOD develop an implementation plan for its strategy and that the Army and Navy develop strategies and establish focal points for managing their space personnel.⁶ In response to our recommendations, DOD issued an implementation plan for its space human capital strategy, and the Navy issued a space cadre strategy and established a focal point. The Army has not yet implemented our recommendations. In our second report, issued in September 2005, we recommended that the Secretary of Defense issue agencywide guidance to provide accountability by defining and institutionalizing space cadre authorities and the responsibilities of the Executive Agent and the services, and that the Secretary of Defense direct

² Secretary of Defense Memorandum, "National Security Space Management and Organization," October 18, 2001.

³ DOD Directive 5101.2, *DOD Executive Agent for Space*, June 3, 2003. Executive agent is a term used to indicate a delegation of authority by the Secretary of Defense to a subordinate to act on the Secretary's behalf. According to a DOD directive issued in September 2002, the nature and scope of an executive agent's responsibilities, functions, and authorities shall be prescribed at the time of assignment and remain in effect until revoked or superseded. See Section 3.1, DOD Directive 5101.1, *DOD Executive Agent*, September 3, 2002.

⁴ 10 U.S.C. § 8084.

⁵ In the National Defense Authorization Act for Fiscal Year 2004, Congress required that we submit two reports assessing DOD's space human capital strategy and the efforts by the military departments to develop their space personnel.

⁶ GAO, *Defense Space Activities: Additional Actions Needed to Implement Human Capital Strategy and Develop Space Personnel*, [GAO-04-697](#) (Washington, D.C.: Aug. 11, 2004).

the DOD Executive Agent for Space to develop appropriate performance measures and evaluation plans for each service.⁷ As of May 2006, DOD had not implemented the recommendations made in our 2005 report.

Many factors, such as the use of new and unproven technology and workforce issues, can contribute to space program delays and cost overruns. We have recently reported that DOD's space acquisition programs have experienced cost and schedule overruns that have postponed delivery of promised capabilities to the warfighter; in some cases, capabilities have not been delivered after decades of development.⁸ We have identified a number of causes behind these problems, noting that among the causes that most consistently stand out are that DOD starts more programs than it can afford, starts programs before it has assurance of technological maturity, and allows new requirements to be added well into the acquisition phase. In addition, we have identified additional problems that contribute to space acquisition problems, though less directly affecting cost and schedule problems. These include such problems as short tenures of top leadership and acquisition managers as well as capacity shortfalls, such as shortages in scientists and engineers and experts in systems and software engineering to oversee its space programs.⁹

Strategic human capital management is a pervasive challenge facing the federal government. In January 2001 and again in January 2003, we identified strategic human capital management as a governmentwide high-risk area after finding that the lack of attention to strategic human capital planning had undermined the federal government's ability to serve the American people effectively.¹⁰ In the wake of extensive downsizing performed during the early 1990s, largely without sufficient consideration of the strategic consequences, agencies are experiencing significant challenges to deploying the right skills, in the right places, at the right times. With a growing number of employees who are eligible for

⁷ GAO, *Defense Space Activities: Management Guidance and Performance Measures Needed to Develop Personnel*, [GAO-05-833](#) (Washington, D.C.: Sept. 21, 2005).

⁸ GAO, *Space Acquisitions: Improvements Needed in Space Systems Acquisitions and Keys to Achieving Them*, [GAO-06-626T](#) (Washington, D.C.: Apr. 6, 2006).

⁹ [GAO-06-626T](#).

¹⁰ GAO, *High-Risk Series: An Update*, [GAO-01-263](#) (Washington, D.C.: January 2001), and *High-Risk Series: An Update*, [GAO-03-119](#) (Washington, D.C.: January 2003).

retirement, agencies are also finding it difficult to fill certain mission-critical jobs—a situation that could significantly drain their institutional knowledge.

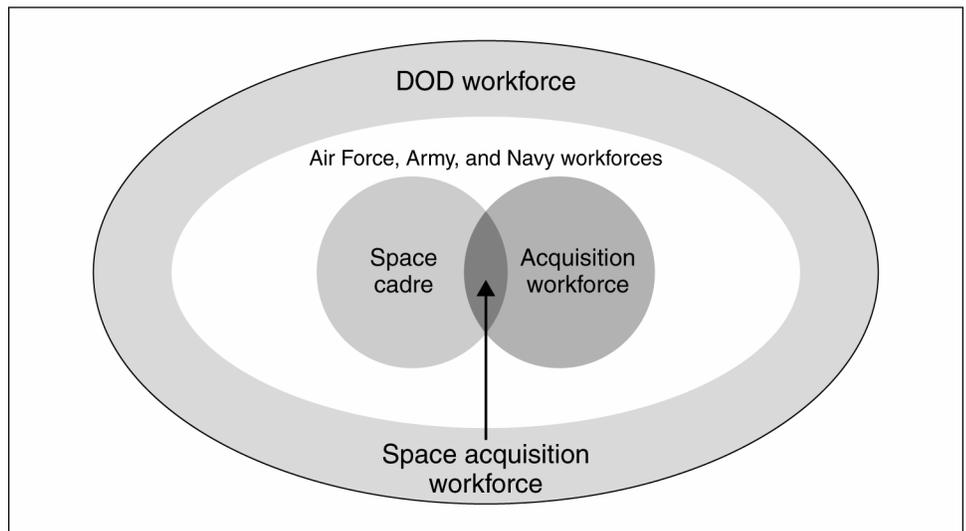
Effectively managing today's workforce is multifaceted. The strategic workforce planning model used by leading public and private organizations to effectively manage their workforces includes the following five key elements¹¹: involving management, employees, and stakeholders; analyzing critical skill and competency gaps between current and future workforce needs; developing strategies to fill identified gaps; building capabilities to address requirements; and monitoring and evaluating progress and the contribution of strategic workforce planning efforts in achieving goals. We also identified additional aspects of effectively managing today's workforce, including the use of a zero-based needs assessment to identify resources that are needed to carry out an organization's mission. A zero-based integrated needs assessment "zeroes out" an organization's existing resources and assesses the organization's needs from a bottom-up approach. It often results in a clearer picture of the resources that are needed without being encumbered by the need to reorganize the organization's existing resource base. Other important aspects of effectively managing a workforce include establishing career fields to provide specific management and development of distinct workforces, defining critical skill sets, and establishing training requirements.

Personnel who acquire space assets—the space acquisition workforce—are not defined as a distinct workforce or career field within DOD or the Air Force. However, for the purposes of our review, we identified space acquisition personnel as those belonging to either of two workforces that DOD and the Air Force have defined—the acquisition workforce and the space cadre workforce. These two workforces have separate management frameworks, and each has certifications, career fields, training, and other requirements tailored to its particular needs. Certifications help establish and maintain professional standards. Career fields provide a development path and identify the training and experience needed for personnel to progress through the career field.

¹¹ GAO, *DOD Civilian Personnel: Comprehensive Strategic Workforce Plans Needed*, [GAO-04-753](#) (Washington, D.C.: June 30, 2004).

Using the Air Force acquisition career field, we identified scientists, engineers, and acquisition managers with experience in developing and acquiring space assets. We determined that the Air Force accounts for more than 90 percent of space personnel, with the remaining 10 percent generally consisting of Army and Navy personnel. Additionally, the space acquisition workforce includes military personnel, civilians, and contractors. Figure 1 depicts our definition of the DOD space acquisition workforce.

Figure 1: Overview of DOD Space Acquisition Workforce



Source: GAO.

Since the overwhelming majority of space personnel work for the Air Force, we focused our review on that service. Overall, our analysis focused on Air Force officers because the Air Force does not yet track civilians or enlisted personnel to the extent that it does officers. Within the Air Force, the space cadre workforce consists of officers in the following career fields: space operators, scientists, engineers, and acquisition managers. The Air Force's acquisition workforce consists of officers in the following career fields: scientists, engineers, acquisition managers, contracting officers, and financial managers. Using these definitions of the acquisition and space cadre workforces, we defined the space acquisition workforce as comprising scientists, engineers, and acquisition managers with experience in developing and acquiring space assets.

As of April 2006, approximately 1,850 Air Force space acquisition officers and civilians were located at the Space and Missile Systems Center (SMC), which is part of the U.S. Air Force Space Command. About 1,300 Air Force personnel, including approximately 340 acquisition and contracting officers, were located at the National Reconnaissance Office (NRO), which designs, builds, and operates the nation's reconnaissance satellites.¹² NRO has no permanently assigned personnel; rather, it draws personnel on rotational assignments from the services and the intelligence community.

In response to your request, our objectives for this report were to determine the extent to which (1) the Air Force's space acquisition workforce is managed using a strategic workforce planning approach, (2) there are sufficient numbers of Air Force space acquisition personnel available to meet DOD's national security space needs, and (3) the Air Force's space acquisition personnel are adequately qualified for their positions. In order to achieve these objectives, we first identified the space acquisition workforce since, as previously mentioned, neither DOD nor the Air Force had established this as a separate workforce. To do this, we obtained Air Force data on the acquisition workforce and identified those acquisition personnel who had space experience. We also obtained Air Force data on the space cadre, and we identified those space cadre personnel who had acquisition experience. We obtained specific database codes in the space professional database that contains all space cadre members, which allowed us to determine education, experience, and expertise levels for the space acquisition workforce, and whether the personnel were working on classified or unclassified space programs. DOD and Air Force officials agreed with our methodology to determine the space acquisition workforce, and we found the data we used to make this determination to be sufficiently reliable for purposes of this review.

To determine the extent to which the Air Force's space acquisition workforce is managed using a strategic workforce planning approach, we identified a strategic workforce planning model used by leading organizations.¹³ We then interviewed officials and obtained documentation

¹² For NRO, the number of acquisition officers is only an approximation because some who are coded as acquisition officers could actually be performing non-space acquisition duties; conversely, some who are not coded as acquisition officers could be performing space acquisition duties. The amounts cited represent our best estimate in the absence of more detailed information from NRO.

¹³ See GAO, *A Model of Strategic Human Capital Planning*, [GAO-02-373SP](#) (Washington, D.C.: Mar. 15, 2002), and National Academy of Public Administration, *Building Successful Organizations: A Guide to Strategic Workforce Planning* (Washington, D.C.: May 2000).

to find out whether strategies, plans, or both for the space acquisition workforce exist, and if so, if they are in accordance with the accepted strategic workforce planning model. To determine the extent to which there are sufficient numbers of Air Force space acquisition personnel to meet DOD's national security space needs, we interviewed officials, obtained documentation, and analyzed Air Force Headquarters data to assess overall trends in composition and assignments of the space acquisition workforce. To determine the extent to which Air Force space acquisition personnel are adequately qualified for their positions, we interviewed officials, obtained documentation, and analyzed data from the Air Force Personnel Center and SMC and space professional databases in order to assess the certification and education levels of the Air Force's space acquisition workforce.

Part of our analysis regarding the quantity and quality of the space acquisition workforce was limited due to the lack of NRO data. NRO did provide us the overall number of Air Force personnel assigned to it, but did not provide us information on the education, experience, or expertise of NRO personnel. As a result, we could not compare the education, experience, or expertise of the space acquisition workforce at SMC and NRO, and we could not compare the NRO space acquisition workforce directly to the Air Force acquisition workforce. In this regard, we were only able to compare SMC personnel directly to Air Force acquisition personnel. However, we were able to identify Air Force acquisition officers who work on classified space programs and, using them as a proxy for the NRO space acquisition workforce, we compared this group to Air Force acquisition personnel. Additionally, we noted the actions that DOD and the Air Force had taken to manage their workforces using a strategic workforce management approach, but we did not evaluate the sufficiency of the actions they took.

We conducted our review from October 2005 through June 2006 in accordance with generally accepted government auditing standards. More detailed information on our scope and methodology is provided in appendix I.

Results in Brief

While DOD and the Air Force have not achieved consensus about whether the space acquisition workforce should have a designated career field or a separate workforce strategy, the Air Force is responsible for strategically

managing this segment of its workforce just as it is for other workforce groups, such as pilots and navigators.¹⁴ The Air Force has taken actions to strategically manage the acquisition workforce and the space cadre separately, including defining critical skill sets and designating training for the space and acquisition workforces, and it has done needs assessments on certain segments of its space workforce. However, the Air Force has not done and does not plan to do an integrated, zero-based needs assessment of its space acquisition workforce, including military personnel, civilians, and contractors for both classified and unclassified space programs. Such a strategic needs assessment would help inform the Air Force's planned force reduction, which is projected to result in a decrease of 40,000 active duty positions and a 25 percent reduction in contractor support over the next 5 years. A zero-based needs assessment enables an organization to identify whether skill and competency gaps exist between current and future workforces needed to meet program goals. It is unclear to what extent needs assessments will be incorporated into the Air Force's force reduction planning process. Without performing an integrated and zero-based space acquisition workforce needs assessment and using the results to inform its force reduction planning, the Air Force may not be able to manage the impact of its force reduction on the space acquisition workforce or take actions to mitigate the impact to ensure it has the quantity and quality of space acquisition personnel needed to accomplish its space mission.

In the absence of an integrated, zero-based needs assessment of its space acquisition workforce and a career field specialty, the Air Force cannot ensure that it has enough space acquisition personnel or personnel who are technically proficient to meet national security space needs. According to the directive establishing the DOD Executive Agent for Space, the services are responsible for developing and maintaining sufficient numbers of space personnel to support space planning, programming, acquisitions, and operations. According to Air Force totals of authorized and assigned acquisition personnel, which include space acquisition personnel, the Air Force is experiencing a shortage of midgrade and senior

¹⁴ Examples of other workforce groups include personnel in specific career fields, such as pilots or intelligence personnel, and a designated grouping of several career fields, such as the space cadre, which comprises personnel from several Air Force career fields.

officers¹⁵ who perform space acquisition, and contractor support is filling these shortages. Midgrade and senior officers provide experience and play vital management and oversight roles, including as acquisition program managers. At SMC, 37 percent of the senior officer positions in engineering and program management were vacant as of April 2006, and more than 50 percent of the center's workload is being performed by contractors. At NRO, this shortage of midgrade and senior officers may ultimately lead to increased reliance on contractors, since NRO depends on Air Force personnel to fill many of its space acquisition positions. As of March 2006, we determined that approximately 57 percent of NRO employees were Air Force personnel. The shortages in midgrade and senior positions are due, in part, to the overall post-Cold War drawdown of military personnel, including space acquisition personnel,¹⁶ and to the limited opportunities available for senior officers in the technical acquisition career fields. The Air Force has recognized the existence of these shortages and has begun considering ways to address them, such as potentially identifying and moving acquisition officers who are in nonacquisition positions to space acquisition positions. However, the Air Force has not yet addressed the shortages because it is trying to balance overall shortages in multiple career fields, of which acquisition is not perceived as the most important. For example, according to Air Force officials, space acquisition workforce shortages have to compete for resources with demands in other career fields, such as pilots and navigators. Continuing shortages of these personnel may hamper SMC's and NRO's ability to meet mission needs and highlight the need for the Air Force to strategically manage its space acquisition workforce.

Furthermore, the technical proficiency of space acquisition personnel who are available to the Air Force may not be adequate to meet national security space needs. Title 10 of the United States Code contains a provision to ensure that space personnel are adequately qualified to meet

¹⁵ We define midgrade officers as those officers who have served 9 to 15 years of an average 20-year career, which can encompass the ranks of captain and major. We define senior officers as those who have served 16 or more years of an average 20-year career, which can encompass the ranks of lieutenant colonel and above.

¹⁶ We also wanted to determine if the shortages were caused by engineers being assigned to other career fields. However, we found that the Air Force is predominantly using the engineers it has to fill general acquisition-related positions. Specifically, we found that from 1994 to 2005, the Air Force placed approximately 84 percent of its engineers in acquisition-related positions. In addition, we note that Title 10 requires that there be a balance between the need for military personnel to serve in career broadening positions and the need for them to serve in positions for a sufficient length of time. 10 U.S.C. § 1722 (f)(2).

mission needs, requiring the Secretary of the Air Force to develop a career field for officers with technical competence in space-related matters, including the capability to develop space systems.¹⁷ At SMC, 61 percent of the officers had the lowest space acquisition certification level, and 23 percent had no certification. In addition, the percentage of SMC officers with the highest acquisition certifications has dropped from 28 percent in 1996 to 15 percent in 2005. The levels of space and acquisition certification levels can be attributed to several factors. First, for SMC, the lower levels of acquisition and space certifications may have occurred because NRO has received priority in selecting space acquisition personnel with higher qualifications, according to DOD and NRO officials. In June 2006, the Air Force and NRO agreed to address a number of workforce issues, but it is not clear how this will affect staffing between SMC and NRO. Second, the Air Force has not institutionalized a means of identifying the space acquisition specialty within any of its existing career fields. Doing so could provide standardized education and training requirements specific to space acquisition for all personnel involved in managing space acquisition programs, and it could help to develop personnel with the technical expertise to effectively oversee the acquisition of space systems. Third, training that focuses on space acquisition is limited. For example, the Defense Acquisition University (DAU) does not incorporate space-specific training into its required curricula for the acquisition workforce, and the Air Force's National Security Space Institute offers only limited acquisition content in its curricula for the space workforce. Without increased space and acquisition-related training and a career field or specialty that addresses standardized education and training requirements specific to space acquisition, the Air Force may lack visibility over the capabilities and career paths of its space acquisition personnel, and therefore may not have the ability to ensure that space acquisition personnel can effectively supervise and oversee the development of new space systems. Lastly, the percentage of new acquisition managers coming into the Air Force with technical degrees has declined over the past 15 years, from 68 percent in 1990 to 16 percent in 2005. The decline in acquisition managers with technical degrees, coupled with the factors listed above, may undermine the Air Force's ability to strategically manage its space acquisition workforce and meet national security space mission needs.

We are making recommendations to the Air Force to take actions to promote better management of its limited pool of space acquisition

¹⁷ 10 U.S.C. § 8084.

personnel. In commenting on a draft of this report, DOD concurred or partially concurred with these recommendations. NRO provided comments but did not formally agree or disagree with our recommendations.

Background

Congress and DOD have become increasingly concerned about significant cost increases and program delays for space acquisition programs. Moreover, the skilled and technical workforce needed to manage space programs may not be sustained at a rate necessary to meet national security needs. We have previously reported on space acquisition performance and space cadre workforce issues and have made recommendations to improve both the acquisition performance of space programs and the workforce, over 90 percent of which resides in the Air Force.

Acquisition Workforce Management Concerns

Over the past decade, Congress and DOD officials have expressed concerns about the performance of acquisition programs, including space acquisition programs, since the programs have consistently experienced significant cost growth and schedule delays. These concerns led to the commissioning of numerous studies, many of which highlighted systemic issues with the acquisition workforce, including the space acquisition workforce, as contributing to program difficulties. Two of the most recent studies are reports by the Defense Science Board and the Defense Acquisition Performance Assessment Project.

In May 2003, a joint task force of the Defense Science Board issued a report on the acquisition of national security space programs, known as the Young Panel report.¹⁸ The task force had been chartered by senior Office of the Secretary of Defense and Air Force officials, including the Under Secretary of the Air Force who was also serving as the Director of NRO, in order to determine underlying causes and systemic issues related to significant problems in many critical national security space programs. The members of the task force noted that one systemic issue is that there is an overall underappreciation of the importance of appropriately staffed and trained system engineering staffs to manage the technologically

¹⁸ Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, *Report of the Defense Science Board/Air Force Scientific Advisory Board Joint Task Force on Acquisition of National Security Space Programs* (Washington, D.C.: May 2003).

demanding and unique aspects of space programs. In July 2004, the task force followed up on the progress made in implementing the Young Panel report recommendations. Although the task force noted in this follow-up report that the establishment of the space cadre was a very positive step, it maintained that the distinctiveness of a space acquisition professional should be recognized with a special identifier.

Additionally, the Defense Acquisition Performance Assessment (DAPA) Project completed an integrated acquisition assessment at the request of the Deputy Secretary of Defense and issued its report in January 2006.¹⁹ Although this report was not limited to space acquisition programs, it noted, among other things, that key DOD acquisition personnel, particularly acquisition managers, do not have sufficient experience, tenure, and training to meet current acquisition challenges and that system engineering capability within DOD is not sufficient to meet program needs. Consequently, the DAPA report recommended that there be an increase in the number of federal employees focused on critical skill areas, such as program management and system engineering, with the cost of this increase to be offset by reductions in funding for contractor support. Moreover, the report also recommended the establishment of consistent training, education, certification, and qualification standards for the entire acquisition workforce. Finally, the report noted that the aging science and engineering workforce and declining numbers of science and engineering graduates willing to enter either industry or government will have a negative impact on DOD's ability to address workforce concerns.

Trends in Science and Engineering Degrees

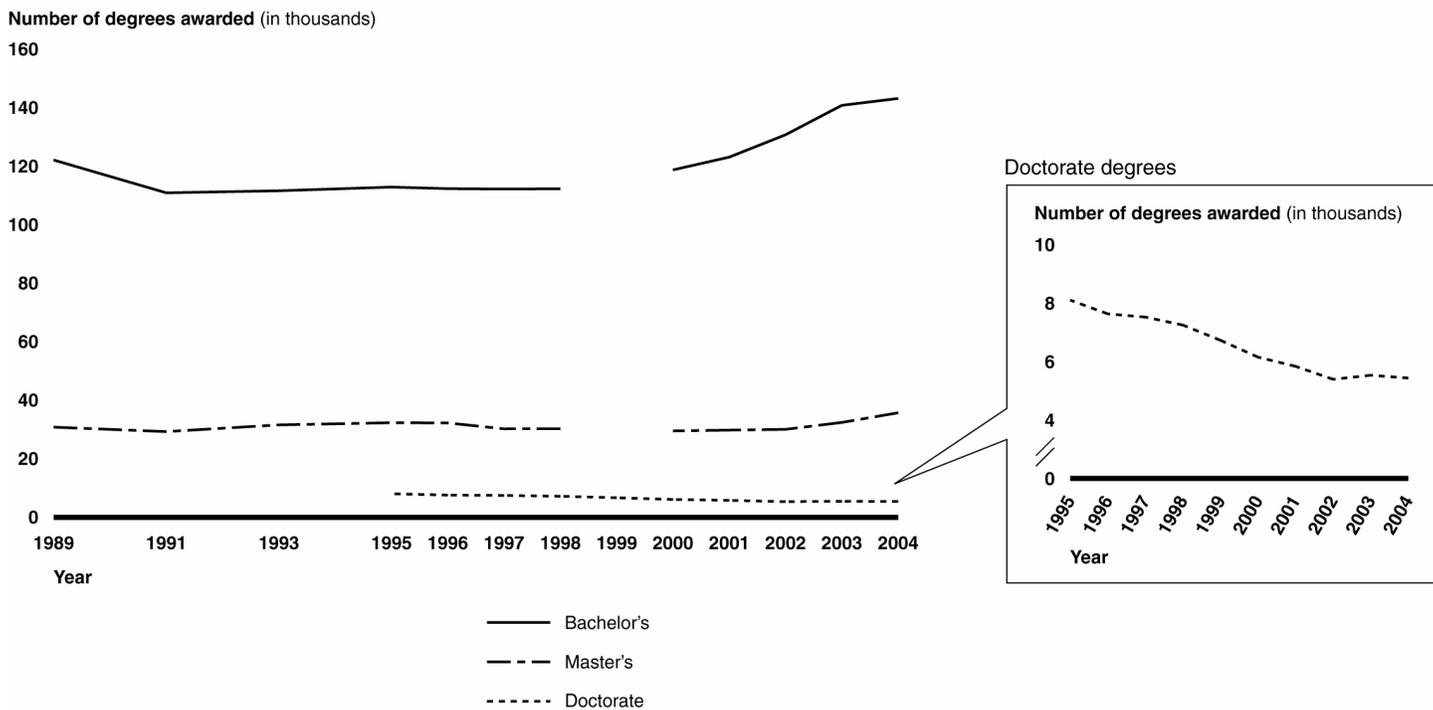
According to the National Science Foundation (NSF), the numbers of U.S. citizens and permanent residents earning science and engineering degrees²⁰ at the bachelor's and doctoral levels remained constant or declined during the 1990s. At the bachelor's level, which is the level at which officers normally enter the Air Force, the numbers have increased since then in some fields. At the doctoral level, from which the Air Force draws technical experts, the U.S. citizen and permanent resident share of

¹⁹ Defense Acquisition Performance Assessment Project, *Defense Acquisition Performance Assessment*, January 2006.

²⁰ We included degrees in the following categories, which include fields required to enter the Air Force as a scientist or engineer: physical sciences, mathematics and computer sciences, and engineering. We excluded the social and life sciences from our analysis.

the total has continued to decline. Figure 2 shows the trends in degrees by level.

Figure 2: Trends in Overall Science and Engineering Degrees Awarded to U.S. Citizens and Permanent Residents

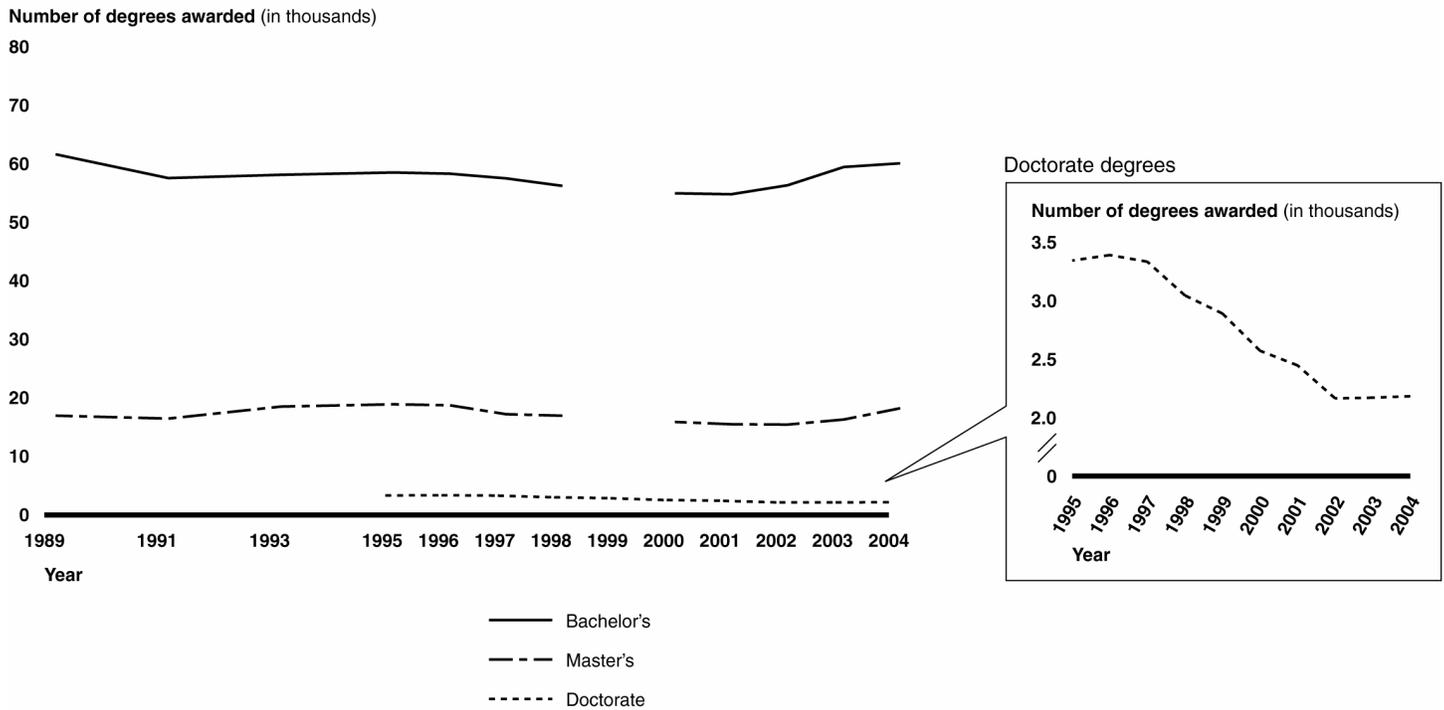


Source: GAO analysis of NSF data.

Note: Bachelor's and master's degree data unavailable for 1999.

Among engineering graduates, the number of doctoral degrees has declined steadily over the past decade, and the number of bachelor's and master's degrees declined in the mid-1990s but has grown since 2002. Figure 3 shows the trends in engineering degrees awarded to U.S. citizens and permanent residents since 1989.

Figure 3: Engineering Degrees Awarded to U.S. Citizens and Permanent Residents



Source: GAO analysis of NSF data.

Note: Bachelor's and master's degree data unavailable for 1999.

The number of engineering graduates, as depicted in figure 3, represents the maximum pool from which Air Force engineering officers, civilians, and contractors may be drawn. However, permanent residents will not necessarily all go on to obtain citizenship, and not even all citizens will be able to obtain the security clearances that some space-related positions require. In addition, demand throughout DOD is high, according to DOD officials: the department employs about 45 percent of the federal government's approximately 200,000 scientists and engineers, including about two-thirds of its engineers. Therefore, DOD considers the dependability of the supply of scientists and engineers who are able to obtain security clearances to be in question.

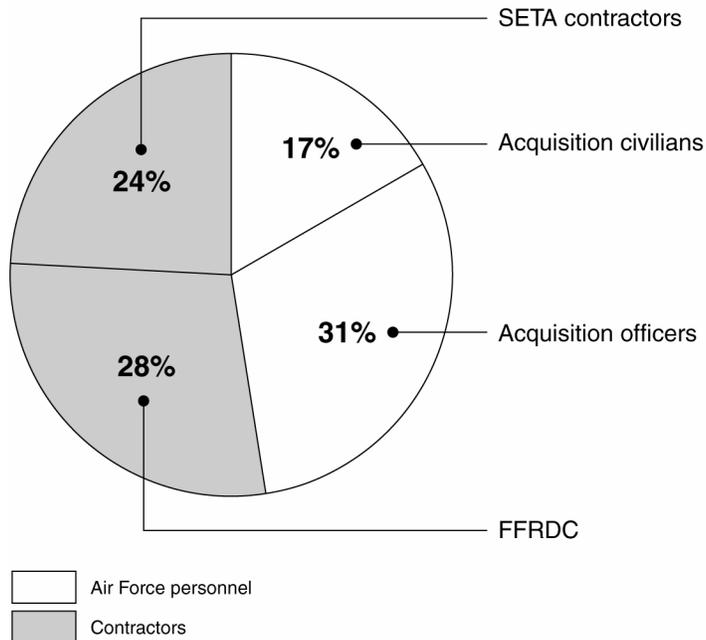
Air Force Role in Space Acquisition

The Air Force is DOD's primary procurer and operator of space systems that are used by the services and others throughout DOD. These activities primarily occur at SMC or NRO. SMC, a subordinate command of Air Force Space Command, designs and acquires all Air Force and most DOD

space systems. As of February 2006, SMC had an authorized workforce of about 7,000 people, who are divided among eight system program offices, such as the Space Superiority and the Global Positioning System Program Office, and several technical, financial, and logistical support directorates.

SMC's space acquisition workforce is composed of Air Force officers and civilians, federally funded research and development center (FFRDC) personnel, and other contractors, each of whom plays a specific role in the acquisition process. Officers provide overall management and military perspective on user needs; civilians provide continuity, functional expertise, and institutional knowledge; FFRDC personnel provide in-depth knowledge of programs and an independent perspective; and contractors provide systems engineering and technical assistance (SETA) as a surge capability to meet a variety of skills shortages. In addition, enlisted personnel fill varied support roles. Figure 4 shows the composition of the SMC workforce. The shaded portion represents contractors, who constitute slightly more than half of the SMC acquisition workforce.

Figure 4: Composition of the Workforce at SMC



Source: SMC as of April 2006.

Notes: Acquisition officers are the scientists, engineers, and acquisition managers that we have defined as constituting the space acquisition workforce. In addition, we included contracting and financial management officers, whom SMC considers part of its acquisition workforce and who are part of the broad Air Force acquisition career field.

NRO, which designs and acquires reconnaissance satellites, is a defense agency whose director reports jointly to the Director for National Intelligence and the Secretary of Defense. From 2001 to 2005, the Under Secretary of the Air Force also served concurrently as the Director of NRO.²¹ Similar to SMC's space acquisition workforce, the space acquisition workforce at NRO also includes Air Force officers, enlisted personnel, and civilians. In addition, Central Intelligence Agency employees, personnel from the other military services, and contractors contribute personnel to NRO. Although exact figures were not available, NRO is authorized approximately 40 percent as many officers with acquisition specialties as

²¹ In 2001, the positions of the Under Secretary of the Air Force and the Director of NRO were merged, upon the recommendation of the Space Commission. However, in July 2005, the Secretary of Defense split the positions once again, appointing a person to serve exclusively as the Director of NRO.

is SMC.²² Historically, the NRO space acquisition workforce has received substantial support from both FFRDC personnel and private contractors.

Space Acquisition Workforce Is Not Defined as a Distinct Workforce

DOD and the Air Force have not established a separate workforce for space acquisition personnel.²³ As a result, we determined that the space acquisition workforce resides in two areas—the acquisition workforce or the space cadre workforce. In other words, we determined that the space acquisition workforce consists of acquisition personnel with space experience and space cadre personnel with acquisition experience. The Air Force acquisition workforce and the space cadre workforce have separate management frameworks—each of which has a separate workforce strategy—that include different certification levels tailored to each of the workforces' needs.

The Air Force has not developed a separate workforce strategy for space acquisition personnel because there is no consensus within DOD or the services that space systems are inherently different from other systems, and DOD's current position is that those involved in developing or acquiring space assets are not different enough from other acquirers to warrant a separate workforce strategy. The departmentwide Space Professional Oversight Board has debated this issue, and we found officials who agreed with both positions. Officials cite two principal arguments in favor of the view that space is unique. First, according to some Air Force and DOD officials, as well as a DAU briefing to the Air Force's National Security Space Institute's (NSSI) flag-officer level executive course, space acquisition is different because space systems are purchased in small quantities; there are few operators, and these require specialized training; and these systems need to be perfect the first time, because satellites cannot be recalled for repairs. In addition, a high proportion of total costs are devoted to system acquisition rather than operations and support, which is different from the typical DOD life cycle

²² For NRO, the authorized percentage of acquisition officers is only an approximation because some who are coded as acquisition officers could actually be performing non-space acquisition duties; conversely, some who are not coded as acquisition officers could be performing space acquisition duties. The authorized percentage cited represents our best estimate in the absence of more detailed information from NRO.

²³ The Navy and the Army also have space officers who perform acquisition work, but Army and Navy space programs are relatively small as a percentage of the overall DOD space program.

cost curve. Second, some senior Air Force and DOD officials believe that personnel need to spend at least a decade learning about space systems before they can become effective acquirers and that knowledge of systems engineering is critical for space acquisition work.

Officials who do not view space as inherently different cite two principal arguments. First, each type of procurement has unique aspects—for example, lives may be lost when prototype aircraft crash—and therefore making a distinction between space and non-space acquisition would set a precedent that could lead to demands for numerous separate acquisition strategies. In addition, officials pointed out that Defense Acquisition Workforce Improvement Act (DAWIA) requirements are structured functionally. Personnel specialize in such areas as program management or systems planning, research, development, and engineering, not in major systems like satellites or aircraft. Therefore, an acquisition manager can acquire any type of platform.

In the absence of a defined space acquisition workforce, we identified the acquisition workforce and the space cadre and the frameworks used to manage them. The acquisition workforce has the Acquisition Professional Development Program (APDP), which was established to promote the development and sustainment of a professional acquisition workforce within the Air Force in accordance with DAWIA requirements.²⁴ The APDP consists of three levels of certification for the acquisition professional. Acquisition professionals may obtain certification in one or more of several areas, such as acquisition program management, systems engineering, and test and evaluation. Each level of acquisition certification requires a combination of education, experience, and training. For example, in order to achieve the first level of certification in the area of acquisition program management, an officer must have 1 year of acquisition experience and attend an acquisition management course offered by DAU.²⁵ To achieve the second level in this area, the officer must

²⁴ In 1990, Congress passed DAWIA in order to enhance the quality and professionalism of the defense acquisition workforce (Pub. L. No. 101-510). Most of DAWIA was codified in Title 10 of the United States Code, and it has been amended a few times since enactment. DAWIA specifies the minimum qualification standards of those personnel performing functions integral to the acquisition process, formalizes career paths for personnel who wish to pursue careers in acquisition, and defines critical or senior management acquisition positions.

²⁵ DAU was established in 1992, in accordance with DAWIA, in order to provide for the professional education, development, and training of the acquisition workforce.

have 2 years of acquisition experience and have taken additional DAU program management courses. To achieve the third level, the officer should have taken some amount of coursework toward a master's degree, have 4 years of acquisition experience, and take an additional DAU program management course.

For the space cadre workforce, Air Force acquisition officers with space experience are included in Air Force Space Command's space professional development program as credentialed space professionals, also known as space cadre members. The Space Professional Development Program includes among its basic elements the identification of the unique space experiences of space professionals, the tracking of these experiences in a space professional database, and the establishment of a Space Professional Certification Program to recognize distinct levels of space expertise. The Space Professional Certification Program consists of three levels of certification, each of which involves varying levels of education, training, and experience, and emphasizes substantial space experience as the main ingredient qualifying an individual for higher levels of responsibility. For example, in order to achieve the first level of certification, an officer must possess a bachelor's degree, have taken the Space 100 course,²⁶ and have at least 1 year of space experience. In order to achieve the second level of certification, which is usually around the 10-year career point, an officer must additionally have taken the Space 200 course and possess at least 6 years of space experience. Finally, in order to achieve the third and highest level of certification, which usually takes place around the 15-year career point, an officer must have also taken the Space 300 course and have at least 9 years of space experience. Within the Air Force's acquisition workforce, officers in both the scientist and engineer career fields are required to possess a degree in a technical area that is relevant to their career field. However, acquisition managers are not required to hold a technical degree or a master's degree.

²⁶ The courses known as Space 200 and Space 300 are offered by Air Force Space Command's National Security Space Institute, which was established in order to institute stronger, technically oriented space education and training programs. Space 100 is offered by the Air Education and Training Command.

Air Force Has Done Some Space and Acquisition Workforce Planning, but Lacks an Integrated Zero-Based Needs Assessment

Although the Air Force has taken some actions to address the key elements of strategic workforce management used by leading organizations, these actions have been targeted to either the acquisition workforce or the space cadre—not the space acquisition workforce. More important, the Air Force has not done a zero-based needs assessment for the space acquisition workforce—a critical step in strategically managing a workforce.

Air Force Actions to Address the Strategic Planning Model Are Directed at the Acquisition and Space Cadre Workforces

We found that the Air Force has taken several actions to better manage the acquisition and the space cadre workforces, such as identifying personnel gaps and addressing career path and training development. For example, the Air Force Assistant Secretary for Acquisition recently conducted a long-range review of scientific and engineering capacity within the Air Force, and one of acquisition officer/civilian supply and shortages. The Air Force Manpower Agency is currently conducting a servicewide Acquisition and Sustainment Unit manpower study, and the Office of the Assistant Secretary of the Air Force for Acquisition has entered into an agreement with the Office of Personnel Management to conduct a workforce and succession planning study, which includes Air Force civilian personnel with acquisition specialties.

The strategic workforce model also entails developing plans and strategies to fill identified personnel gaps, building capabilities, and monitoring and evaluating the progress of efforts. We found that Air Force Headquarters has identified gaps in its acquisition workforce and subsequently plans to allocate acquisition officers among areas of need; however, the plan does not distinguish between space-related and other acquisition officers. Building capabilities entails acquiring and using flexibilities to shape the workforce. We found that the Office of the Air Force Assistant Secretary for Acquisition regularly monitors the rates at which authorized positions are filled, and brings acquisition personnel shortages to the attention of higher headquarters for corrective action.

Efforts regarding Skill Sets, Training, and Career Path Development

The Air Force Space Command has addressed critical skill sets, training, and career path development as part of its effort to develop and manage its space cadre officers, including acquisition personnel who meet space cadre qualifications. For example, Air Force Space Command is

continuing to conduct an analysis of the current space cadre and to identify critical skill sets needed for each segment, including officers, enlisted personnel, and civilians. So far, the analysis has been completed for acquisition officers, including those who are assigned to NRO, but has not yet been completed for civilians.

Air Force Space Command has also established a space-specific series of training courses.²⁷ In addition, SMC and NRO offer space acquisition-specific curricula to newly assigned officers and civilians at those locations. Air Force Space Command has also published its Career Opportunities Guide that lists each space-related position, and describes the education, experience, and training prerequisites for each to enable officers to prepare for specific assignments.

Air Force Space Command and the Air Force's acquisition career field manager have developed sample career paths for space cadre members and acquisition officers, respectively, to follow. Each sample career path provides variations that provide flexibility and emphasize different types of assignments, depending on individual preference and service needs.

Efforts regarding Recruitment and Promotion

In terms of recruitment and promotion, the Air Force Deputy Chief of Staff for Personnel annually sets recruitment targets as well as retention and promotion goals for each military rank with input from each of the career field managers. The major commands, such as Air Force Space Command, do not set recruitment targets. Rather, acquisition officers are recruited and promoted according to targets set for each career field and source of commission. Individuals who may fill space acquisition positions at some time in their careers are normally recruited into space operations or one of the acquisition career fields, but officers from a wider range of career fields, including pilots, may also fill acquisition positions. Civilian recruitment is managed at the major command level. Air Force Space Command, and subordinate commands such as SMC, may hire civilian personnel up to the command's budget ceiling. Different major commands can therefore tailor the civilian proportion of the workforce to their particular needs.

²⁷ The series consists of three courses, which are designed to be completed in approximately the 1st, 9th, and 15th year of service, respectively. The latter two courses are managed by NSSI, and are meant eventually to be given to all space cadre members at the appropriate point in their careers.

The Air Force Does Not Have an Integrated Zero-Based Needs Assessment for the Space Acquisition Workforce

The Air Force has not performed an integrated zero-based needs assessment for the entire space acquisition workforce. It has performed or will perform such assessments for components of the space acquisition workforce. For example, the Air Force has done an assessment of the personnel working on classified space systems that recommended a 27 percent reduction in positions allotted to NRO. In addition, at the time of our review, the Air Force was conducting an assessment that included personnel working on unclassified systems; however, the Air Force has not conducted an integrated needs assessment of its entire space acquisition workforce, to include all segments of the workforce—military, civilian and contractor personnel—and those who work on both classified and unclassified space systems. In May 2005, the Air Force completed a separate zero-based needs assessment that included those Air Force personnel who were assigned to classified programs. This assessment included all Air Force personnel who are assigned to classified positions, not only those space acquisition personnel working on classified space systems. According to Air Force officials, the purpose of the ongoing assessment of personnel working on unclassified space systems is to establish an approved method of distributing all acquisition personnel, including space acquisition personnel, among the various acquisition organizations in order to ensure that each organization has the right number of personnel with the right skill sets to meet its mission goals. Although Air Force officials told us that this assessment includes military, civilian, and contractor personnel, they noted that it does not include the portion of the space acquisition workforce that works on classified space systems.

The Air Force is entering a 5-year period that will see a projected decrease of 40,000 active duty positions and a 25 percent reduction in both the SETA and the FFRDC contractor workforces. It is unclear to what extent the two completed and ongoing needs assessments will be incorporated into the service's force reduction planning and process improvement efforts. Also, the Air Force cannot draw on overall DOD guidance: the recently published acquisition workforce strategic plan lacked information on the space workforce. The absence of such a fact-based gap analysis can undermine an organization's efforts to identify and respond to current and emerging challenges. For example, without such an analysis, the Air Force may find itself with a workforce that does not have the education, experience, or expertise needed when program goals change. Additionally, without incorporating an integrated space acquisition workforce needs assessment into its force reduction planning, or reducing the number of space acquisition programs, the Air Force may find it difficult to determine

the impact of its force reductions on the quantity and quality of its space acquisition personnel and to formulate actions to mitigate the reductions.

Air Force May Not Have Enough Space Acquisition Personnel to Meet National Security Space Needs

In the absence of an integrated, zero-based needs assessment of its space acquisition workforce, the Air Force cannot ensure that it has enough space acquisition personnel to meet national security space needs given its current number of space acquisition programs. The Air Force is experiencing a shortage of midgrade and senior officers—specifically, captains, majors, and lieutenant colonels—who perform space acquisition work, and contractor support is filling this shortage. The Air Force has recognized the existence of this shortage and has begun considering ways to address it, but it has not yet addressed it.

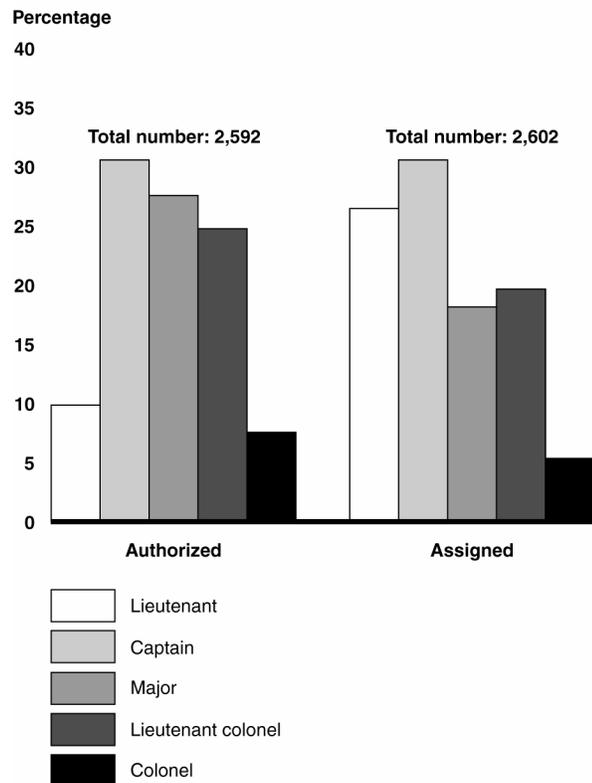
Air Force May Not Have Sufficient Numbers of Mid- and Senior-Grade Space Acquisition Personnel

Determining sufficient numbers of qualified personnel for current and future needs is a key function of workforce planning. The DOD directive that established the Executive Agent for Space charges the military services with developing and maintaining a sufficient number of space-qualified personnel to support space planning, programming, acquisitions, and operations. The Air Force is experiencing a shortage of mid- and senior-grade officers in the engineering and acquisition manager career fields, according to Air Force totals of authorized and assigned acquisition personnel, which include space acquisition personnel.²⁸ The shortages of these officers within the space acquisition workforce may hamper the Air Force's ability to meet national security space needs. Specifically, the engineering career field is experiencing a shortage from captain to colonel, and the acquisition manager career field is experiencing a shortage from major to colonel. For example, in fiscal year 2006, the Air Force authorized that 48 percent of its officers, or 1,285 total, in the engineering workforce should be the rank of captain, but currently only 29 percent, or 767, are captains. Additionally, while 21 percent should be the rank of major, only 15 percent are currently majors. Similarly, the Air Force has authorized 28 percent of acquisition managers (713 total) to be majors and 25 percent (639 total) to be lieutenant colonels, but these ranks are currently 18 percent (472) of the total and 20 percent (511 total), respectively. Despite this shortage, the Air Force currently has more scientists and acquisition

²⁸ Authorization refers to the number of positions that the Air Force has determined it will fund in a given fiscal year. Assignment refers to the number of personnel that the Air Force has placed in those funded positions.

managers assigned than authorized. This is because there is a surplus of junior officers in these acquisition career fields. For example, in fiscal year 2006, the Air Force authorized 20 percent of engineers, or 535 total, to be the rank of lieutenant, but currently 46 percent of engineers, or 1,205 total, are lieutenants. Similarly, the Air Force authorized 10 percent of acquisition managers, or 254 total, to be the rank of lieutenant, but currently 26 percent of acquisition managers, or 686 total, are lieutenants. Acquisition managers play an important role in managing space programs, and the surplus of lieutenants, or junior officers, as acquisition managers may hamper the Air Force's ability to meet program needs. For an example, see figure 5, which shows the authorized and assigned totals by rank for the acquisition manager career field. In addition, Air Force officials told us that there are other career fields within the service that are also experiencing shortages.

Figure 5: Fiscal Year 2006 Authorized and Assigned Totals for Air Force Acquisition Managers by Rank



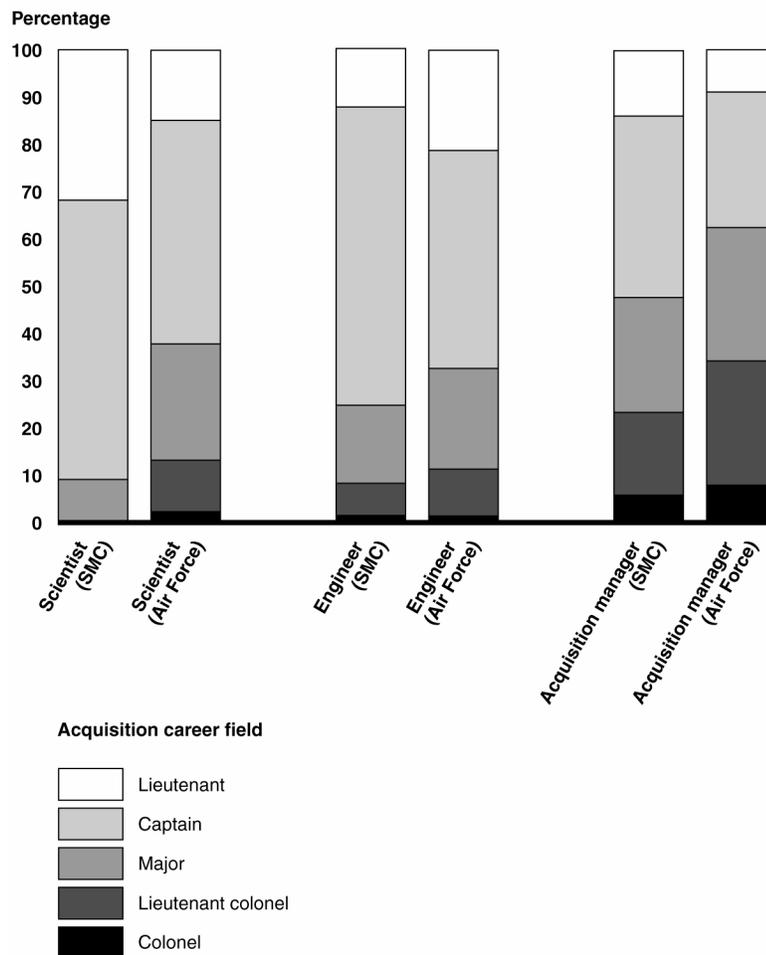
Source: GAO analysis of Air Force headquarters data.

Based on our analysis, there are similar shortages of majors and lieutenant colonels at SMC. As of February 2006, SMC's authorized positions for majors and lieutenant colonels were both filled at 63 percent, which is equivalent to 111 majors and 68 lieutenant colonels. In contrast, SMC's positions for lieutenants were filled at 302 percent of their authorized numbers; although 116 lieutenants were authorized, there were 350 lieutenants assigned to SMC. Several officials from the Office of the Secretary of the Air Force and SMC told us that SMC is staffed with much higher percentages of such junior officers than of midgrade and senior officers as part of Air Force's attempt to address SMC shortages. Additionally, 37 percent of SMC's senior management acquisition positions for military personnel performing systems engineering or program management functions—positions requiring a rank of lieutenant colonel or higher—were vacant as of February 2006. SMC officials have consistently expressed concern that the shortage of acquisition personnel with the right experience and knowledge—such as those eligible to fill senior management acquisition positions—will make it difficult to properly manage space system acquisition programs.

We also observed that, without considering actual fill rates, SMC was authorized to receive a greater percentage of junior officers in the acquisition career fields than were authorized for the balance of the Air Force in fiscal year 2006. For example, in the acquisition manager career field, SMC was authorized to have about 14 percent lieutenants and 38 percent captains, whereas the comparable acquisition manager authorizations for the balance of the Air Force were 9 percent lieutenants and 29 percent captains. Correspondingly, SMC was authorized to receive a lower percentage of senior officers than was the rest of the Air Force, with SMC authorized to have 7 percent of its engineers be at the rank of lieutenant colonel, compared to the Air Force authorization that 10 percent of engineers be at this rank. In the scientist career field, SMC is authorized zero lieutenant colonels and zero colonels, with the remaining Air Force authorization being 93 lieutenant colonels and 20 colonels. In the engineer career field, SMC is authorized to have 23 lieutenant colonels and 5 colonels, with the remaining Air Force authorization being 230 lieutenant colonels and 33 colonels. Having a lower number of senior officers authorized for SMC may create a risk of hampering SMC's ability to carry out its mission, especially compared to locations that are receiving a higher rate of senior officers. According to a former Commander of Air Force Space Command, the continuing shortage of experienced space acquisition personnel assigned to SMC is one of the command's most urgent problems. See figure 6 for more detail on the

authorizations by rank for acquisition personnel at SMC and within the Air Force as a whole.

Figure 6: Fiscal Year 2006 Authorizations for Acquisition Personnel by Rank at SMC and for the Air Force Overall



Source: GAO analysis of Air Force headquarters data.

SMC is using contractor support to fill the shortages of midgrade and senior officers in the engineering and acquisition manager career fields. This contractor support includes both personnel from FFRDCs as well as contractors from private companies who provide SETA support. As of April 2006, contractors were performing approximately 50 percent of SMC's workload. In addition, SMC employs about 1,300 civilians, about half of whom work in technical and financial acquisition positions. Civilian

acquisition positions in program offices were filled at a rate of 96 percent as of April 2006. According to SMC officials, civilians provide functional expertise and continuity, and SMC is pursuing initiatives to increase its civilian positions in order to counter the shortage of military space acquisition personnel. However, SMC was experiencing a 26 percent vacancy rate in its civilian acquisition positions for systems engineering and program management as of April 2006, and SMC officials related that approximately 40 percent of its civilian workforce will be eligible for retirement by 2007. We were not able to make a comparison to NRO because of lack of information from NRO. However, NRO depends on Air Force personnel to fill many of its space acquisition positions, with approximately 57 percent of NRO employees being Air Force personnel as of March 2006. The shortage of midgrade and senior officers in the Air Force may ultimately lead NRO to increase its contractor support. In general, the vacancy rates at SMC for both senior military and civilian management acquisition positions and the high percentage of the civilian workforce that is eligible for retirement in a few years are factors that may affect SMC's ability to carry out its mission.

The Air Force has recognized the existence of this shortage and has recently begun considering potential ways to address it. For example, during a March 2006 conference, Air Force officials discussed potential near-term solutions to acquisition personnel shortages, such as tapping available resources to the maximum extent practicable to fill acquisition positions. This near-term solution would involve utilizing acquisition officers who currently serve in nonacquisition positions, such as instructor positions, as well as officers with nonacquisition specialties, particularly if they have technical degrees or space experience. Air Force officials also discussed mid- and longer-term solutions, such as reevaluating the nonrated prioritization plan for acquisition personnel, streamlining the civilian hiring process, and defining future acquisition manpower requirements. It is unclear what actions will stem from these discussions. If actions are not taken to address the shortage of midgrade and senior acquisition officers, the Air Force may be facing substantial risk, as the shortage may affect the Air Force's ability to strategically manage its workforce to ensure that national security space needs are met.

Shortages Are Due to 1990s Reductions in Acquisition Personnel and Other Factors

There are several reasons for the Air Force's shortage of midgrade and senior officers in the engineering and acquisition manager career fields. First, the shortage is due, in part, to the drawdown of acquisition personnel in the 1990s and the effects of DOD's subsequent acquisition reform. Following the end of the Cold War, there was a decline in the

national security space budget and a corresponding decrease in the number of acquisition personnel available to perform space acquisition work. For example, DOD reduced the size of its acquisition workforce in the 1990s, beginning in fiscal year 1996 when Congress directed the services to reduce the workforce by 15,000 within a year and by 25 percent over the following 5 years. This decrease in acquisition personnel means that today there are fewer officers, particularly majors and lieutenant colonels, to perform acquisition work. This is consistent with the Air Force's workforce model, which shows that it takes an average of 11 and 16 years, respectively, to reach the ranks of major and lieutenant colonel.

The decrease in midgrade and senior space acquisition officers is also consistent with the emphasis on breadth in the acquisition career field. Scientists and engineers have three defined career paths: technical expert, manager/leader, and senior leader. Those who embark on the technical expert path, and continue to pursue technical depth beyond the senior captain level, can generally expect to retire as majors or lieutenant colonels. The acquisition manager timeline also concentrates system program office assignments early in a career and emphasizes staff assignments for majors and lieutenant colonels. By contrast, the space professional career guide emphasizes depth of experience; therefore, an acquisition officer who is also a member of the space cadre may experience difficulty in balancing both sets of expectations.

The 1990s drawdown of the acquisition workforce, including the space acquisition workforce, had the effect of increasing DOD's reliance on contractor support to perform space acquisition work. We have previously reported that in the 1990s, DOD structured contracts for acquisition programs, including space acquisition programs, in a way that reduced oversight and shifted key decision-making responsibility onto contractors.²⁹ For example, in 1994, the Secretary of Defense directed that acquisition programs, including space acquisition programs, decrease reliance on military specifications and standards and encouraged contractors to propose nongovernment standards and industrywide standards instead. DOD officials told us that the workforce reductions of the 1990s, coupled with this decision to grant substantial control over specifications and standards to contractors, led to poor management of acquisition programs, including space acquisition programs, especially

²⁹ GAO, *Space Acquisitions: Improvements Needed in Space Systems Acquisitions and Keys to Achieving Them*, [GAO-06-626T](#) (Washington, D.C.: Apr. 6, 2006).

with regard to testing, process, quality control, and subcontractor oversight. As a result, these officials believe that current space acquisition programs have many undetected problems that could lead to cost, performance, and schedule problems upon discovery.

In addition, there have been consolidations within the defense supplier base for space programs. Since 1985, there were at least 10 fully competent prime contractors competing for the large programs and a number that could compete for subcontracts. Arguably today, there are only two contractors that could handle DOD's most complex space programs. We observed that SMC's Technical Acquisition Support Services contractor firms include the major satellite-building prime contractor firms, as well as some firms that are owned by or have other relationships with these prime contractors. This interrelationship has caused both the House Committee on Armed Services³⁰ and space acquisition organization leaders to express concern about the potential for conflict of interest and the outsourcing of inherently governmental functions. SMC officials observed that they lack visibility over the work of subcontractors, which can lead to technical problems that cause cost overruns or schedule delays. While SMC has calculated that contractors carry out approximately 50 percent of the organization's workload, NRO does not have a standard method to count its contractors. The DOD Inspector General recently reported that although DOD is not required to report the number of contractors, omitting contractors from the workforce count results in the invisibility of a large part of the true acquisition workforce.³¹ This lack of visibility, over what could be a substantial percentage of the workforce, also makes it difficult to determine workforce gaps in critical skills and to take corrective actions.

Another reason for the shortage of midgrade and senior officers in the engineering and acquisition manager career fields that constitute the space acquisition workforce is that the Air Force is trying to balance overall shortages in multiple career fields, not only in the acquisition career fields. Although it has recognized the existence of this shortage, the Air Force considers the needs of all career fields with respect to mission, people, and available resources when directing personnel actions. However, the acquisition career fields are not perceived as the most important of the

³⁰ H.R. Rep. No. 109-452, at 350 (2006).

³¹ Department of Defense, Office of the Inspector General, *Human Capital: Report on the DOD Acquisition Workforce Count*, D-2006-073 (Washington, D.C.: Apr. 17, 2006).

career fields within the Air Force, which generally places greater emphasis on recruiting and retaining personnel in the pilot career field. Thus, space acquisition workforce shortages have to compete for resources with demands for pilots and navigators. According to Air Force personnel data, pilots entering the Air Force in fiscal year 2007 will increase as a percentage of total Air Force personnel over the course of the next 30 years whereas engineers decrease as a percentage over the same time period. For example, pilots entering the Air Force in fiscal year 2007 will make up 19 percent of total Air Force officers, with these pilots at the end of this period constituting about 27 percent of total Air Force officers. However, engineers will enter the Air Force in fiscal year 2007 constituting 7 percent of total Air Force officers and, in 30 years, they will constitute only 2 percent. The lack of emphasis on the acquisition career path and the small percentage of Air Force engineers may affect the Air Force's ability to strategically manage its workforce and ensure adequate staffing of its program offices.

Finally, the Air Force has not addressed the shortage of midgrade and senior space acquisition officers because it is currently concentrating on Air Force overall force reduction planning and process improvement efforts. The Air Force is entering a 5-year period that will see a projected decrease of 40,000 active duty positions and a 25 percent reduction in both the SETA and the FFRDC contractor workforces. In the face of these reductions, the Air Force has also begun an effort that focuses on the identification and elimination of activities, actions, and policies that do not contribute to its efficient and effective operation. At the time of our review, Air Force officials told us they did not know what impact these force reduction and process improvement efforts would have on the Air Force space acquisition workforce.

Air Force's Existing Space Acquisition Personnel May Not Be Technically Proficient in Ways Needed to Meet National Security Space Needs

The technical proficiency of the current space acquisition workforce that is available to the Air Force may not be adequate to meet national security space needs. Although Title 10 of the United States Code requires the Air Force to develop a career field for officers with technical competence in space-related matters, including the capability to develop space systems,³² there are no specific technical requirements for the space acquisition workforce. However, there are certification programs for the acquisition and space cadre workforces, the two workforces we have identified as including members of the space acquisition workforce. These certification programs are the APDP and the Space Professional Certification Program. Based on our analysis, the space acquisition workforce at SMC had fewer of the higher certification levels in both certification programs. Because of the unavailability of NRO data, we were generally only able to examine the certification levels for SMC staff. For example, SMC's percentage of personnel with the highest level of acquisition professional certification has steadily dropped in the last few years while those at the lowest level of certification have steadily increased. Several factors contribute to these differences.

SMC Acquisition Officers Have Fewer Higher Certification Levels

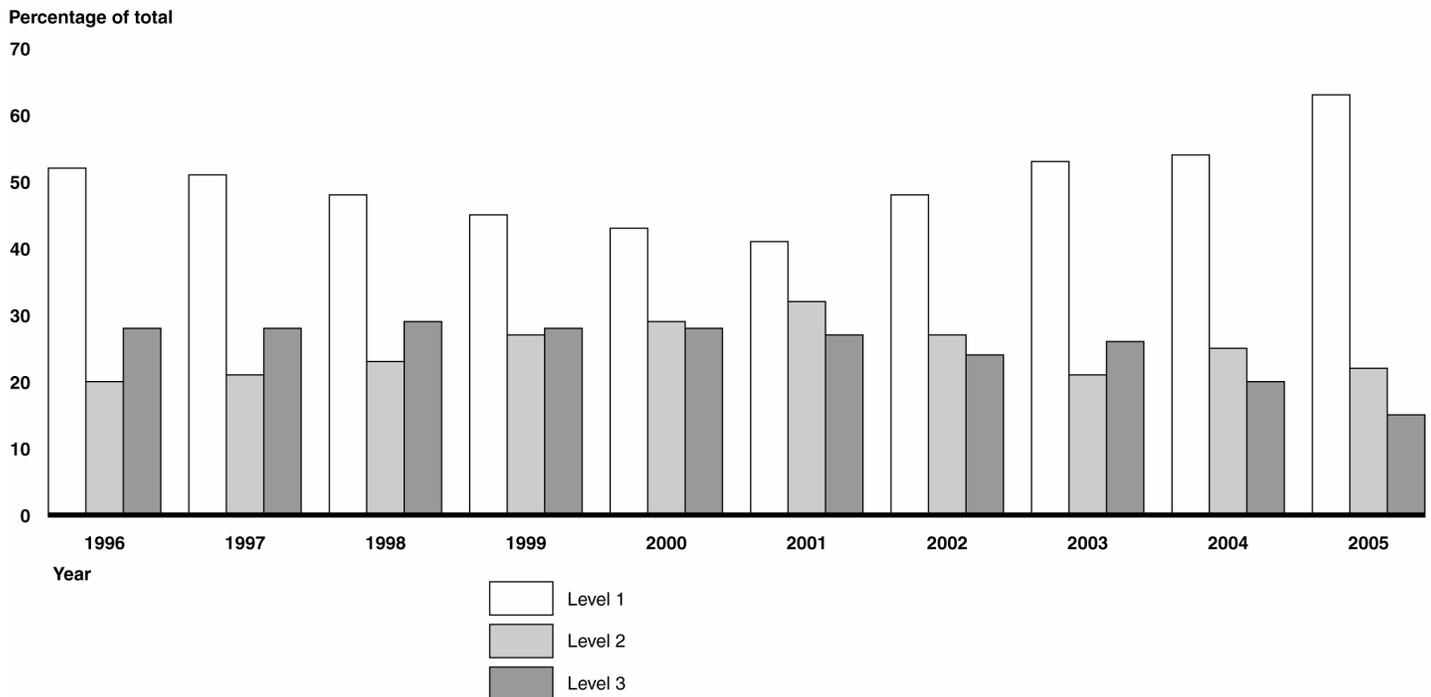
Our analysis showed that SMC acquisition officers have fewer acquisition certifications at the higher levels than do Air Force acquisition officers overall. The Air Force APDP requires a combination of education, coursework, and experience to attain any of three levels of certification, with the first level being for junior acquisition personnel; the second level for midgrade acquisition personnel; and the third level for senior acquisition personnel, such as lieutenant colonels and above.

For SMC only, while the percentage of APDP level 1 personnel is higher in 2005 than in 1996, the percentage of APDP level 3 personnel—the highest certification level—has gone down, as shown in figure 7.³³

³² 10 U.S.C. § 8084.

³³ Percentages were determined by dividing the total for each level by the overall total for that year.

Figure 7: Acquisition Certification Levels at SMC, 1996-2005



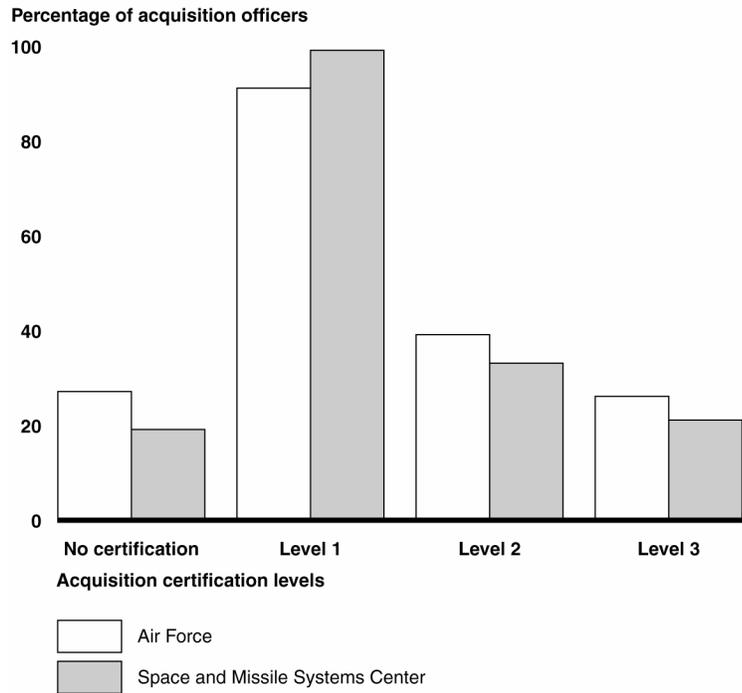
Source: GAO analysis of Air Force Personnel Center data.

Certification at the third level is required for officers to serve in senior management acquisition positions, which are acquisition positions designated by the Secretary of Defense that carry significant responsibility. Specifically, the number of acquisition officers at SMC certified at the highest level was about 28 percent in 1996 and in 2005 was 15 percent. As previously mentioned, approximately 37 percent of SMC's senior management acquisition positions for military personnel performing systems engineering or program management functions were vacant as of April 2006. One reason for the drop in highly certified acquisition officers may be the Air Force's lack of emphasis on the acquisition career path. For example, officials from the Office of the Secretary of the Air Force and SMC told us that scientists and engineers may choose to leave the Air Force before reaching higher certification levels because of the lack of promotion opportunities and the lure of higher wages in the private sector, a view which was echoed in a discussion we held with about a dozen SMC junior officers. Moreover, according to an official from the Office of the Secretary of the Air Force,

the drop in the number of highly certified acquisition officers may also be explained by a change in Air Force philosophy about promotions, in which information regarding an individual's advanced degree was masked from promotion boards in favor of a focus on the individual's operational or warfighting experience. Acquisition personnel, who generally do not deploy and are therefore less likely to have operational or warfighting experience, may have seen this change concerning promotions as career limiting and left the Air Force. The Secretary of the Air Force recently decided that beginning with calendar year 2008 promotion boards, information on all degrees earned by an individual will once again be made available to the board. The steadily rising percentage of certification level 1 personnel since 2001 may be explained by the large number of junior officers at SMC but may bode well for future higher certification levels over the next decade and beyond. However, the continued lack of promotion opportunities for those in the acquisition workforce, including those in the space acquisition workforce, may not allow the Air Force to build on the rising certification levels in the future.

Acquisition officers at SMC generally had fewer of the acquisition certifications at the higher levels compared to acquisition officers for the Air Force as a whole. Figure 8 shows these comparisons.

Figure 8: Acquisition Certification Levels for Acquisition Officers at SMC and the Air Force

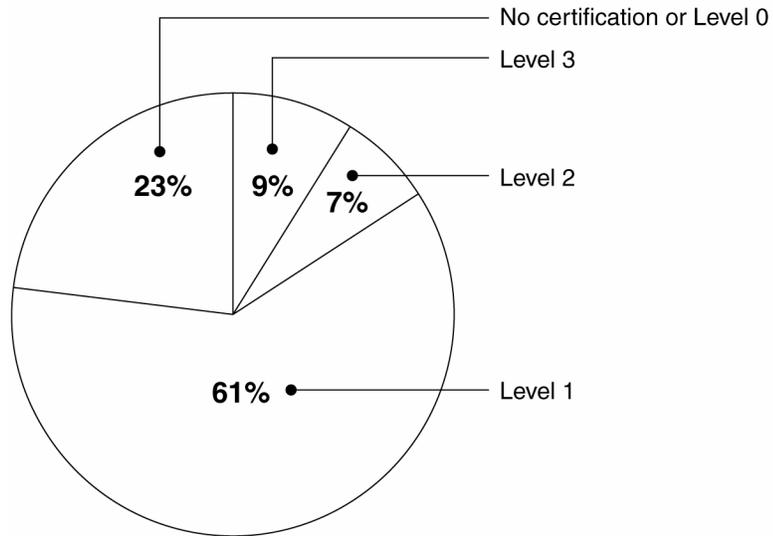


Source: GAO analysis of Air Force space professional and SMC databases.

Note: Numbers for each group may add up to more than 100 percent because acquisition officers can have certification levels in more than one acquisition category.

For the space certification levels at SMC, we found that in spring 2006, 61 percent of the workforce had certification for level 1 of the space professional certification program—the lowest level of the program—and 23 percent of the workforce had no certification. As noted in the previous section, these percentages more than likely reflect the relatively large percentage of the SMC workforce made up of junior officers and the relatively small percentage made up of senior officers. Figure 9 reflects the breakout of the space professional certifications at the three levels at SMC during our review.

Figure 9: Space Professional Certification Levels for SMC Space Acquisition Workforce



Source: GAO analysis of Air Force data.

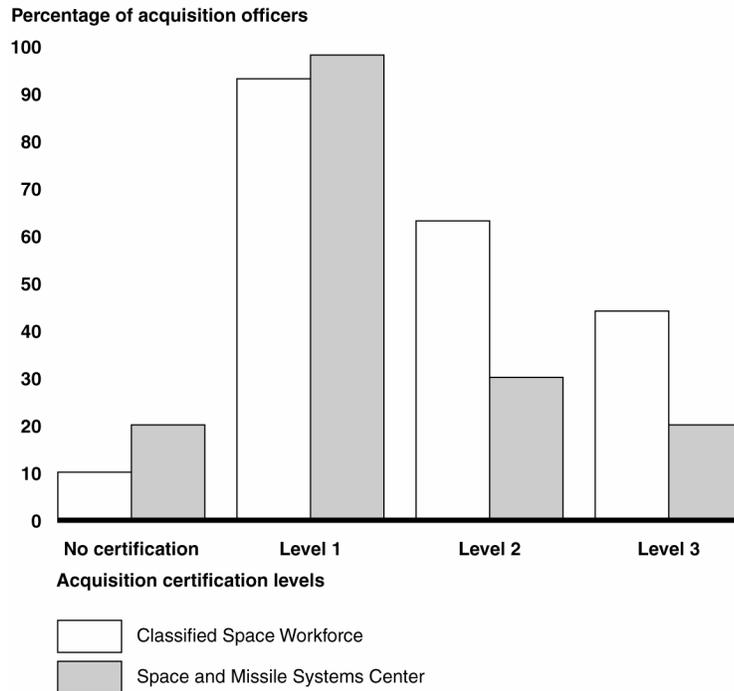
Notes: The no certification or level 0 category includes individuals who have not yet attained level 1, who are not currently considered credentialed space professionals, or both. We found only one case in which a level 1 officer was not concurrently a credentialed space professional.

Differences in SMC Space Acquisition Personnel and Personnel Working in Classified Space Programs

Our analysis showed that the acquisition officers at SMC also possess fewer of the acquisition and space professional certifications at the higher levels than those serving in classified space positions.³⁴ Specifically, for the acquisition certification levels, we found that as of April 2006, a greater percentage of SMC acquisition officers had the lowest certification level than did the acquisition officers serving in classified space positions. Conversely, a higher percentage of acquisition officers working in classified space programs had certifications at levels 2 and 3. Figure 10 depicts these comparisons.

³⁴ NRO declined to provide us a detailed breakout of all of its personnel. Therefore, we could not directly compare SMC personnel working on unclassified space programs to NRO personnel working on classified space programs. Using Air Force personnel data, we were able to identify and compare SMC personnel in unclassified programs to some personnel working on classified space programs at other organizations, including NRO.

Figure 10: Acquisition Certification Levels for Classified and SMC Space Acquisition Workforces

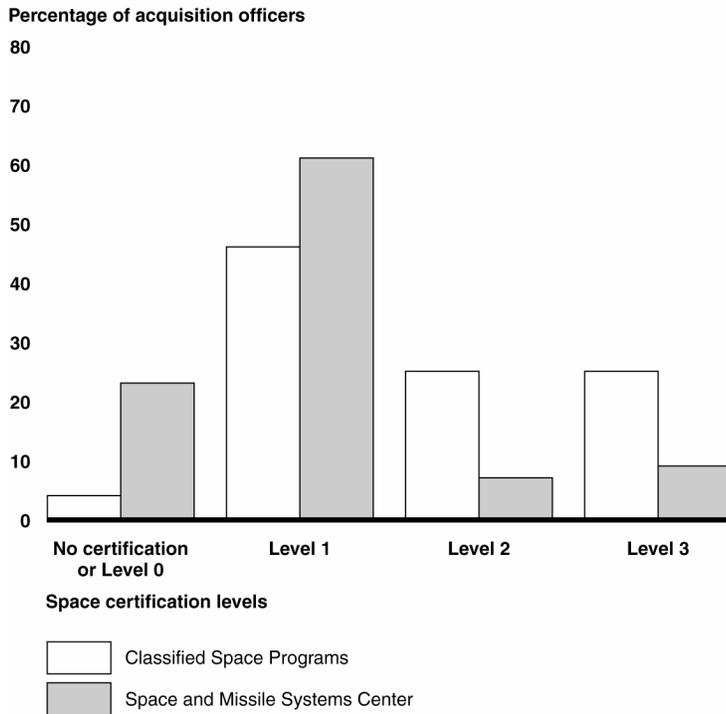


Source: GAO analysis of Air Force space professional and SMC databases.

Notes: Numbers for each group may add up to more than 100 percent because acquisition officers can have certification levels in more than one acquisition category.

Similarly, our analysis showed that those working on classified programs have a greater percentage of the higher levels of space certification compared to the SMC workforce. We believe this may be a reflection of the Air Force’s decision to place more senior officers at NRO as well as a reflection of the perceived risk level of classified programs and the need to place more experienced personnel on these programs. Figure 11 shows the comparison of space certification levels for personnel working on classified space programs and at SMC.

Figure 11: Space Certification Levels for Classified and SMC Space Acquisition Workforces



Source: GAO analysis of Air Force data.

Note: The no certification or level 0 category includes individuals who have not yet attained Level 1, who are not currently considered credentialed space professionals, or both.

Additionally, our analysis showed that acquisition officers working in classified space programs have more education and space and acquisition experience than do their counterparts in unclassified space programs. Specifically, of the acquisition officers who are currently serving in classified space positions, about 40 percent have technical master’s degrees or higher, whereas 16 percent of those serving in unclassified space positions do. The comparable figures for technical bachelor’s degrees were 83 and 60 percent, respectively.

In general, SMC’s acquisition managers had less depth and breadth of experience than their classified counterparts. Acquisition managers constituted a higher share of entry-level positions at SMC, and a smaller share of the most senior positions, than either their classified counterparts or those in the Air Force as a whole. Moreover, acquisition managers are

encouraged to already have experience in a different specialty, preferably at the beginning of their careers.³⁵ However, only a little more than half of acquisition managers at SMC had prior experience in a different specialty, whereas most acquisition managers in classified space programs had such experience. Of the 180 acquisition managers we identified as assigned to a classified space program in February 2006, 80 percent had had one or more prior assignments in another field, and more than half of these were in scientific or engineering specialties. Several DOD officials, along with officers from the Navy as well as the Air Force, expressed the opinion that acquisition management skills are broadly transferable for any type of program; therefore, space acquisition managers do not need a distinct academic background or type of experience. Yet the classified acquisition managers are more likely to have technical degrees and higher certification levels, reflecting more education, training, and experience than their SMC peers—creating, in effect, a specialty for some but not all acquisition managers.

Lower Levels of Education and Experience in Space Acquisition Workforce Are Attributable to Several Factors

The lower levels of technical education and certification in the Air Force space acquisition workforce are due to several factors. First, the lower levels of certification and experience among acquisition officers at SMC have occurred because NRO has received priority in selecting space acquisition personnel with higher qualifications, based on a historical agreement between the Secretary of Defense and the Director of Central Intelligence, as well as on the Air Force's prioritization plan for acquisition officers. Second, the Air Force has not institutionalized a means of identifying the space acquisition specialty within any of its existing career fields. At a minimum, identifying space acquisition as a specialty within the acquisition career field could allow the Air Force to identify personnel and provide standardized training in space acquisition. Finally, training that focuses on space acquisition is limited. Without increased space- and acquisition-related training and a career field or specialty within a career field that addresses standardized education and training requirements specific to space acquisition, the Air Force may not have the visibility it needs over its space acquisition personnel in order to strategically manage the workforce and to ensure that these personnel can effectively supervise and oversee the development of new space systems. These issues are compounded by the decline of acquisition managers entering SMC with technical degrees.

³⁵ *Officer Classification*, Air Force Manual 36-2105, October 31, 2004, Attachment 43.

NRO Priority in Selecting Qualified Space Acquisition Personnel

We believe that the shortage of qualified space acquisition personnel with a technical education has occurred at SMC in part because NRO receives priority in selecting space acquisition personnel with higher certification levels. This priority is founded upon a provision of a 1965 agreement between the Secretary of Defense and the Director of Central Intelligence, which states that NRO is to receive the best talent appropriately available from the military services and other agencies. In addition, NRO currently receives priority fill status in the Air Force nonrated prioritization plan, while Air Force Space Command, which includes SMC, receives only entitlement fill status.³⁶ As previously mentioned, this prioritization plan serves the purpose of allocating scarce numbers of acquisition officers among the various requirements, in an effort to ensure that the most critical requirements are filled and that when necessary, vacancies occur in the lowest priority organizations. At present, staff organizations such as Air Force Headquarters have the highest priority, with NRO occupying the next highest priority. The major commands, such as Air Force Space Command, have the lowest priority according to the prioritization plan. This means that NRO can choose the better qualified personnel to fill its space acquisition positions before SMC does. Moreover, officials from NRO and the Office of the Secretary of the Air Force told us that NRO has historically been accorded this staffing priority over other Air Force locations competing for the same acquisition personnel. In addition, NRO has entry-level requirements for its space acquisition positions that are higher than the Air Force entry-level requirements established by the APDP.

This prioritization plan is currently under review. During the course of our review, SMC and Air Force Space Command leadership requested that the Deputy Air Force Chief of Staff for Personnel reconsider the prioritization plan because of SMC's shortage of senior acquisition personnel. Specifically, they asked that SMC receive the same status under the prioritization plan as NRO; this means having must fill or priority fill status instead of its current entitlement status. Following the February 2006 Air Force staffing conference, the Office of the Assistant Secretary of the Air Force for Acquisition agreed to review the prioritization plan. In June 2006, the Air Force Chief of Staff and the Director of NRO signed a joint

³⁶ Manpower positions are prioritized into three categories: Must Fill, Priority Fill, and Entitlement Fill. The fill rate for the must fill category is 100 percent. The manning percentage for priority fill is normally 85 percent. The entitlement fill rate is a function of the remaining available resources once the must fill and priority fill rate positions are appropriately filled.

statement of intent aimed at enhancing Air Force-NRO relations, space capabilities, and mission performance. Among other things, this statement of intent calls for the establishment of a Space Assignment Advisory Board to oversee the assignments of Air Force space professionals, including those assigned to NRO. According to the statement, this board offers the potential to provide a proper balance of Air Force professional manning and experience levels between SMC and NRO, but it does not specify that this involves any change to SMC's or NRO's status under the prioritization plan. Additional workforce issues may be addressed in future agreements.

However, as previously mentioned, the Air Force has not conducted an integrated zero-based needs assessment for the space acquisition workforce, as called for by the strategic workforce planning model that is used by leading private and public sector organizations. Conducting such an assessment would help the Air Force to ensure proper staffing of all space acquisition positions, such as those at NRO and SMC, because it involves identification of gaps that exist between the current and future workforces needed to meet program goals.

Lack of a Designated Career Field

Although the Secretary of the Air Force is required to develop a career field for officers to ensure that they have the technical competence to develop space systems, there is currently no single space acquisition career field or specialty. Title 10 of the United States Code contains a provision requiring the Air Force to develop a career field for officers with technical competence in space-related matters, including the capability to develop space systems.³⁷ We believe that the capability to develop space systems includes the capability to acquire them. The law also requires technical competence in operating space systems and in developing space doctrine and concepts of space operation, both of which are encompassed in the training required by the Air Force's space operations career field. However, the space operations career field does not include space acquisition personnel, and there is no corresponding career field or specialty to develop technical competence in space acquisition. Moreover, of the acquisition career fields that encompass the space acquisition workforce, scientists and engineers are required to possess a degree in a technical area, whereas acquisition managers are not required to hold a technical degree. We have previously reported that DOD and Air Force officials have expressed concern that there are not enough experienced acquisition managers to run space programs or enough experts in software

³⁷ 10 U.S.C. § 8084.

engineering. These officials also commented that acquisition managers for space systems are often not equipped to understand what is behind a contractor's proposal.³⁸

The Air Force has not specifically identified the personnel who work on space acquisition programs within any of its existing career fields because, as previously mentioned, there is an ongoing debate within the Air Force over the extent to which space acquisition is different enough from non-space acquisition to warrant tailored training, education, career path development, or a combination of these. However, DOD believes that space is different because of the complexity of space systems and the inability to recall space systems once they are launched. The need for space systems that operate properly upon launch is reflected in the fact that a high proportion of the cost of developing a space system is devoted to system acquisition rather than to operations and support, as is the case with non-space acquisition programs. Personnel with technical and space acquisition knowledge are therefore important in ensuring that complex space systems are developed and acquired successfully.

As previously mentioned, the acquisition manager career field is the one acquisition career field in the space acquisition workforce that does not require a technical degree. We believe that at a minimum, establishing a space acquisition specialty within the Air Force's existing acquisition manager career field³⁹ could identify the space acquisition workforce and direct standardized education and training requirements specific to space acquisition for all personnel involved in managing space acquisition programs. Although we are not arguing for a separate category for space acquisition within the DAWIA construct, we do believe that establishing a specialty within the Air Force's acquisition manager career field would also provide the Air Force with a mechanism to apply strategic workforce management principles to the space acquisition workforce, as is done by leading public and private organizations. Without a career field or specialty within a career field that addresses standardized education and

³⁸ GAO, *Defense Acquisitions: Incentives and Pressures That Drive Problems Affecting Satellite and Related Acquisitions*, [GAO-05-570R](#) (Washington, D.C.: June 23, 2005).

³⁹ According to Air Force Instruction 36-2101, p.6, an Air Force Specialty Code (AFSC) is the basic grouping of positions requiring similar skills and qualifications. An AFSC is further grouped into career field ladders, career field subdivisions, and career fields to provide for career development in different aspects of a career field. An AFSC may be subdivided by alphabetical "shredouts" to identify specialization in a specific type of equipment or function. See also Air Force Manual 36-2105, p. 5.

Decrease in Acquisition
Officers with Technical
Degrees Entering SMC

training requirements specific to space acquisition, the Air Force may lack visibility over the capabilities and career paths of its space acquisition personnel and therefore may not have the ability to strategically manage the workforce and ensure that space acquisition personnel can effectively supervise and oversee development of new space systems.

In addition, there has been a decrease in the number of acquisition officers entering SMC with technical degrees, a pattern that has paralleled the overall decline in U.S. citizens and permanent residents earning bachelor's degrees in science and engineering at U.S. institutions in the 1990s. The percentage of new acquisition managers coming into the Air Force with technical degrees, including those in charge of acquiring space systems, has declined over the past 15 years, from 68 percent in 1990 to 16 percent in 2005. There has been a similar decrease in new acquisition managers at SMC who possess technical degrees during this same period, although Air Force Space Command, which includes SMC, has more officers with technical bachelor's degrees than does the Air Force as a whole. Title 10 of the United States Code⁴⁰ directs the Secretary of the Air Force to establish and implement policies and procedures to develop a career field for Air Force officers with technical competence in space-related matters so that these officers have the capability to develop space doctrine and concepts of space operations, develop space systems, and operate space systems. Although acquisition managers, unlike scientists and engineers, are not required to hold technical degrees, officials and space acquisition officers we interviewed considered it desirable. Because this decrease in technically educated acquisition managers parallels a decline during the 1990s in the number of U.S. citizens and permanent residents receiving bachelor's degrees in science and engineering, it appears at least partly attributable to the drop in the national supply rather than to the preferences of Air Force officials. Entering the acquisition workforce with a technical degree could be particularly useful at SMC, where there is a high proportion of junior officers who, as acquisition managers, begin supervising experienced contractors early in their careers. Conversely, acquisition managers without technical degrees may be at a disadvantage in evaluating proposals and conducting progress reviews. Moreover, the overall decline in the national pool of technical expertise also limits the Air Force's ability to rely on contractors and civilians to offset the decline of expertise among military personnel. Over the past few years, however, the national number of U.S. citizens and permanent residents earning

⁴⁰ 10 U.S.C. § 8084.

bachelor's degrees in science and engineering has increased, but the number of new acquisition managers entering the Air Force with technical degrees continues to decrease, according to Air Force Personnel Center data.

Limited Space Acquisition Training

The limited availability of training that focuses on space acquisition also contributes to the shortage of technically proficient personnel. For example, DAU does not incorporate space-specific training into its required curricula for the acquisition workforce and the Air Force's NSSI offers limited acquisition content in its curricula for the space workforce. NSSI's 4-week intermediate- and senior-level courses—Space 200 and Space 300—have 2 1/2 and 3 days of acquisition content, respectively. Although DAU, in collaboration with NSSI, has developed a course that focuses on the acquisition process guidance for DOD space programs—known as the National Security Space Acquisition Policy—this course is in the form of a continuous learning module (CLM), which is an online course. We note that after our inquiry about the amount of space acquisition training, NSSI designated this space CLM as a prerequisite to the Space 200 course. Because of the lack of space acquisition training, SMC has developed a space acquisition school, which provides initial qualification training before an officer is assigned to a system program office. Similarly, NRO has an Acquisition Center of Excellence, which provides NRO-centered acquisition training to less experienced personnel assigned to NRO. However, without adding more space-specific content to DAU's courses and adding more acquisition content to NSSI's courses, the Air Force may lose an opportunity to broaden the pool of personnel who are qualified to serve in space acquisition positions. Moreover, as the Air Force prepares to carry out force reductions, it will become increasingly important to get the best-qualified people to fill space acquisition positions; moreover, those who are assigned may not have the luxury of extended training periods. As a result, the Air Force may not have enough technically proficient space acquisition personnel within the existing space acquisition workforce to meet national security space needs.

Conclusions

Congress and DOD have repeatedly emphasized that qualified space personnel are critical to the success of space systems. Although the Air Force has made progress in identifying, training, and providing career path guidance to its space cadre, more remains to be accomplished. The Air Force is managing its existing space acquisition workforce using some facets of the strategic workforce planning model that is used by leading organizations; however, neither DOD nor the Air Force has developed a separate workforce strategy, as they have for other workforce groups,

because there is a lack of consensus about the merits of doing so. While the lack of a separate strategy is not necessarily a deficiency, we continue to believe that DOD and the Air Force need to ensure that the personnel who are essential to developing and acquiring national security space systems are effectively managed. Without performing an integrated and zero-based space acquisition workforce needs assessment and using the results to inform its force reduction planning, the Air Force may not be able to manage the impact of its planned force reductions on the space acquisition workforce or take actions to mitigate the impact to ensure it has the quantity and quality of space acquisition personnel needed to accomplish its space mission. Moreover, the Air Force has not developed a space acquisition career field or specialty for its officers to ensure technical competence in space acquisition-related matters, including the ability to develop space systems. Without increased space and acquisition-related training and a career field or specialty that addresses standardized education, training, and career path development requirements specific to space acquisition, the Air Force may lack visibility over the capabilities and career paths of its space acquisition personnel and therefore may not have the ability ensure that space acquisition personnel can effectively supervise and oversee development of new space systems. Additionally, without a career field or specialty, the Air Force may find it more difficult to apply strategic workforce management principles to the space acquisition workforce. Without adequate numbers of technically proficient personnel to meet national security space needs, the government may have to rely more on contractors to fill the gap, but reliance on contractors may become more difficult as the Air Force conducts its force shaping. Current force shaping plans call for 25 percent cuts in contractor and FFRDC support. SMC currently relies on an FFRDC to supplement its technical support needs. Without such support, the Air Force may be unable to maintain the necessary expertise on legacy systems and fully support emerging space programs.

Recommendations for Executive Action

We recommend that the Secretary of Defense direct the Secretary of the Air Force to take the following three actions:

- Direct that an integrated, zero-based needs assessment of space acquisition personnel be performed and then incorporated into the Air Force's force reduction planning and process improvement efforts in order to ensure that the resulting force structure is optimally balanced among workforce segments—that is, military, civilian, contractor, those who work on classified and unclassified programs, and FFRDC support

personnel—and functional areas, such as classified and unclassified space systems.

- Institutionalize and manage a space-specific specialty within the Air Force’s acquisition manager career field in order to ensure that all incumbents in the space acquisition workforce, including personnel at SMC and NRO, have strong technical backgrounds and to better manage the career paths and retention of technical personnel in accordance with strategic workforce management principles.
- Improve training by providing greater acquisition-specific content in the Air Force’s NSSI’s curricula in order to broaden the pool of personnel who are qualified to fill space acquisition positions.

We recommend that the Secretary of Defense direct the Under Secretary of Defense for Acquisition, Technology, and Logistics to take the following action:

- Improve training by bolstering space-specific content in DAU’s curricula in order to broaden the pool of personnel who are qualified to fill space acquisition positions.

Agency Comments and Our Evaluation

Both DOD and NRO provided us comments on a draft of this report. DOD provided specific comments on whether it concurred or did not concur with each of our recommendations. NRO provided comments; however, it declined to concur or not concur with our recommendations because it believes that the recommendations fall within the purview of the Air Force.

DOD concurred with our recommendation on improving training at DAU but only partially concurred with our remaining recommendations. Regarding our recommendation that the Air Force conduct an integrated, zero-based needs assessment and incorporate it into the Air Force’s force reduction planning and process improvement efforts, DOD partially concurred, stating that a needs assessment of space acquisition personnel is important and that it must be integrated as part of the component’s force planning and process improvement initiatives. This statement mirrors our recommendation and reaffirms our discussion in this report.

DOD partially concurred with our recommendation that the Air Force institutionalize and manage a space-specific specialty within the Air Force’s acquisition manager career field. We agree with DOD that the Air Force Space Professional Development Program has identified and continues to track space-specific experience, and we relied on the space

experience codes found in Air Force Space Command's database for portions of our analysis. DOD also stated that this process enables effective career management while still affording the flexibility to use individuals in other assignments; however, we think that its process still does not provide adequate visibility over the career paths of space acquisition personnel. For example, we attempted to obtain certain information, such as promotion rates, for space acquisition personnel, and found that the Air Force was not tracking this information as part of the Air Force Space Professional Development Program. We believe that having a specialty would allow the Air Force to track such information to provide more effective strategic human capital management. Furthermore, implementing our recommendation would not diminish the Air Force's flexibility to use these individuals in any positions that Air Force requirements dictate. As our report points out, a specialty within the acquisition manager career field would be a better means of providing visibility and management of personnel involved in managing space acquisition programs, such as by tracking the numbers of officers (and civilians) who are attaining senior levels and establishing standardized training and education requirements specific to space acquisition. As the Air Force determines its priorities, we continue to believe that at a minimum, having a space-specific specialty would give it the visibility that it currently lacks over this important segment of its workforce.

DOD partially concurred with our recommendation to improve training by providing greater acquisition-specific content in the curricula of the Air Force's NSSI. Although DOD concurred that more space acquisition training is needed, it noted that NSSI is only one forum for such training. However, we note that NSSI is, according to its own mission statement, the DOD center of excellence for space education throughout the national security space community and that its acquisition content is limited. While we acknowledge that there are other venues for training in space acquisition, including DAU, we focused on NSSI because of its role as DOD's single focal point for space education and training.

Lastly, DOD concurred with our recommendation to improve training by bolstering space-specific content in DAU's curricula. In its comments, DOD listed some of the ways in which DAU has expanded its support of the space acquisition community. We acknowledge these efforts and noted in our report that DAU has already developed a CLM related to the space acquisition process. However, we continue to believe that additional space-specific content is needed in DAU's curricula in order to increase the pool of personnel who are qualified to fill space acquisition positions. Adding such space-specific content would allow more acquisition officers

to receive a baseline level of training in space acquisition through DAU. This baseline level of training would help ensure that acquisition officers do not arrive in space acquisition assignments with little or no knowledge of space-specific acquisitions, such as is currently often the case at the SMC. In this way, the recommendation is also intended to maximize Air Force flexibility in assigning its acquisition officers to space acquisition positions, the importance of which was noted by DOD in its response to our second recommendation.

NRO provided us comments regarding specific issues discussed in the report. Regarding our observation that the percentage of acquisition personnel certified at the highest level at SMC dropped between 1996 and 2005, NRO stated that its hiring policies may currently exacerbate the problems at SMC. We agree. We also agree with NRO, and have stated in our report, that a variety of factors have contributed to SMC's shortage of qualified space acquisition personnel with a technical education. In an atmosphere of overall shortage, however, SMC's lower staffing priority means that other organizations therefore have a higher level of access to a comparatively senior workforce, whose members are, as NRO stated, able to work on complex systems, hold high clearances, and work in a multiagency environment with significant levels of autonomy. Moreover, we acknowledge, and stated in our report, that there is no consensus on a space acquisition career field within DOD. However, as we have mentioned earlier, we continue to believe that a space acquisition specialty within the existing acquisition manager career field could both strengthen career path management and ensure that those who manage space programs have strong technical backgrounds by addressing standardized training and education requirements specific to space acquisition. In addition, we also agree with NRO and noted in our report that there are a variety of factors that have contributed to Air Force-wide acquisition workforce shortages, such as 1990s workforce management decisions.

DOD and NRO comments are reprinted in their entirety in appendix II and appendix III, respectively. DOD and NRO did not provide technical comments on this report.

We are sending copies of this report to interested congressional committees; the Secretary of Defense; the DOD Executive Agent for Space; the Secretaries of the Army, Navy, and Air Force; the Commanding General, U.S. Air Force Space Command; and the Director, National Reconnaissance Office. We will also make copies available to others upon

request. In addition, this report is available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-5431 or dagostinod@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 key contributions to this report are listed in appendix IV.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Davi M. D'Agostino". The signature is fluid and cursive, with the first name "Davi" being the most prominent.

Davi M. D'Agostino
Director, Defense Capabilities
and Management

Appendix I: Scope and Methodology

To determine the extent to which the Air Force has addressed strategies for critical skill sets, training, recruiting, promotion, and career path development for the space acquisition workforce, we reviewed human capital strategies pertaining to the Department of Defense (DOD) acquisition workforce and the Air Force space cadre. We compared the DOD and Air Force documents to the strategic human capital planning model that is generally accepted by the National Academy for Public Administration, the Office of Personnel Management, and other leading public and private sector organizations. We analyzed the documents to ascertain whether they addressed each of the elements of a comprehensive workforce planning strategy as well as whether they addressed the five career stages listed above. We also discussed workforce strategic planning with cognizant officials in the Office of the Secretary of Defense; the National Security Space Office; U.S. Air Force Space Command, Peterson Air Force Base, Colorado; the Air Force Manpower Agency, Randolph Air Force Base, Texas; the Office of the Secretary of the Air Force for Acquisition, Arlington, Virginia; the Directorate of Space Acquisition, Arlington, Virginia; and the Office of the Deputy Chief of Staff of the Air Force for Manpower and Personnel, Arlington, Virginia. We noted the actions that DOD and the Air Force had taken to manage the Air Force's workforce using a strategic workforce management approach, but we did not evaluate the sufficiency of the actions they took. To gather information on Army and Navy strategies and plans, we interviewed officials at the Army Office of the Deputy Chief of Staff for Operations and Plans, Arlington, Virginia; U.S. Army Space and Missile Defense Command, Arlington, Virginia; and the Office of the Navy Space Cadre Advisor, Arlington, Virginia.

To determine the extent to which the Air Force has addressed how sufficient numbers of space acquisition personnel are provided to meet DOD's current and projected national security space needs, we collected and compared recent data on acquisition positions and personnel from the Office of the Assistant Secretary of the Air Force for Acquisition and from the Office of the Deputy Chief of Staff of the Air Force for Manpower and Personnel, Arlington, Virginia, as well as from Air Force Headquarters. We also received overall workforce figures from the National Reconnaissance Office, Chantilly, Virginia, that were current as of March 2006. We limited our analysis to technical acquisition personnel who are included in the Air Force's credentialed space professional program, which corresponded to Air Force Specialty Codes 61S (scientist), 62E (engineer), and 63A (acquisition manager). We excluded Air Force Specialty Codes 64P (contracting) and 65F (financial management) from our scope since these acquisition codes are not currently included as Air Force credentialed

space professionals. We also excluded civilians and enlisted personnel from our scope, since the Air Force has not completed its identification of civilian and enlisted space professionals, as well as contractors, since contractors are not currently included as Air Force credentialed space professionals. We also interviewed officials at the Air Force Personnel Center, Randolph Air Force Base, Texas; U.S. Air Force Space Command, Peterson Air Force Base, Colorado; Space and Missile Systems Center, Los Angeles Air Force Base, California; the Office of the Secretary of the Air Force for Acquisition, Arlington, Virginia; and the Office of Security and Special Programs Oversight, Arlington, Virginia.

To determine the extent to which the Air Force has addressed whether space acquisition personnel are adequately qualified for their positions, we collected and analyzed data on space acquisition positions and personnel from U.S. Air Force Space Command, Peterson Air Force Base, Colorado, and the Space and Missile Systems Center, Los Angeles Air Force Base, California, and conducted discussion groups about topics including education and prior experience with junior and midgrade officers at Space and Missile Systems Center, Los Angeles Air Force Base, California. We reviewed National Science Foundation data as of May 2006 and Air Force Personnel Center data as of March 2006 in order to determine the extent to which new Air Force acquisition managers hold technical degrees and the extent to which the numbers represent a national trend. We also interviewed officials at Air Force Personnel Center, Randolph Air Force Base, Texas; the Office of the Secretary of the Air Force for Acquisition, Arlington, Virginia; and the Office of the Deputy Chief of Staff of the Air Force for Manpower and Personnel, Arlington, Virginia. The Space and Missile Systems Center database is current as of February 2006, and the space professional database is current as of March 2006. We used the Space and Missile Systems Center database and the space professional database, obtained from Air Force Space Command, to analyze the certification and experience levels of acquisition officers at the Space and Missile Systems Center and Air Force-wide. We did this by examining their degree and certification levels, as well as duty histories, and comparing them with the certification requirements of the Air Force's Acquisition Professional Development Program and Space Professional Development Program. To assess comparative certification and experience levels between unclassified and classified space acquisition personnel, we used the Space and Missile Systems Center database and the space professional database and compared the results. We also used these two databases to analyze the prior experience and education of acquisition managers working on unclassified space systems and acquisition managers working on classified space systems. We examined acquisition officers' degree and

certification levels, as well as duty histories, and compared them with the certification requirements of the Air Force's acquisition professional development program and space professional development program. To capture the acquisition officers working on unclassified space systems, we used all Space and Missile Systems Center acquisition officers except for those acquisition officers working in the Space Superiority system program office, which is a classified space system. Although we did not have detailed personnel data from the National Reconnaissance Office, we were able to search the space professional database for certain key elements that were known to indicate classified space positions; and we used the acquisition officers thus identified to represent the classified space acquisition workforce. These key elements included whether the acquisition officer worked at the Space and Missile Systems Center's Space Superiority system program office; was in a space position that required a very high-level security clearance; or was in a space position with an experience code that indicated work at certain classified space locations, including the National Reconnaissance Office. In the interest of issuing an unclassified product, we did not attempt to identify whether specific individuals worked at the National Reconnaissance Office or another intelligence agency. We also reviewed applicable National Reconnaissance Office directives and interviewed officials from the National Reconnaissance Office, Chantilly, Virginia; the Space and Missile Systems Center, Los Angeles Air Force Base, California; and Air Force Headquarters. In addition, we used the Space and Missile Systems Center database and the space professional database to analyze records of officers who either work in the Space Superiority system program office or have had intelligence-related assignments in the past. We assessed the reliability of Air Force Space Command's space professional database and the Space and Missile Systems Center database by (1) reviewing existing information about the data and the system that provided them, (2) interviewing Air Force and contractor officials knowledgeable about the data, and (3) comparing information in the databases. We determined that the data in these databases were sufficiently reliable for the purposes of this report. We also assessed the reliability of the data provided by the Air Force Personnel Center and determined that these data were sufficiently reliable for the purposes of this report. To determine the extent to which acquisition is reflected in space training, we reviewed and discussed the curricula of the National Security Space Institute's Space 200 and 300 courses; to determine the extent to which space is reflected in acquisition training, we reviewed the Defense Acquisition University's catalog. We also interviewed officials from both organizations, including Defense Acquisition University consultants to the National Security Space Institute and the Space and Missile Systems Center.

Part of our analysis regarding the quantity and quality of the space acquisition workforce was limited because of the lack of data from the National Reconnaissance Office. As noted above, the National Reconnaissance Office did provide us the overall number of Air Force personnel assigned to that agency, but it did not provide us information on the education, experience, or expertise of its space acquisition personnel. As a result, we could not directly compare the education, experience, or expertise of the space acquisition workforce at the Space and Missile Systems Center and the National Reconnaissance Office, and we could not compare the workforces at these two locations collectively to the Air Force acquisition workforce overall. In this regard, we were only able to compare the Space and Missile Systems Center personnel to the Air Force acquisition workforce overall.

We performed our work from October 2005 through June 2006 in accordance with generally accepted government auditing standards.

Appendix II: Comments from the Department of Defense



DEPARTMENT OF DEFENSE

DEFENSE ACQUISITION UNIVERSITY
OFFICE OF THE PRESIDENT
9820 BELVOIR ROAD
FORT BELVOIR, VA 22060-5565

August 31, 2006

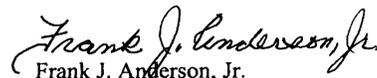
Ms. Davi M. D'Agostino
Director, Defense Capabilities and Management
U.S. Government Accountability Office
441G. Street, NW
Washington, DC 20548

Dear Ms. D'Agostino:

This is the Department of Defense (DoD) response to the GAO draft report, "DEFENSE SPACE ACTIVITIES: "Management Actions Are Needed to Better Identify, Track, and Train Air Force Space Personnel," dated July 28, 2006, (GAO Code 350741/GAO-06-908)

The Department partially concurs or concurs with the recommendations as outlined in the enclosed. The Department appreciates the opportunity to comment on the draft report.

Sincerely,


Frank J. Anderson, Jr.
President

Enclosure:
As stated

GAO DRAFT REPORT – DATED JULY 28, 2006
GAO CODE 350741/GAO-06-908

“DEFENSE SPACE ACTIVITIES: Management Actions Are Needed to Better Identify,
Track, and Train Air Force Space Personnel”

DEPARTMENT OF DEFENSE COMMENTS
TO THE RECOMMENDATIONS

RECOMMENDATION 1: The GAO recommended that the Secretary of Defense direct the Secretary of the Air Force to direct that an integrated, zero-based needs assessment of space acquisition personnel be performed and then incorporated into the Air Force’s force reduction planning and process improvement efforts in order to ensure that the resulting force structure is optimally balanced among workforce segments – that is, military, civilian, contractor, those who work on classified and unclassified programs, and Federally Funded Research and Development Center support personnel- and functional areas, such as classified and unclassified space systems. (p. 48/GAO Draft Report)

DOD RESPONSE: Partially concur. A needs assessment of space acquisition personnel is important, but it must be integrated as part of the Component’s force planning and process improvement initiatives. These efforts must be balanced with the component’s total workforce requirements.

RECOMMENDATION 2: The GAO recommended that the Secretary of Defense direct the Secretary of the Air Force to institutionalize and manage a space-specific specialty within the Air Force’s acquisition manage career field in order to ensure that all incumbents in the space acquisition workforce, including personnel at Space and Missile Systems Center and National Reconnaissance Office, have strong technical backgrounds and to better manage the career paths and retention of technical personnel in accordance with strategic workforce management principles. (p. 48/GAO Draft Report)

DOD RESPONSE: Partially concur. The Air Force Space Professional Development Program has identified and continues to track Air Force scientists, engineers, and program managers who have space-unique experience. This process enables effective career management and placement of acquisition officers with space experience but still affords the flexibility to use these individuals in other acquisition positions as Air Force requirements dictate. The Air Force continues to evaluate the merits of establishing a separate space-specific acquisition career specialty. Recently, the Air Force and the National Reconnaissance Office (NRO) signed a Statement of Intent to establish the Space Assignment Advisory Board which will oversee assignments of all Air Force Credentialed Space Professionals. This will enable development of a larger pool of space leaders with operations and acquisition experience.

RECOMMENDATION 3: The GAO recommended that the Secretary of Defense direct the Secretary of the Air Force to improve training by providing greater acquisition-specific content

in the Air Force's National Security Space Institute's curricula in order to broaden the pool of personnel who are qualified to fill space acquisition positions. (p. 48/GAO Draft Report)

DOD RESPONSE: Partially concur. The DoD and Air Force concur that more space acquisition training is needed, and the NSSI is one forum. Acquisition is one of many key elements covered by NSSI courses, especially through their flagships courses, Space 200 and Space 300. Other venues for additional space acquisition training include the SMC Acquisition School (SAS) and the Defense Acquisition University. There are several ongoing initiatives between DAU, Air Force Space Command, NRO, and NASA that will expand and leverage available training. Additionally, the Air Force is currently beta testing critical software acquisition skills training that will soon be deployed and available for the Space community.

RECOMMENDATION 4: The GAO recommended that the Secretary of Defense direct the Under Secretary of Defense for Acquisition, Technology, and Logistics to improve training by bolstering space-specific content in the Defense Acquisition University's curricula in order to broaden the pool of personnel who are qualified to fill space acquisition positions (p. 48/GAO Draft Report)

DOD RESPONSE: Concur. DAU has already expanded its support of the Space acquisition community, including support for the Air Force. DAU has established a major campus in San Diego adjacent to the Navy SPAWARS center. DAU has also expanded the teaching staff collocated with AF Space and Missile Center (Los Angeles). Additionally, they recently established an on-site presence at the National Security Space Institute (NSSI), Air Force Space Command (Colorado Springs). DAU partnered with the Air Force and developed a Continuous Learning Module (CLM) that provides a comprehensive overview of National Security Space Directive 03-01. This CLM highlights both similarities and differences to improve Space and non-Space major system acquisitions and went online in March 2006. The course has been well received by the Space community, and approximately 250 individuals have completed the course. This CLM is now tightly integrated as a pre-requisite for NSSI and SMC curriculum. DAU is leveraging other core courses to create a stronger Space focus. Together, these learning assets will serve to strengthen linkage between the operational space and acquisition development communities. Ultimately this will foster improved acquisition outcomes. In addition, DAU and the Air Force are working together to further develop leadership training assets that will also be available for the Space community.

Appendix III: Comments from the National Reconnaissance Office

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



Office of the Deputy Director

NATIONAL RECONNAISSANCE OFFICE

14675 Lee Road
Chantilly, VA 20151-1715

September 6, 2006

Ms. Lorelei St. James
Assistant Director
United States Government Accountability Office
Washington, DC 20548

Dear Ms. St. James:

Thank you for the opportunity to comment on the draft report *DEFENSE SPACE ACTIVITIES: Management Actions are Needed to Better Identify, Track, and Train Air Force Space Personnel (GAO-06-908)*.

The report highlights a number of national level problems associated with the nation's space programs, notably the long-term decline in the education and training of scientists and engineers, and the government's struggle to attract and retain these individuals. As you are aware, the National Reconnaissance Office (NRO) does not have an indigenous workforce. We rely on the Services and other agencies to provide the properly educated, trained, and experienced personnel necessary to perform our mission. While we are in favor of actions that will continue to enhance the caliber of the Department of Defense (DoD) acquisition workforce, it is inappropriate for us to concur with your recommendations since these recommendations fall within the purview of the Air Force. The report does, however, present a few points on which I would like to comment.

a. "At SMC, the percentage of space acquisition officers with the highest acquisition certification level dropped from 29 percent in 1996 to 15 percent in 2005. Reasons for the lower certification levels include **NRO priority in selecting personnel**, the lack of a space acquisition specialty, limited training, and the decline of personnel coming into the Air Force with technical degrees." [Page 0 and a theme repeated throughout the report]

Response: The NRO's hiring policies have been in place for over 40 years. During that time, Space and Missile Systems Center (SMC) was able to fill its authorization of scientists, engineers, and program managers, according to your report.

While the NRO's hiring policies may currently exacerbate the problems at SMC, the policies are not the causal agent. Like most organizations, the NRO seeks to hire the best qualified, most experienced people to execute our mission. This hiring philosophy is driven by the combined complexity of our systems, the clearance requirements, and the level of maturity necessary to work in a multiagency environment where our personnel exercise significant levels of autonomy. The shortage of appropriately qualified individuals at the right levels is a result of workforce management decisions made in the 1990s, prioritization plans that put engineers in non-engineering jobs, and a decline in the number of graduates with engineering and science degrees.

It would appear that the *prima facie* cause of the increase in Level 1 certified individuals at SMC would be the manning of lieutenants at 300 percent of authorization. If you increase the number of Level 1 certified individuals and keep Level 2 certifications constant, it follows that there must be a corresponding decrease in Level 3 certified individuals. The lack of a space acquisition specialty is unlikely to be the culprit; and there is no consensus across the DoD that a space acquisition specialty is required or even a good idea. The current problem is there are not enough qualified people to meet all requirements. This is true across the acquisition career field, not just in space-related duties. Additionally, many Air Force acquisition professionals will earn *de facto* space specialties by virtue of the education and assignment actions taken during their careers. Depth of experience in space acquisition is essential; however, the Air Force also has a requirement for acquisition professionals with breadth.

b. "Part of our analysis regarding the quantity and quality of the space acquisition workforce was limited due to the lack of NRO data. NRO did provide us the overall number of Air Force personnel assigned to NRO, but it did not provide us information on the education, experience, or expertise of NRO personnel." [Page 8]

Response: As written, the report paints the NRO as being uncooperative. The NRO made every attempt to address the Government Accountability Office's (GAO) request for information; however, there were information requests, notably those identified above, where the NRO advised the GAO that the Air Force Personnel Center was the appropriate agency from which to request information concerning Air Force personnel.

See comment 1.

**Appendix III: Comments from the National
Reconnaissance Office**

Over the past few years there has been a great deal of effort, including the agreements outlined in the recently released Statement of Intent, to better manage the flow of space professionals between the Air Force and the NRO. We have integrated our command selection processes with Air Force Space Command's (AFSPC) processes. The NRO sends representatives to the Air Force's developmental teams, provides instructors to the National Security Space Institute, and works closely with AFSPC to chart education and training requirements. Continued efforts along this path will lead to even greater collaboration and sharing between the Air Force and the NRO -- strengthening our partnership and enhancing the nation's space community.

If you have any further questions, please contact Eric Feldman, NRO Inspector General, on 310-416-7405 or Lanie D'Alessandro, NRO Deputy Inspector General, on 703-808-1810.

Sincerely,


JOHN T. SHERIDAN, Maj Gen, USAF

The following is GAO's comment on NRO's letter dated September 6, 2006.

GAO Comment

1. NRO also commented upon GAO's requests for information related to NRO's space acquisition personnel. The NRO did provide us with the overall number of Air Force personnel assigned to NRO, but in its letter providing this information, NRO noted that it could not disaggregate the personnel information without revealing intelligence community information. We submitted a second request for information to the Air Force Personnel Center, but this request was ultimately forwarded to NRO, on the grounds that only NRO could provide the data, where it was declined for similar reasons. In our report, we noted that we did not have detailed information about NRO's space acquisition workforce, as we did for SMC's space acquisition workforce, since this affected our ability to report on the entire space acquisition workforce.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Davi M. D'Agostino (202) 512-5431 or dagostinod@gao.gov

Acknowledgments

In addition to the contact named above, Lorelei St. James, Assistant Director; Gabrielle A. Carrington; Barbara Hills; Linda S. Keefer; Ron La Due Lake; Julie Matta; Sally L. Newman; Jerome Sandau; and Cheryl Weissman made key contributions to this report.

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