



March 2019

DEFENSE SPACE SYSTEMS

DOD Should Collect and Maintain Data on Its Space Acquisition Workforce

GAO Highlights

Highlights of [GAO-19-240](#), a report to congressional committees

Why GAO Did This Study

DOD plans to spend about \$65 billion from fiscal year 2019 to 2023 on space acquisition programs—including satellites, launch vehicles, ground components, and user equipment. DOD’s space acquisition personnel perform a variety of activities, such as preparing and reviewing acquisition documents, to manage or oversee programs that develop or procure space capabilities. DOD recently announced it plans to establish a new Space Development Agency and a United States Space Command.

A House Report accompanying a bill for the 2017 National Defense Authorization Act contained a provision for GAO to review DOD’s space acquisition workforce. This report examines, among other things, what is known about the size, mix, and location of that workforce. GAO collected data from DOD’s acquisition workforce data systems and multiple space acquisition organizations. GAO interviewed officials from these organizations and from a non-generalizable sample of 10 space acquisition programs, representing a range of dollar values and stages in the acquisition process.

What GAO Recommends

GAO recommends that DOD (1) identifies the universe of its space acquisition programs and the organizations that support them and (2) collects and maintains data on the workforce that supports these programs. DOD agreed with the first recommendation, but not the second. GAO revised the second recommendation to address DOD’s concerns.

View [GAO-19-240](#). For more information, contact Jon Ludwigson at (202) 512-4841 or ludwigsonj@gao.gov.

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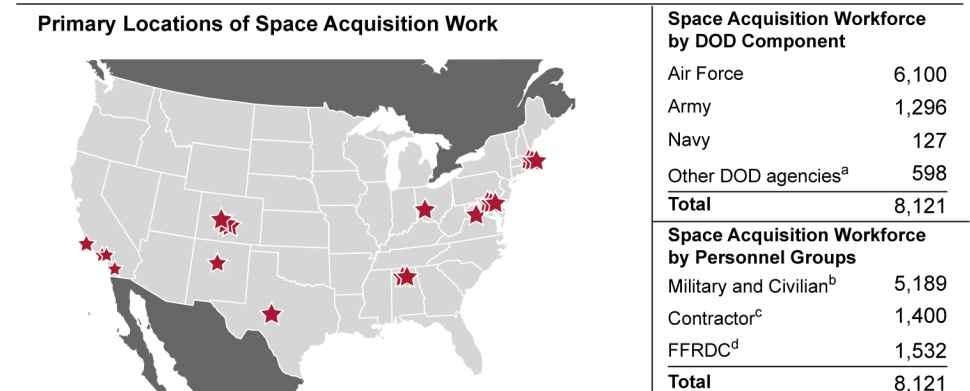
DEFENSE SPACE SYSTEMS

DOD Should Collect and Maintain Data on Its Space Acquisition Workforce

What GAO Found

The Department of Defense (DOD) does not routinely monitor the size, mix, and location of its space acquisition workforce. However, data GAO collected and aggregated from multiple DOD space acquisition organizations show that at least 8,000 personnel in multiple locations nationwide were working on space acquisition activities at the end of 2017 (see figure). Also as shown, military and civilian personnel comprise the majority of the overall workforce, while contractor and Federally Funded Research and Development Center personnel also provide support.

Primary Locations and Size of Department of Defense (DOD) Space Acquisition Workforce Identified by GAO as of December 31, 2017



^a Other DOD agencies include the Defense Contract Management Agency and the Missile Defense Agency.

^b Number of Military and Civilian personnel reflects those working 50 percent or more of their time on space acquisitions.

^c Number of contractor personnel reflects full-time equivalents, which may have been performed by more than one person.

^d Number of Federally Funded Research and Development Center (FFRDC) personnel reflects staff-years of technical effort equivalents, which may have been performed by more than one person.

Source: GAO presentation of DOD documentation (data); Map Resources (map). | GAO-19-240

Several factors hinder DOD’s ability to collect data needed for a comprehensive view of its space acquisition workforce:

- DOD does not maintain a complete list of its space acquisition programs;
- DOD’s workforce data systems are not configured to identify personnel working on space acquisition activities; and
- DOD space acquisition personnel are dispersed across organizations and some personnel support both space and non-space programs.

Without complete and accurate data, DOD cannot assess gaps in the overall capabilities of the space acquisition workforce. Identifying space programs and collecting such data would also better position DOD to ensure that the appropriate space acquisition personnel are assigned to the new Space Development Agency and the United States Space Command. Finally, comprehensive data on the space acquisition workforce would also be beneficial to support DOD’s efforts related to its recent legislative proposal regarding the establishment of the United States Space Force.

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Abbreviations

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| DOD | Department of Defense |
| FFRDC | Federally Funded Research and Development Center |

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March 14, 2019

Congressional Committees

The Department of Defense (DOD) plans to spend more than \$65 billion from fiscal year 2019 to 2023 to acquire space systems that will provide critical capabilities to support military and other government operations, such as intelligence collection; battlefield surveillance and management; communications; and positioning, navigation, and timing. Historically, the military services and other DOD components, such as the Missile Defense Agency, have developed space capabilities separately, and in some cases collaboratively, to meet different warfighter needs, and each has their own acquisition workforce to support these efforts.

Space programs and the acquisition functions necessary to develop them have faced challenges over the years. We have previously found that fragmentation and overlap in DOD space acquisition management and oversight contributed to long-standing problems of cost overruns and schedule delays.¹ For example, we reported that the Global Positioning System lacked a single authority responsible for synchronizing the various functions that must occur for the system to operate effectively. This diffused leadership contributed to a decade-long gap in the military's ability to use the updated Global Positioning System signal after its satellites were launched.² In December 2017, we found that the new ground system—the Next Generation Operational Control System—remained at risk for further delays and cost growth, and that the Air Force has begun a second new program to deliver an interim, limited capability.³

DOD's oversight of its space activities is evolving. In August 2018, DOD announced plans to establish a consolidated Space Development Agency intended to rapidly develop and field next generation space capabilities.

¹ GAO, *Defense Space Acquisitions: Too Early to Determine If Recent Changes Will Resolve Persistent Fragmentation in Management and Oversight*, [GAO-16-592R](#) (Washington, D.C.: July 27, 2016).

² GAO, *2012 Annual Report: Opportunities to Reduce Duplication, Overlap and Fragmentation, Achieve Savings, and Enhance Revenue*, [GAO-12-342SP](#) (Washington, D.C.: February 28, 2012).

³ GAO, *Global Positioning System: Better Planning and Coordination Needed to Improve Prospects for Fielding Modernized Capability*, [GAO-18-74](#) (Washington, D.C.: December 12, 2017).

In December 2018, the President directed DOD to establish the United States Space Command to integrate space capabilities across all branches of the military, and improve and evolve space procedures and techniques to assist the warfighter. In the February 2019 Space Policy Directive, the President called for DOD to submit a legislative proposal to establish a United States Space Force as a new armed service within the Air Force.

The House Report accompanying a bill for the National Defense Authorization Act for Fiscal Year 2017 contained a provision for GAO to review DOD's space acquisition workforce.⁴ This report examines (1) what DOD knows about the size, mix, and location of its space acquisition workforce and (2) the challenges, if any, DOD faces in hiring, staffing, and retaining space acquisition workforce personnel. We define the space acquisition workforce broadly to include acquisition-coded military and civilian personnel, as well as support contractor and Federally Funded Research and Development Center (FFRDC) personnel that work on space acquisition programs and related activities.

To assess what DOD knows about the size, mix, and location of its space acquisition workforce, we reviewed DOD directives related to the definition of space systems and the DOD acquisition workforce, and interviewed pertinent DOD officials. We obtained available data, as of December 31, 2017, from organizations that perform space acquisition activities since DOD-wide comprehensive data were not available. We interviewed the Directors of Acquisition Career Management from the military services to identify space organizations, and then met with officials from each organization to identify the current space acquisition programs and obtain workforce data. Military and civilian personnel data in the report reflect those personnel that spent 50 percent or more of their work time on space acquisitions. Contractor and FFRDC personnel data are presented in terms of the number of full-time equivalents and staff-years of technical effort equivalents, respectively. To assess the reliability of these data, we discussed the data and sources used to compile the data with DOD officials, reviewed the data for logical inconsistencies, and compared the data when possible to other sources, such as DOD briefing

⁴ H.R. Rep. No. 114-537, pt. 1, at 284-85 (2016), accompanying H.R. 4909, related to the National Defense Authorization Act for Fiscal Year 2017, Pub. L. No. 114-328, § 911 (2016). The report specified that the space acquisition workforce of the National Reconnaissance Office should be excluded from our review.

documents. We determined the data were sufficiently reliable to provide estimates of the general size and mix of the space acquisition workforce.

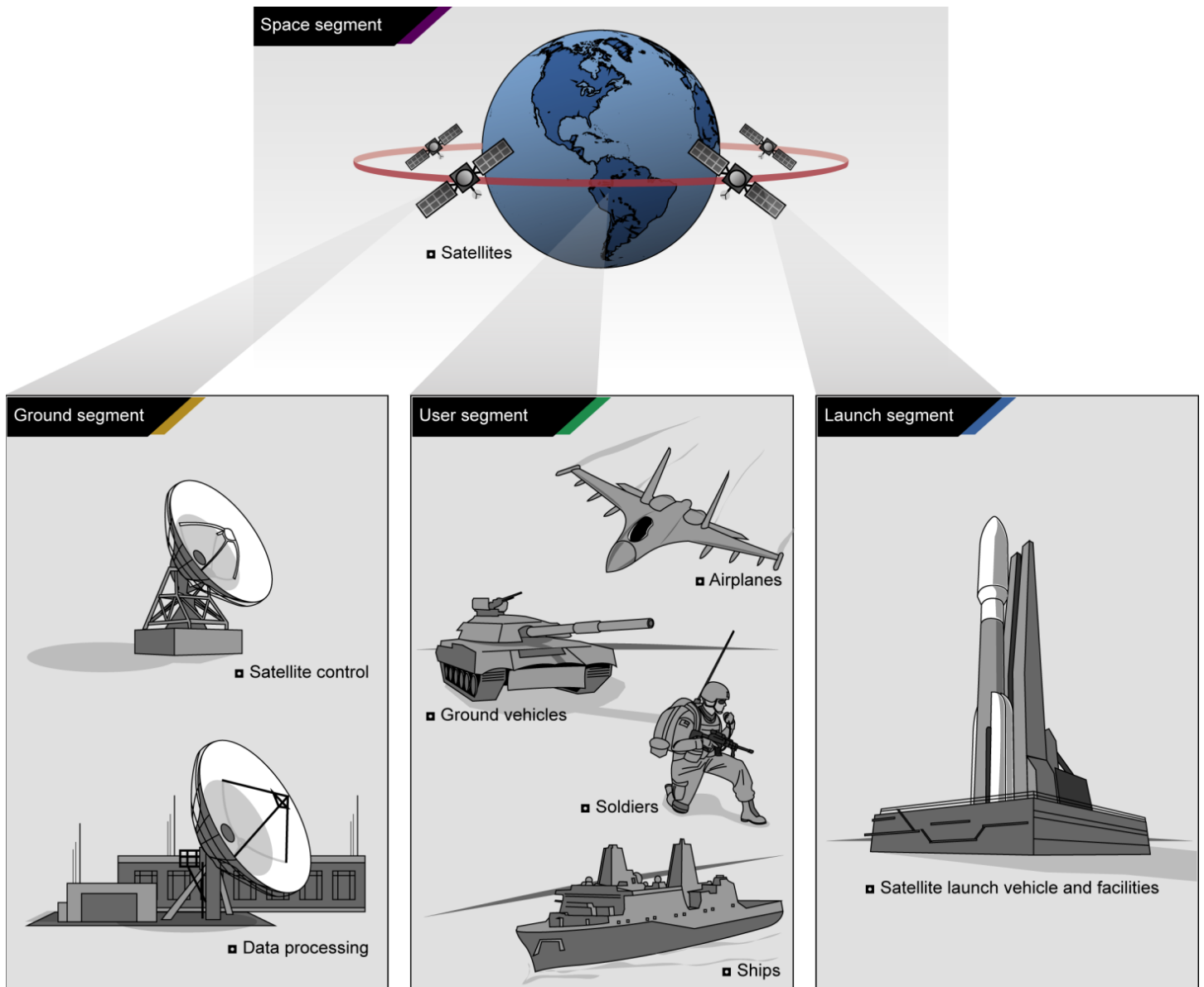
To assess any challenges DOD faces in hiring, staffing, and retaining its space acquisition workforce, we interviewed space acquisition officials from multiple levels within DOD, the Air Force, the Army, and the Navy. We also met with officials from a non-generalizable sample of 10 DOD space acquisition programs. We selected these programs to present a range of dollar values and different stages of the acquisition process. In addition, we reviewed studies from DOD and elsewhere that discuss space acquisitions and workforce challenges.

We conducted this performance audit from November 2017 to March 2019 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. Additional details on our scope and methodology are provided in appendix I.

Background

Space systems generally involve one of four types of interrelated segments that are needed to make a space capability fully functional. As illustrated in figure 1, they include (1) space components—namely the satellites, (2) ground components, including satellite control systems and data processing subsystems and facilities, (3) user equipment, such as radios/terminals, needed by the warfighter to use the capability, and (4) launch vehicles and facilities.

Figure 1: The Four Segments Needed to Provide Space Systems Capabilities



Source: GAO (data and images). | GAO-19-240

DOD space systems are acquired under the same acquisition policies as other weapons systems.⁵ However, as we found in July 2016, space systems are different from other acquisitions in some ways.⁶ For example, space has more programs of joint interest than other areas, and includes varied stakeholders, such as civil agencies and multiple services. According to officials, in developing space systems once a satellite is launched, if there are problems it is essentially impossible to change the hardware, and software changes may not be an option. In addition, space programs typically use cutting-edge technologies that have to withstand the harsh space environment. Such technologies are rarely available as off-the-shelf systems from the commercial market and must be developed following a specific process overseen by specially-trained DOD acquisition personnel.

Data from the Under Secretary of Defense for Acquisition and Sustainment's Office of Human Capital Initiatives show that, as of June 2018, DOD employed about 170,000 military and civilian personnel who are designated as acquisition personnel and are responsible for acquiring weapon systems, such as aircraft, ships, tanks, and space systems. DOD tracks the characteristics, education, training, and experience of these acquisition personnel in DOD's acquisition workforce data system—Data Mart—where they are tracked as belonging to 1 of 15 acquisition career fields.⁷ Table 1 shows a list of these acquisition career fields.

⁵ DOD Directive 5000.01, The Defense Acquisition System (Aug. 31, 2018) and DOD Instruction 5000.02, Operation of the Defense Acquisition System (Aug. 10, 2017), direct the Defense Acquisition System and provide governing policies.

⁶ [GAO-16-592R](#).

⁷ The Defense Acquisition Workforce Improvement Act designates specific acquisition-related career fields as defense acquisition workforce positions. Pub. L. No. 101-510, §1202(a) (1990) (codified, as amended, at 10 U.S.C. § 1721).

Table 1: Department of Defense Acquisition Career Fields

| |
|--|
| Auditing |
| Business—Cost Estimating |
| Business—Financial Management |
| Contracting |
| Engineering |
| Facilities Engineering |
| Industrial and/or Contract Property Management |
| Information Technology |
| Life Cycle Logistics |
| Production, Quality & Manufacturing |
| Program Management |
| Program Management—International Acquisition |
| Purchasing |
| Science & Technology Manager |
| Test & Evaluation |

Source: GAO presentation of DOD information. | GAO-19-240

Contractor and FFRDC personnel often support DOD acquisition efforts. For the purpose of this report, “contractor” refers to support service contractors who provide technical and administrative support rather than prime contractors who develop and produce weapon systems or products. FFRDCs are not-for-profit entities sponsored and funded primarily by DOD to fulfill research and development, engineering, and analytic needs that cannot be met as effectively by existing government or contractor personnel.⁸ Nonprofit, university-affiliated, or private industry organizations operate the FFRDCs through contracts or other agreements with federal agencies. DOD procures FFRDC services by staff years of technical effort. The total amount of FFRDC services time that DOD is permitted to obtain is set annually by Congress.⁹ For fiscal year 2018, DOD was authorized to use available funds for FFRDCs for

⁸ Other federal agencies, such as the Department of Energy, also sponsor and use FFRDCs. For the purpose of this report, the term FFRDC refers to those FFRDCs sponsored by DOD.

⁹ DOD FFRDCs work within an annual ceiling of staff-years of technical effort defined as 1,810 hours of paid effort for technical services. Staff-years of technical effort specify a fixed number of hours per fiscal year.

not more than 6,030 staff years of technical effort.¹⁰ Authorized staff years of technical effort are allocated among the military services' organizations that act as the primary sponsors for each FFRDC, which then prioritize what work the FFRDC will perform according to the allocation level received. In general, managers in the contractor and FFRDC organizations direct the daily activities of their respective personnel, while DOD military and civilian personnel oversee their work.

Over the years, GAO has highlighted the importance of workforce management. Since 2001, GAO has included strategic human capital management as a government-wide high-risk area.¹¹ More recently, we found that having the right workforce mix with the right skill sets is critical to achieving DOD's mission, and that it is important for DOD, as part of its strategic workforce planning, to conduct gap analyses of its critical skills and competencies.¹² Strategic workforce planning—an integral part of human capital management—is an iterative, systematic process that helps organizations determine if they have staff with the necessary skills and competencies to accomplish their strategic goals. As shown in table 2, many DOD offices play key roles in strategic workforce planning activities.

¹⁰ Consolidated Appropriations Act, 2018, Pub. L. No. 115-141, § 8024(d) (2018). This limitation does not apply to staff years funded in the National Intelligence Program and the Military Intelligence Program.

¹¹ GAO, *High-Risk Series: An Update*, [GAO-01-263](#) (Washington, D.C.: January 2001).

¹² GAO, *Human Capital: DOD Needs Complete Assessments to Improve Future Civilian Strategic Workforce Plans*, [GAO-12-1014](#) (Washington, D.C.: September 27, 2012).

Table 2: Roles and Responsibilities of Key Department of Defense (DOD) Players in Strategic Workforce Planning

| Office | Primary responsibilities |
|--|--|
| Under Secretary of Defense, Personnel and Readiness | <ul style="list-style-type: none"> • Issue guidance on overall personnel management to be used by DOD and the military services • Provide guidance on personnel levels of the components • Develop personnel mix criteria and other information used by DOD components to determine their workforce mix |
| Under Secretary of Defense (Comptroller) | <ul style="list-style-type: none"> • Ensure DOD’s budget is consistent with total force management policies and procedures |
| Under Secretary of Defense for Acquisition and Sustainment, Office of Human Capital Initiatives | <ul style="list-style-type: none"> • Oversee department-wide acquisition workforce strategic planning • Oversee acquisition workforce education, training, and career development • Develop policy for the defense acquisition workforce • Coordinate, implement, and oversee acquisition workforce programs • Manage Defense Acquisition Workforce Development Fund |
| Career Functional Leaders from Offices of the Under Secretary of Defense for Acquisition and Sustainment and Research and Engineering | <ul style="list-style-type: none"> • Serve as subject matter experts for respective career fields • Oversee and maintain education, training, and experience requirements for career fields, including competencies and certification standards • Establish and oversee functional integrated product teams |
| Functional Integrated Product Teams (Membership includes career functional leaders, career field experts, and representatives from DOD military services and the Defense Acquisition University) | <ul style="list-style-type: none"> • Support the career functional leaders in carrying out responsibilities • Provide career functional leaders with information on DOD’s acquisition workforce, including training requirements and professional development |
| Military services secretaries and defense agency heads | <ul style="list-style-type: none"> • Determine workforce requirements • Perform planning, programming, and budgeting for total force management |
| Director, Acquisition Career Management office for each military service and other defense agencies | <ul style="list-style-type: none"> • Serve as service acquisition executives’ representative in assisting Under Secretary of Defense for Acquisition and Sustainment’s Office of Human Capital Initiatives with execution and oversight of acquisition workforce responsibilities within respective components • Key advisor for policy, coordination, implementation and oversight of acquisition workforce programs within respective components |
| Defense Acquisition University | <ul style="list-style-type: none"> • Offer training and certification courses to military and civilian personnel in the defense acquisition workforce. |

Source: GAO presentation of DOD data. | GAO-19-240

DOD Lacks Comprehensive Data on Its Space Acquisition Workforce, but Information Indicates That It Includes at Least 8,000 Personnel

DOD does not have comprehensive information about its space acquisition workforce—including the size, mix, and location of this workforce. DOD does not have this information because, among other things, DOD has not clearly identified its space programs, and its workforce data systems are not configured to identify space acquisition personnel. In the absence of comprehensive DOD data, we sought to obtain an understanding of the extent of this workforce. We aggregated data from individual DOD organizations and estimate that at least 8,000 military, civilian, contractor, and FFRDC personnel were working on space acquisitions in multiple locations across the United States at the end of 2017. While this information represents only a snapshot in time, it provides insight into the extent of the space acquisition workforce. Given DOD's recent decision to stand up a United States Space Command and to establish a consolidated Space Development Agency in 2019, along with the President's directive for DOD to submit a legislative proposal for a United States Space Force, having knowledge about which personnel are involved with military space acquisitions and where these personnel are located will be important to DOD's planning efforts.

DOD Does Not Collect and Maintain Comprehensive Information on the Space Acquisition Workforce

DOD collects data on its acquisition workforce, but does not collect and maintain comprehensive and complete data on the size, mix, and location of the military, civilian, contractor, and FFRDC personnel working on space acquisitions. According to the military services' Directors of Acquisition Career Management, DOD manages its acquisition workforce by career field, such as program management and engineering, and not by the type of product being acquired, such as space systems. They told us that, in their view, the acquisition skills needed for an acquisition program—such as those for program management, engineering, and contracting—are largely the same regardless of the product type. However, officials acknowledged that it takes some time for personnel to learn the nuances of acquiring a specific type of product.

We identified three factors that hinder DOD's ability to collect comprehensive data on its space acquisition workforce. Together, they impede DOD from maintaining a complete and accurate understanding of the size, mix, and location of its space acquisition workforce.

- **DOD does not maintain a complete list of its space acquisition programs.** Officials from the office of the Assistant Secretary of the Air Force for Acquisition and the service-level acquisition career managers told us that DOD does not maintain a list of the universe of space acquisition programs. In addition, the budget document that DOD submits

to Congress specific to space programs, which could possibly serve as an alternative source of such information, identifies programs that have large amounts of funding by name, but aggregates information for smaller programs without identifying them individually.

While DOD does not maintain a complete list of space acquisition programs, during the course of our review we found that the military services were generally able to identify space acquisition programs. DOD does have a definition of space systems. Specifically, according to a DOD Directive, space systems include all systems related to making a space capability operational—that is programs acquiring satellites, satellite ground systems (including satellite control and data processing), receivers/user segments (including terminals and radios), and launch systems—but specifies that terminals that are embedded as part of a platform (i.e. aircraft, ship, or tank) are excluded.¹³ However, DOD officials had difficulty identifying some programs, particularly those in the user segment. For example, the Air Force’s Space Fence program, which is developing ground radar as a part of the space surveillance network that detects and tracks space objects, is included as a space program in DOD’s budget documents. Officials from the Program Executive Office that staffs personnel to the program initially told us they did not consider it a space program since it is a series of ground-based radars. They subsequently determined that it is a space program since the radar will track space objects and provide data for space situational awareness.

- **DOD data systems are not currently configured to identify space acquisition personnel.** We examined three data sources that have information on the different personnel groups in the acquisition workforce, and found that none of them can identify space acquisition personnel.
 - The Office of Human Capital Initiatives within the Office of the Under Secretary of Defense for Acquisition and Sustainment uses the Data Mart system to track the education, experience, and training of military and civilian acquisition-coded personnel working in the 15 acquisition functional career fields shown in table 1. DOD has taken periodic steps to enhance the data captured in this system. For example, in 2009 DOD began tracking whether acquisition personnel in the business career field were working on financial management or cost estimating. In

¹³ DOD, DOD Directive 5100.96, DOD Space Enterprise Governance and Principal DOD Space Advisor, § G.2 (June 9, 2017).

2014, DOD started to track personnel with expertise in contracting with small businesses, and expanded its efforts to track personnel with expertise in international acquisitions. However, this system does not currently identify personnel staffed to or supporting space acquisitions or any other type of product acquisition.

- The Office of the Under Secretary of Defense for Personnel and Readiness tracks contractor data using the Enterprise-wide Contractor Manpower Reporting Application system to provide DOD management information on contracted services obtained by each military service and defense agency. The system includes data on the number of hours of service each contractor provides to the government, which could be used to approximate the number of contractor personnel used to perform the work. However, the system does not track the type of acquisition programs being supported, such as space acquisition programs. In addition, the data are self-reported by service contractors and concerns exist regarding potential underreporting. For example, we reported in March 2018 that the military services estimated that the Enterprise-wide Contractor Manpower Reporting Application included fiscal year 2016 contractor data for 80 percent of Army contracts and 75 percent of Navy contracts; the percentage of Air Force contracts was unknown.¹⁴
- The Director of Laboratories and Personnel within the Office of the Under Secretary of Defense for Research and Engineering tracks information on FFRDCs, such as the staff years of technical effort provided each year, to ensure that DOD stays within its congressionally mandated limit. Each FFRDC sponsor organization provides an annual report of their staff years of technical effort and funding to DOD. However, DOD officials told us that sponsoring organizations do not identify what type of acquisition program their respective FFRDC personnel support, such as space acquisition programs.
- **Personnel supporting space acquisitions are dispersed across a variety of organizations and may also support non-space programs.** Each of the military services we reviewed has program executive offices,

¹⁴ GAO, *DOD Contracted Services: Long-Standing Issues Remain about Using Inventory for Management Decisions*, [GAO-18-330](#) (Washington, D.C.: March 29, 2018).

research labs, or other organizations that support both space and non-space acquisitions. DOD officials told us that functional career field leaders in each of the organizations, such as the engineering or the contracting directorates, assign personnel to space or non-space programs on an as-needed basis, which could make it difficult for DOD to determine which and how many personnel should be included in the space acquisition workforce. Five of the 10 space acquisition programs we reviewed—1 Air Force, 1 Navy, and 3 Army—were managed by organizations that were primarily responsible for developing and acquiring non-space programs.

- Air Force—The Space Fence program is staffed by the Air Force Life Cycle Management Center’s Program Executive Office for Battle Management. The Center primarily supports non-space programs, such as fighters, bombers, tankers, and presidential aircraft.
- Navy—The Mobile User Objective System is managed by the Space and Naval Warfare Systems Command, which primarily manages non-space programs that provide enterprise information system and command, control, communications, computers, and intelligence capabilities.
- Army—The Joint Tactical Ground Station program is managed by the Army’s Program Executive Office for Missiles and Space. The office primarily manages a variety of missile programs—such as close combat, cruise, and integrated air and missile defense programs—that are non-space programs. Similarly, the Secure, Mobile, Anti-Jam, Reliable, Tactical-Terminal and the Transportable Tactical Command Communications programs are managed by the Army’s Program Executive Office for Command, Control, Communications-Tactical. This office primarily manages a variety of information systems to provide tactical communication for the service, which may or may not be space programs. Officials told us that the three Army programs we reviewed were also supported by other, separate Army organizations, such as the Army Contracting Command for contracting support; the Army’s Aviation and Missile Research, Development, and Engineering Center for engineering support; and the Army Materiel Command for logistics support. These organizations provide support to space and non-space programs on an as-needed basis.

The Administration, Congress, and DOD are discussing a variety of approaches for strengthening the government’s space operations, including the establishment of one or more new organizations. In June 2018 the President directed DOD to begin the process of establishing a

new military branch focused on space that is separate from and equal to the other military departments, Army, Navy, and Air Force. In an August 2018 report to the Congress on the organizational and management structure needed for the national space components, DOD described the immediate steps that it plans to take to implement the President's direction while waiting for Congressional authorization to create the new military branch.¹⁵ These steps include establishing a new United States Space Command to further its space warfighting capabilities, as well as developing plans to establish a consolidated Space Development Agency to rapidly develop and field next generation space capabilities. DOD has described the general areas of focus planned for these new organizations; however, many specifics are still to be determined. DOD has announced that a committee of senior DOD leaders is expected to identify which of the current space activities will be consolidated into these new space organizations. In addition, the President's February 2019 Space Policy Directive now requires DOD to submit a legislative proposal to establish a United States Space Force as a new armed service within the Air Force. DOD announced it delivered a legislative proposal to Congress on March 1, 2019.

The lack of comprehensive information about DOD's space programs and the acquisition personnel supporting those programs affects DOD's ability to assess gaps in the overall capabilities of its space acquisition workforce and determine whether it has sufficient internal capability and critical knowledge or skills for its space acquisitions. Moreover, it hampers DOD's ability to make decisions related to establishing the United States Space Command, a new Space Development Agency, or potentially the United States Space Force. This includes determining the appropriate number and mix of acquisition personnel that are needed for the new organizations, as well as which military and civilian personnel should be assigned to them. According to federal internal control standards, an agency, such as DOD, should have relevant, reliable, and timely information in order to run and control operations, including managing the workforce.¹⁶ Air Force Director of Acquisition Career Management officials stated that having a process for identifying space acquisitions personnel would be beneficial. As we reported in July 2003, the success

¹⁵ DOD, *Final Report on Organizational and Management Structure for the National Security Space Components of the Department of Defense*, (August 9, 2018).

¹⁶ GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: September 10, 2014).

of merging personnel during organizational transformations is more likely when the best individuals are selected to meet the skills and competencies needed for the new organization's goals.¹⁷

GAO Identified at Least 8,000 Personnel in Over 20 Locations As Part of DOD's Space Acquisition Workforce

In the absence of readily available comprehensive data from DOD, we collected and aggregated data from multiple DOD space organizations and found that at least 8,000 personnel were in the space acquisition workforce at the end of 2017. However, our data set is not complete.¹⁸ For example, the National Reconnaissance Office, which DOD officials told us has a significant number of personnel working on space acquisitions, is not included in our analysis. In addition, our count only includes personnel that spent 50 percent or more of their time working on space acquisitions; therefore any personnel who spent less than 50 percent of their time on space acquisitions was not included. Furthermore, it is important to note that our data provide a snapshot of the workforce as of December 31, 2017. According to DOD officials, the size and mix of the workforce can change based on the number of programs and where programs are in the acquisition process. The military and civilian personnel data we collected are expressed as number of people.¹⁹ The contractor and FFRDC personnel data are expressed as full-time equivalents and staff-years of technical effort equivalents, respectively.²⁰

¹⁷ GAO, *Results-Oriented Cultures: Implementation Steps to Assist Mergers and Organizational Transformations*, [GAO-03-669](#) (Washington, D.C.: July 2, 2003).

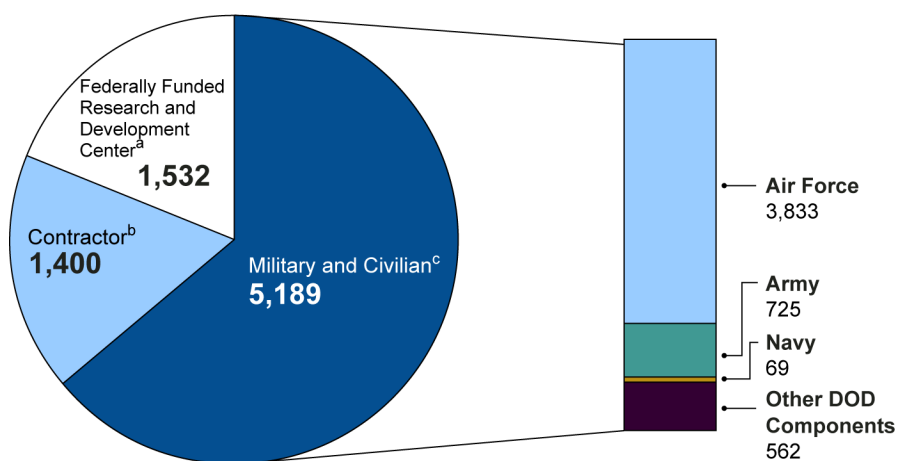
¹⁸ We made a diligent attempt to work with DOD officials to identify the DOD programs and organizations performing space acquisition activities, subject to time and resource constraints. However, it is possible that DOD did not identify some existing programs or organizations with personnel who support space acquisitions.

¹⁹ At our request, DOD identified the number of military and civilian personnel that worked on space acquisitions 50 percent or more of their work time. As such, the data we obtained reflect personnel and may not reflect the annual level of effort focused on space acquisitions by military and civilians.

²⁰ DOD officials could not identify the number of contractor and FFRDC personnel working on space acquisitions. Therefore, at our request, DOD provided data on the level of annual effort provided by contractor and FFRDC personnel as full-time equivalents for contractors and annual technical effort for FFRDCs, which reflect the effort of one person completing the work full-time over a full year; however, because the work could have been completed by more than one person these data may not reflect the total number of personnel supporting space acquisitions.

- **Size of Workforce:** Based on data we collected from multiple DOD space acquisition organizations, at least 8,000 military, civilian, contractor, and FFRDC personnel supported DOD’s space acquisitions as of December 31, 2017 (see figure 2).

Figure 2: Number of Department of Defense (DOD) Space Acquisition Workforce Personnel Identified by GAO as of December 31, 2017, by Type



Source: GAO analysis of DOD reported data. | GAO-19-240

^a The number of Federally Funded Research and Development Center staff reflects the staff years of technical effort equivalent identified by DOD, which may have been performed by more than one person.

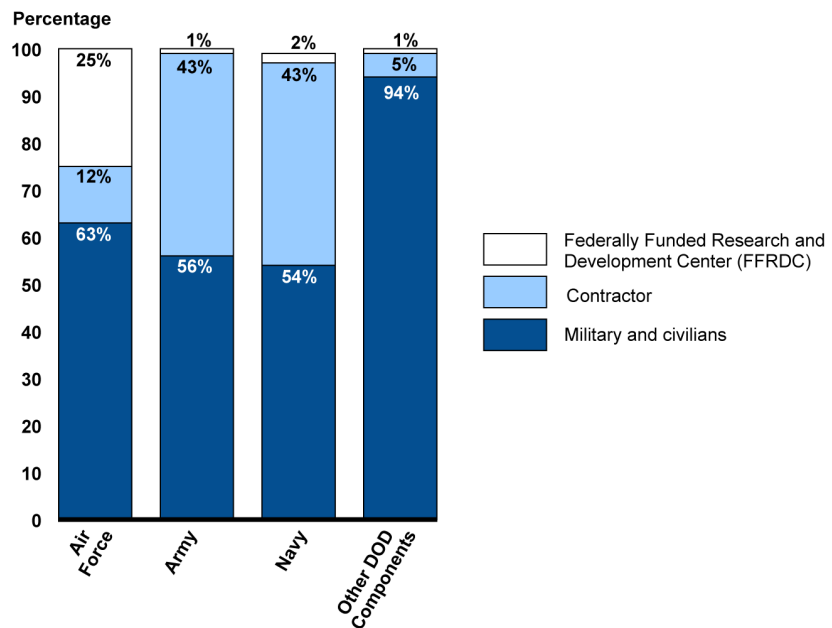
^b The number of contractor personnel identified reflects the number of full-time equivalents identified by DOD as supporting space acquisitions, which may have been performed by more than one person.

^c The number of military and civilians identified reflects the number of personnel identified by DOD as working 50 percent or more of their time on space acquisitions.

Military and civilian personnel comprised about 64 percent of the total space acquisition workforce, the vast majority of which support Air Force acquisitions. The remaining 36 percent of the workforce is contractor and FFRDC personnel that support DOD’s space acquisition activities. The Air Force has the largest number of military and civilian personnel because the Air Force has primarily been responsible for DOD’s space acquisitions and develops programs for all four segments of space capability, including launch services for the most critical national security space satellites. The Navy is responsible for systems that provide satellite communications across DOD as well as its user segments, while the Army and other DOD components primarily focus their efforts on developing their user segment systems or other space-related projects.

- Workforce Mix:** Based on data we collected from multiple DOD space acquisition organizations, the mix of military, civilian, contractor, and FFRDC personnel that each military service and agency had supporting their respective space acquisition programs varied considerably (see figure 3).

Figure 3: Percentage of Department of Defense (DOD) Space Acquisition Workforce Identified by GAO Used by Components to Support Their Respective Programs as of December 31, 2017, by Personnel Type



| Personnel type | Air Force | Army | Navy | Other DOD Components | Total |
|-------------------------------------|--------------|--------------|------------|----------------------|--------------|
| FFRDC ^a | 1,516 | 9 | 3 | 4 | 1,532 |
| Contractor ^b | 751 | 562 | 55 | 32 | 1,400 |
| Military and civilians ^c | 3,833 | 725 | 69 | 562 | 5,189 |
| Total | 6,100 | 1,296 | 127 | 598 | 8,121 |

Source: GAO analysis of DOD reported data. | GAO-19-240

^a The number of FFRDC staff reflects the staff years of technical effort equivalent identified by DOD, which may have been performed by more than one person.

^b The number of contractor personnel identified reflects the number of full-time equivalents identified by DOD as supporting space acquisitions, which may have been performed by more than one person.

^c The number of military and civilians identified reflects the number of personnel identified by DOD as working 50 percent or more of their time on space acquisitions.

Note: Totals may not add to 100 percent due to rounding.

Military and civilian personnel comprised between 54 and 63 percent of the Air Force's, Army's, and Navy's space acquisition workforce and 94 percent of the other DOD components' workforces. Contractors and FFRDC personnel made up the remainder of the workforce. The Air Force relies more heavily on FFRDC personnel as a percentage of its workforce than the Army, Navy, and other DOD components. According to Air Force officials, the Space and Missile Systems Center—the Air Force's major space acquisition organization—has relied heavily on FFRDC support for space engineering and technical expertise since its founding in the 1950s. The Army and Navy primarily rely on contractors for their remaining support. These contractors mainly provide technical expertise, such as engineering services, to support military and civilian personnel. Some contractors also support program management and business and administration activities, such as cost estimating. Figure 4 provides detailed examples of how personnel support two space acquisition programs included in our review.

Figure 4: Selected Department of Defense (DOD) Space Programs' Descriptions of Their Use of Military, Civilian, Contractor, and Federally-Funded Research and Development Center (FFRDC) Personnel



Source: United Launch Alliance and SpaceX.

Program size and workforce mix as of December 31, 2017:

| | Personnel | Percent |
|-----------------------|------------|------------|
| Military and Civilian | 195 | 25 |
| Contractor | 169 | 22 |
| FFRDC | 405 | 53 |
| Total | 769 | 100 |

Evolved Expendable Launch Vehicle Program

The Evolved Expendable Launch Vehicle program provides launch services for government missions using contractor-provided launch vehicles. The program is focused on ensuring DOD's access to space. In 2018, the program awarded three contracts to develop launch vehicle prototypes. In 2019, the program plans to award two contracts to launch providers for a combined total of about 25 launches to occur from 2022 through 2026.

Contractor personnel comprised 22 percent of the program's workforce. The majority, 152 of 169 personnel, performed technical work in support of the program's managers and engineers. Some also provided business and program management support. For example, 10 contractor personnel performed cost estimating and financial management services and 7 assisted with program management.

Military and civilian personnel comprised 25 percent of the program's workforce. They held key leadership positions in program management, engineering, and contracting. Of these 195 government personnel:

- 68 performed program management activities;
- 72 provided engineering and test and evaluation services;
- 50 provided business support services, such as cost estimating, financial management and contracting; and
- 5 performed life cycle logistics management activities.

FFRDC personnel comprised the remaining 53 percent of the program's workforce. These 405 FFRDC personnel provided launch expertise that was not available in the civilian or military engineering workforce, according to program officials. They performed in-depth technical analysis of launch vehicles that were developed, manufactured, and tested by the prime contractors to ensure design stability and launch readiness



Source: United States Air Force.

Program size and workforce mix as of December 31, 2017:

| | Personnel | Percent |
|-----------------------|-----------|------------|
| Military and Civilian | 13 | 27 |
| Contractor | 19 | 40 |
| FFRDC | 16 | 33 |
| Total | 48 | 100 |

Protected Tactical Enterprise Service Program

The Protected Tactical Enterprise Service program is developing a software-intensive ground system that is expected to provide secure tactical satellite communications to the warfighter. The program awarded a development contract in 2019.

Contractor personnel comprised the largest portion—40 percent—of the program's space workforce. Most of the 19 contractor personnel functioned as systems engineering subject matter experts who provided technical expertise to government personnel. Some contractor personnel provided program management support, such as writing technical documents for the request for proposals and other acquisition documents in preparation for the program's development contract award in fiscal year 2019.

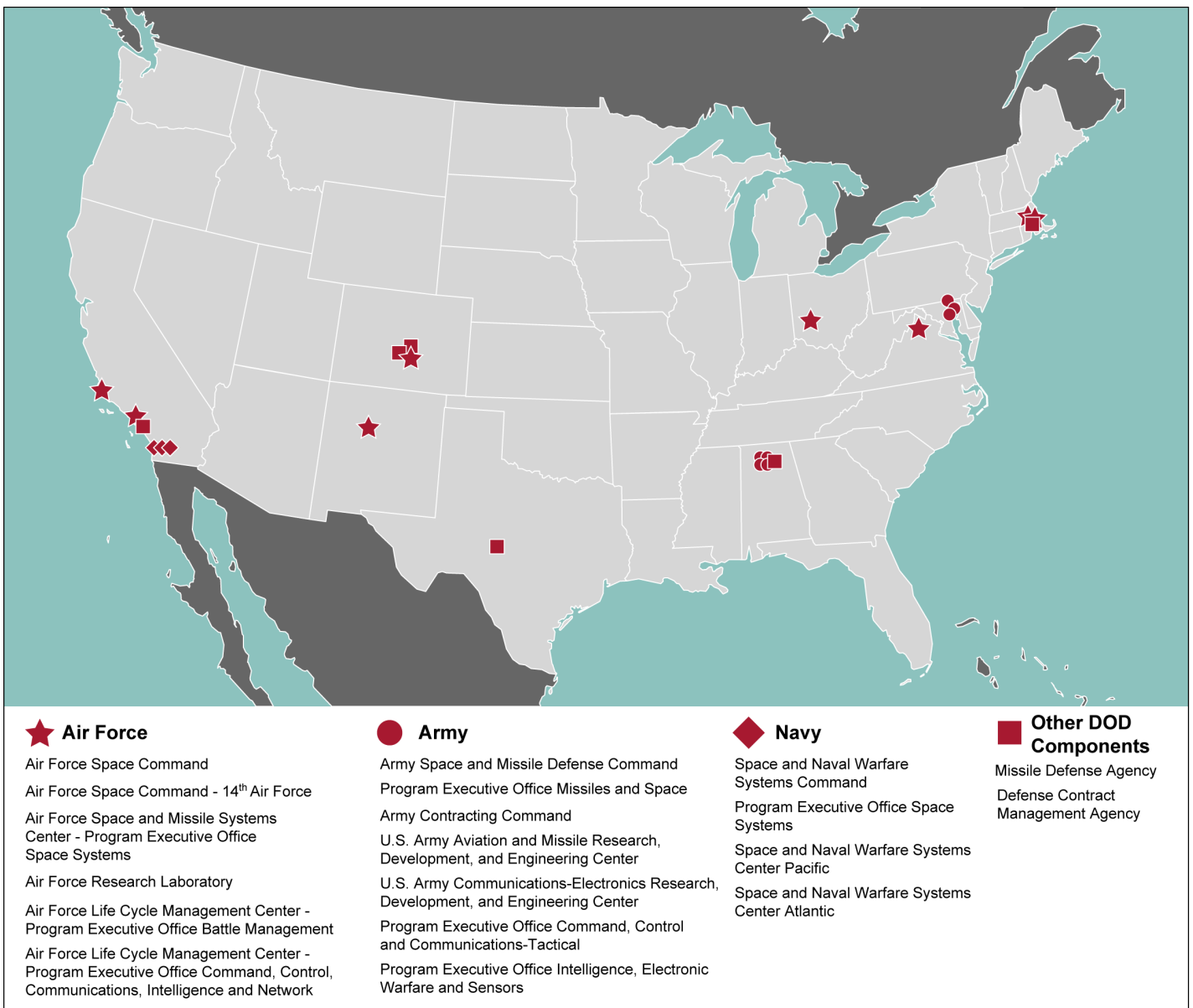
Military and civilian personnel comprised 27 percent of the program's workforce. The 13 military and civilian personnel included the program manager, chief engineer, and business manager. Most of these personnel were responsible for managing the program and overseeing the work completed by FFRDC and contractor personnel, including approving technical inputs for the request for proposals written by contractor personnel. Some also managed engineering and test and evaluation activities.

FFRDC personnel comprised 33 percent of the program's workforce. The 16 FFRDC personnel performed a variety of services, including providing technical training for government personnel, information technology expertise, and program management support, such as reviewing technical information in program acquisition documents.

Source: GAO analysis of DOD data. | GAO-19-240

- Locations of Workforce: Based on data we collected from multiple DOD space acquisition organizations, space acquisition personnel work at over 20 organizations located across the United States. Figure 5 shows the primary locations of DOD's space acquisition organizations.

Figure 5: Primary Locations of Department of Defense (DOD) Organizations Performing Space Acquisition Work as of December 31, 2017



Source: GAO presentation of DOD documentation (data); Map Resources (map). | GAO-19-240

Note: The map shows the primary locations where space systems acquisition work is performed. Some organizations also have other locations that are not shown. For example, the Defense Contract Management Agency identified 18 offices, but only the 5 largest are shown on the map.

About 45 percent of the overall space acquisition workforce is located at the Air Force Space and Missile Systems Center in Los Angeles, California. The Army space acquisition workforce is located primarily at Redstone Arsenal in Huntsville, Alabama, and Aberdeen Proving Ground, Maryland. The Navy space acquisition workforce is located at the Space and Naval Warfare Systems Command in San Diego, California, and a few other locations.

DOD Faces Challenges Hiring, Assigning, and Retaining Qualified Personnel to Work on Space Acquisition Programs, but Is Taking Steps to Address These Challenges

DOD faces several challenges related to hiring, assigning, and retaining qualified personnel to work on space acquisition programs, similar to the challenges it faces more generally with the acquisition workforce. However, some of the challenges are magnified because almost half of the military and civilian space acquisition workforce is concentrated in Los Angeles, California, which has a higher cost of living than many other areas in the United States, and where competition with private industry for personnel with space acquisition experience is high. DOD is taking steps to address these challenges where possible.

DOD Faces Challenges Hiring Qualified Candidates, but Is Taking Steps to Address Them

DOD officials told us that one of the primary workforce challenges DOD faces is its ability to hire qualified people to work on space acquisitions. They said that DOD is competing with private industry and other federal agencies for top talent in several acquisition career fields.

- **Attracting Candidates with Technical Expertise.** DOD officials stated that it is particularly difficult to attract people with certain technical expertise, such as cybersecurity and systems engineering, because they are in high demand in both government and private industry. Air Force officials said the government cannot match the salaries offered by industry. For example, the Launch and Test Range System program office told us that a shortage of trained and qualified cybersecurity personnel exists both within the government and industry. Our prior work has described how maintaining cybersecurity personnel is a challenge government-wide, and that, according to DOD officials, even when DOD

cybersecurity positions are filled, it may not necessarily be with the right expertise since it is a specialized area.²¹

- **Hiring in Areas with Higher Costs of Living.** Air Force officials at the Space and Missile Systems Center said that hiring challenges are further exacerbated for space acquisition organizations that are located in areas with higher costs of living. They said, for example, that prospective employees often visit the center in Los Angeles, California, and, after assessing the local cost of living, decide not to accept a job offer.

DOD is taking steps to address its hiring challenges.

- To address difficulties in obtaining personnel with sufficient technical experience, some officials told us that they typically hire the best candidate available—who may lack some of the desired technical skills—and provide them with on-the-job and formal training to increase their technical knowledge and skills.
- To better compete with higher salaries offered by other potential employers, several officials told us they offer tuition reimbursement as a recruiting incentive.
- Air Force officials told us that in areas with higher costs of living they focus their recruiting efforts on the local area because local candidates already understand the higher costs of living challenges for the area and are more likely to have support systems in place to manage such costs.

DOD Faces Challenges Assigning Experienced Personnel to Space Acquisition Programs, but Is Taking Steps to Address Them

Beyond the concerns expressed about hiring personnel, Air Force Space and Missile Systems Center officials expressed concerns that some functional areas within the space acquisition workforce face challenges assigning experienced personnel—personnel with the appropriate knowledge and skill set to perform the work—that are already hired to space acquisition programs. For example, contracting career field officials at the center noted that the space acquisition workforce does not have enough mid-level personnel who understand the detailed steps and documentation required in the acquisition process. In particular, the Air Force Space and Missile Systems Center reported that at the end of January 2018, the number of mid-level civilian and military personnel working in the contracting functional career field was 50 less than the

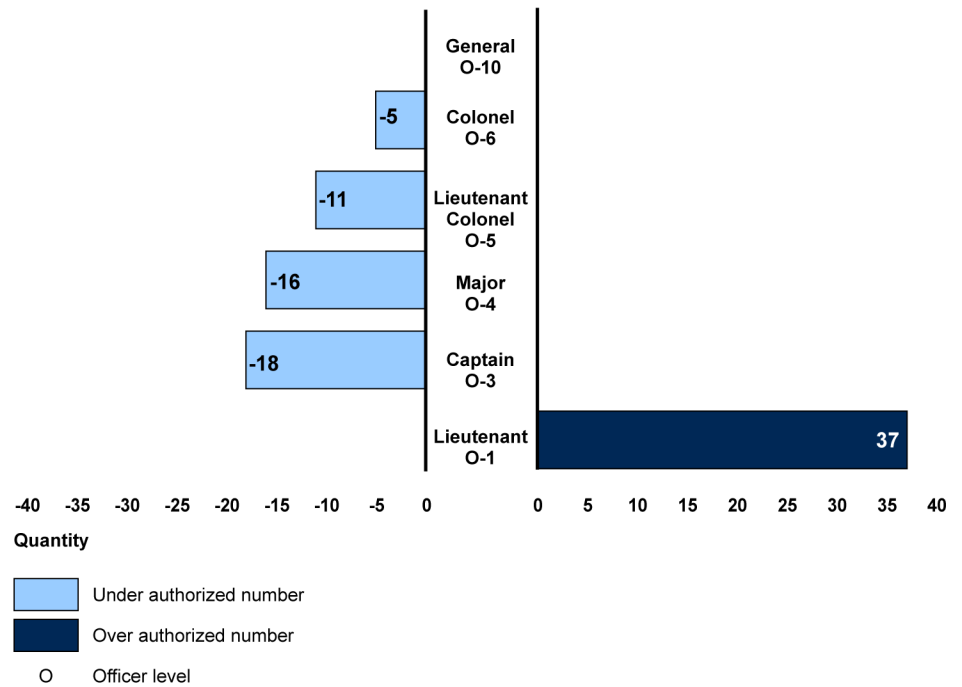
²¹ GAO, *Weapons Systems Cybersecurity: DOD Just Beginning to Grapple with Scale of Vulnerabilities*, [GAO-19-128](#) (Washington, D.C.: October 9, 2018).

number authorized.²² According to contracting career field officials at the center, a large number of mid-level procurement contracting officer positions were vacant, and senior procurement managers were picking up the corresponding workloads rather than performing their staff development and strategic planning tasks.

Furthermore, officials from the Air Force's Space and Missile Systems Center program management functional office also expressed concern that the bulk of the military personnel assigned to the program management positions were more junior in rank than the Center was authorized by the Air Force to obtain. Figure 6 shows the level of the Air Force Space and Missile Systems Center personnel that filled its program management positions as of January 2018. Junior officers typically have less experience managing acquisition programs than more senior officers.

²² In commenting on a draft of this report, the Air Force Space and Missile Systems Center reported that as of February 2019 the number of vacancies in the mid-level civilian and military contracting functional career field was 28 less than the number authorized.

Figure 6: Number of Military Program Managers Filling Positions Whose Rank Is Lower or Higher than Authorized Levels at Air Force Space and Missile Systems Center as of January 2018



Source: GAO presentation of Department of Defense data. | GAO-19-240

Note: An additional 13 military positions were vacant.

The military services are taking steps to manage the effects of military and civilian personnel skills and experience gaps, to some degree, by having contractor personnel perform the work. For example, the Air Force Space and Missile Systems Center’s contracting functional office used four contractor personnel to support its pricing work.

DOD Faces Challenges Retaining Experienced Personnel in Space Acquisitions, but Is Taking Steps to Address Them

DOD has also experienced challenges with retaining some space acquisition personnel, especially those within their first few years of joining federal government service that had obtained certain acquisition-related experience or authorities. For example, contracting career field officials at the Air Force Space and Missile Systems Center said that they have difficulty retaining contracting officers once they receive their contract warrant authority because they can obtain a higher compensation package from private industry companies. Receiving contract warrant authority is considered an indication that the individual

gained sufficient skills and experience to be able to perform the work involved in writing, awarding, and managing contracts.²³ Officials also stated that some personnel leave after obtaining security clearances required to perform their work because private companies working on government contracts pay more to qualified individuals with clearances.

Officials from the Air Force Space and Missile Systems Center and Army Space and Missile Defense Command also told us that they have difficulty retaining engineers. They said some engineers have left because they were not satisfied with being used as generalists to oversee the work of FFRDC or contractor personnel, rather than being used to perform hands-on engineering work. Officials also stated that this situation is not unique to space acquisitions—government engineers seldom get to design, develop, or build systems as the hands-on engineering work is primarily performed by prime contractors. Air Force Space and Missile Systems Center officials said they are trying to help the government engineers understand how to influence decisions and be more effective in working as part of the space engineering acquisition team, which would include military, civilian, contractor, and FFRDC personnel.

Officials from various functional career fields at these Air Force and Army locations noted that limited promotion opportunities for civilian personnel in space acquisitions also cause retention challenges. For example, the Air Force Space and Missile System Center has 53 management (General Schedule 15) positions; however, Center officials told us that the turnover rate for these higher-level positions is low. Officials reported that some mid-level program management personnel seek and accept promotions at other non-space acquisition offices or in other geographical locations that have more promotion opportunities.

Some Air Force Space and Missile Systems Center and Army officials noted that retention incentives are used to help retain staff. This includes student loan repayments, and recognition incentives, such as monetary or time-off awards tied to performance. Air Force Space and Missile Systems Center officials also said that they are working to realign current civilian acquisition personnel at the center under the Civilian Acquisition

²³ Per Federal Acquisition Regulation, contracting authority is granted by an appointing official after considering the complexity and dollar value of the acquisitions to be assigned and the candidate's experience, training, education, business acumen, judgment, character, and reputation. (Federal Acquisition Regulation § 1.603-2).

Workforce Demonstration project, which they believe will help attract, retain, and motivate high-quality civilian personnel for the acquisition workforce.²⁴

Conclusions

DOD space systems and the personnel who work to acquire them remain critical components of national security and key resources. As DOD takes steps toward establishing the United States Space Command, its Space Development Agency, and potentially the United States Space Force, it will be essential to understand the size, mix, and location of the space acquisition workforce. However, DOD does not collect and maintain this type of comprehensive data on its space acquisition workforce. Although we were able to pull together information on the space acquisition workforce, the data represent a snapshot of the workforce at one point in time, and are not complete since acquisition personnel working on National Reconnaissance Office space programs and those who spent less than 50 percent of their time working on space acquisitions were not included.

Taking steps to identify and routinely track accurate information on space acquisition programs and the organizations and personnel that support those programs would provide several benefits to DOD. In particular, it would better position DOD to assess whether it has the appropriate number and mix of military, civilian, contractor, and FFRDC personnel working on space acquisitions and to make adjustments if necessary. Further, it would better position DOD to make decisions on which acquisition personnel will support or transition into the United States Space Command or the new Space Development Agency, since DOD has not clearly defined what acquisition functions may or may not be handled by these new organizations. Finally, comprehensive data on the space acquisition workforce would also be beneficial to support DOD's development of its legislative proposal regarding the establishment of the United States Space Force.

²⁴ DOD implemented the Civilian Acquisition Workforce Demonstration Project in 1999. Among other initiatives, it simplifies the hiring process and allows for more flexibility in determining compensation. It promotes greater compensation for those who are the highest contributors to the organization's mission based on factors such as level of effort and required skills and certifications.

Recommendations for Executive Action

We are making the following two recommendations to DOD:

The Secretary of Defense should direct the military services and other DOD components to identify the universe of space acquisition programs, as well as the various organizations that support these programs, and report this information to Congress. In doing so, DOD should implement procedures to maintain and periodically update the list. (Recommendation 1)

The Under Secretary of Defense for Acquisition and Sustainment, in conjunction with the Under Secretaries of Defense for Research and Development and for Personnel and Readiness, should collect and maintain data on acquisition-coded military and civilian personnel that support space acquisition programs and related activities—including those that may do so less than full time—as well as track the contractor and FFRDC workforce general levels of effort supporting space acquisition programs and related activities and the total resources annually committed to perform that work. (Recommendation 2)

Agency Comments and Our Evaluation

We provided a draft of this report to DOD for review and comment. DOD provided written comments (reproduced in appendix II) on our draft report. In those comments, DOD concurred with our first recommendation to identify the universe of space acquisition programs, as well as the various organizations that support these programs, and report this information to Congress. DOD did not concur with our draft second recommendation to collect and maintain data on the space acquisition workforce. DOD stated that the manner in which personnel data are captured in its human resource and development systems makes it difficult to identify, collect, and maintain data on the military and civilian personnel working on space acquisition programs. Further, DOD raised concerns over contractual limitations on collecting and maintaining data on contractor and FFRDC personnel supporting space acquisitions. In light of these concerns, we made changes to the draft recommendation. We believe the language of our final recommendation will better facilitate implementation by DOD.

With regard to our second recommendation, we continue to believe that taking steps to identify military and civilian personnel supporting space acquisition programs would support DOD's strategic workforce planning, particularly considering DOD's recent legislative proposal for establishing the United States Space Force. For example, we acknowledge that the current personnel data system used to track military and civilian

acquisition personnel has limitations, but we believe taking steps to make minor modifications to the system to facilitate identifying and routinely tracking accurate information on these two segments of the space acquisition workforce would provide several benefits to DOD. Most importantly, it would help DOD make decisions on how many and which military and civilian acquisition personnel should be assigned to the new space organizations—namely the Space Development Agency, the United States Space Command, and the United States Space Force. With regard to DOD’s comment that our recommendations do not recognize that DOD personnel have been shifted into and out of space acquisition programs, we recognize that acquisition personnel have been moved across programs and support space and non-space acquisitions. However, we continue to believe that DOD should have better information on military and civilian acquisition personnel. In particular, knowing which personnel have space acquisition backgrounds could enhance the productivity and effectiveness of DOD’s space acquisition efforts. As a result, we did not make a change to our second recommendation as it relates to military and civilian space acquisition personnel.

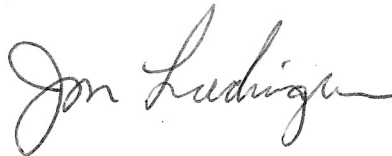
However, in consideration of the concerns raised by DOD about tracking data on contractor and FFRDC personnel who are supporting space acquisition activities, we modified our second recommendation. It was not our intention to have DOD undertake significant modifications to the relevant contracts to obtain data on these segments of the space acquisition workforce. However, understanding the extent to which space acquisition programs rely on contractor and FFRDC personnel for support could be useful in helping DOD determine the right number and mix of military and civilian personnel needed in the new space organizations. As a result, we modified the language of our second recommendation to focus on tracking the contractor and FFRDC workforce general levels of effort supporting space acquisition activities and the resources spent to obtain this assistance, rather than—as we stated in our draft recommendation—tracking the individuals who perform such work. However, we continue to believe that collecting and maintaining more robust data on that workforce will support DOD’s planning efforts and better inform Congress.

DOD also expressed concern that our report may be equating statements of officials at the staff- and operational-level to military service- and DOD-level officials. We reviewed statements attributed to DOD officials throughout our report. Where necessary, we clarified attributions to better reflect the appropriate level of the officials with whom we discussed the corresponding information during our review.

DOD also provided technical comments on our draft report, which we incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees; the Acting Secretary of Defense; and the Secretaries of the Air Force, Army, and Navy. In addition, the report will be available at no charge on GAO's website at <http://www.gao.gov>.

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



Jon Ludwigson
Acting Director, Contracting and National Security Acquisitions

List of Committees

The Honorable James M. Inhofe
Chairman

The Honorable Jack Reed
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Richard Shelby
Chairman

The Honorable Richard Durbin
Ranking Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable Adam Smith
Chairman

The Honorable Mac Thornberry
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Peter Visclosky
Chairman

The Honorable Ken Calvert
Ranking Member
Subcommittee on Defense
Committee on Appropriations
House of Representatives

Appendix I: Objectives, Scope, and Methodology

A House Report related to the National Defense Authorization Act of Fiscal Year 2017 contained a provision for GAO to review the current state of the Department of Defense's (DOD) space systems acquisition workforce.¹ This report examines (1) what DOD knows about the size, mix, and location of its space acquisition workforce, and (2) the challenges, if any, DOD faces in hiring, staffing, and retaining space acquisition workforce personnel. For the purpose of this report, we defined the space acquisition workforce broadly to include military, civilian, contractor, and Federally Funded Research and Development Center (FFRDC) personnel working on space acquisition programs and related efforts.

To determine what DOD knows about the size, mix, and location of the space acquisition workforce, we met with officials from DOD's Office of Human Capital Initiatives, the Air Force, the Army, the Navy, and 4th Estate's Director of Acquisition Career Management to obtain information that is collected on the space acquisition workforce. We were told by each of these officials that DOD does not have a group of personnel officially designated as the space acquisition workforce. They stated that DOD has separate mechanisms for collecting military, civilian, contractor, and FFRDC workforce data and that none of these systems contained the level of granularity we would need to identify all personnel working on space acquisitions. Specifically, the sources we discussed were DOD's Data Mart system, a central repository for military and civilian acquisition workforce data, as well as workforce data systems maintained by DOD components that feed into the Data Mart system; the Enterprise-wide Contractor Manpower Reporting Application system for contractor services data; and FFRDC data maintained by military components.

We collected data on the size, mix, and location of the space acquisition workforce from the space organizations performing space acquisition activities. The Directors of Acquisition Career Management for the military services and the 4th Estate defense agencies provided a list of organizations that could be working on space acquisitions based on DOD's 2017 space system definition, which states that a space system includes all areas related to making a space capability operational—that is programs acquiring satellites, satellite ground systems (including satellite control and data processing), receivers/user segments (including

¹ H.R. Rep. No. 114-537, accompanying H.R. 4909, 114th Cong. (2016). The report specified that the space acquisition workforce of the National Reconnaissance Office should be excluded from our review.

terminals and radios), and launch systems. It also specifies that terminals are included unless they are embedded as part of a platform (i.e., aircraft, ship, or tank).²

We contacted each of the identified space organizations to verify that they had personnel working on space acquisitions based on this definition. Three of the organizations we originally contacted stated their organizations did not work on any space acquisition programs based on the definition. We did not include these organizations in our data gathering efforts. We also identified other organizations that worked on space acquisitions through discussions with acquisition management officials from the Army and included these organizations in our data gathering efforts. We asked each space organization to identify the number of military and civilian personnel working on space acquisition activities for 50 percent or more of their work time as of December 31, 2017. We used the threshold of 50 percent or more of the time to be consistent with the DOD definition of the acquisition workforce, which requires personnel to work 50 percent or more of their work time on acquisition activities to be counted as part of that workforce. DOD officials could not identify the number of contractor and FFRDC personnel working on space acquisitions. Therefore, for contractor and FFRDC personnel, we asked for the number of full-time equivalencies and staff-years of technical effort equivalencies, respectively, provided as support to space acquisitions. We requested that the personnel data be categorized by acquisition career field.

We collected data from each DOD component as follows:

- Air Force

The Air Force Director of Acquisition Career Management provided military and civilian workforce data from the Air Force's Acquisition Career Management System that feeds into Data Mart for all Air Force organizations where the entire organization works on space acquisitions. These organizations were the Air Force Space Command and the Networks Family of Advanced Beyond Line of Sight Terminals Division within the Air Force Life Cycle Management Center's Program Executive Office for Command, Control, Communications, Intelligence and Networks. The Deputy Director identified other space programs that are

² DOD, DOD Directive 5100.96, DOD Space Enterprise Governance and Principal DOD Space Advisor, § G.2 (June 9, 2017).

managed by the Air Force Life Cycle Management Center, but could not identify which military and civilian personnel were supporting those programs because the workforce data system is not configured to identify personnel by product types. In addition, the Deputy Director could not provide data on the number of contractor or FFRDC personnel working on any space acquisition program. We contacted these organizations directly to collect additional military, civilian, contractor and FFRDC workforce data:

- Air Force Space Command;
- Air Force Space and Missile Systems Center;
- Program Executive Office Command, Control, Communications, Intelligence and Networks;
- Program Executive Office Battle Management; and
- Air Force Research Laboratory.

These organizations provided personnel data from their respective manpower sources, such as personnel data systems or manning documents.

To assess the reliability of the data, we discussed the data and sources used to compile the data with Air Force officials; reviewed the data for logical inconsistencies; compared the data received from the Air Force workforce data system to data from Air Force Space and Missile Systems Center briefing documents; and compared relevant data received from individual space organizations with data from the Air Force Research Laboratory Space Vehicle Directorate.

- Army

We collected military, civilian, contractor and FFRDC workforce data directly from the following Army organizations performing space acquisition activities:

- Army Space and Missile Defense Command;
- Program Executive Office Missiles and Space;
- Program Executive Office Command, Control and Communications-Tactical;
- Program Executive Office Intelligence, Electronic Warfare and Sensors;

- Communications-Electronics Research, Development and Engineering Center;
- U.S. Army Aviation and Missile Research Development and Engineering Center; and
- Army Contracting Command.

These organizations provided personnel data from their respective manpower sources, such as personnel data systems or manning documents.

To assess data reliability, we discussed the data and sources used to compile the data with Army officials, and reviewed the data for logical inconsistencies.

- Navy

We collected military, civilian, contractor and FFRDC workforce data directly from the following Navy organizations:

- Space and Naval Warfare Systems Command;
- Program Executive Office Space Systems;
- Space and Naval Warfare Systems Center Pacific; and
- Space and Naval Warfare Systems Center Atlantic.

These organizations provided personnel data from their respective manpower sources, such as personnel data systems or manning documents.

The Naval Research Laboratory and the Navy's Program Executive Office for Command, Control, Communications, Computers and Intelligence were originally identified as performing space acquisition activities; however, officials stated they did not have any personnel working on space acquisition activities for at least 50 percent of their time.

To assess data reliability, we discussed the data and sources used to compile the data with Navy officials, and reviewed the data for logical inconsistencies.

- Other DOD Components

We collected military, civilian, contractor, and FFRDC workforce data directly from:

- Defense Contract Management Agency; and
- Missile Defense Agency.

To assess data reliability, we obtained information on the data and sources used to compile the data with the agencies' officials and reviewed the data for logical inconsistencies.

The Defense Advanced Research Projects Agency was originally identified as performing space acquisition activities; however, officials stated they did not have any personnel working on space acquisition activities for at least 50 percent of their time.

We determined the workforce data were sufficiently reliable to provide estimates of the general size and mix of the space acquisition workforce.

To assess any challenges DOD faces in hiring, staffing, and retaining its space acquisition workforce, we interviewed officials from multiple levels within DOD and the Air Force, Army and Navy. In addition to discussing the challenges with the majority of the military service space organizations listed above, we also met with the following DOD organizations:

- Office of Cost Assessment and Program Evaluation; and
- Defense Acquisition University.

To gather additional insight into the challenges faced at the program office level, we also interviewed officials from a non-generalizable sample of 10 space acquisition programs from the Air Force, Army, and Navy. The selected programs included different types of space acquisitions—such as satellites and launch systems—with a range of dollar values and phases of acquisition. During our review, the Air Force and Army had other space acquisition programs in addition to the ones we selected, whereas the Navy had one space acquisition program according to service officials. The selected programs from each military service included:

- Air Force
 - Advanced Extremely High Frequency (space segment)
 - Evolved Expendable Launch Vehicle (launch segment)
 - Launch and Test Range System (launch segment)
 - Protected Tactical Enterprise Service (ground segment)
 - Space Fence (ground segment)
 - United States Nuclear Detonation Detection System (ground segment)
- Army
 - Joint Tactical Ground Station (ground system)
 - Secure, Mobile, Anti-Jam, Reliable, Tactical–Terminal (user segment)
 - Transportable Tactical Command Communications (user segment)
- Navy
 - Mobile User Objective System (space segment)

We also reviewed prior DOD and other space acquisition studies, including reports from the Defense Science Board, Institute for Defense Analyses, Office of Management and Budget, and the RAND Corporation.

We conducted this performance audit from November 2017 to March 2019 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Comments from the Department of Defense



DEPARTMENT OF THE AIR FORCE
WASHINGTON DC

26 FEB 2019

OFFICE OF THE ASSISTANT SECRETARY

SAF/AQ
1060 AF Pentagon
Washington DC 20330-1060

Mr. William M. Solis
Director, Defense Capabilities and Management
U.S. Government Accountability Office
441 G Street, NW
Washington DC 20548

Dear Mr. Solis:

This is the Department of Defense (DoD) response to the GAO Draft Report, GAO-19-240, 'DEFENSE SPACE SYSTEMS: DOD Should Collect and Maintain Data on Its Space Acquisition Workforce,' dated January 25, 2019 (GAO Code 102424).

The Department is providing official written comments for inclusion in the report. Additionally, the report equates the statements of several individuals at the staff- and operational-level to Service- and Department-level leadership. This limits the effectiveness of the report in a manner that is detailed throughout the written comments attached.

Sincerely,

A handwritten signature in black ink, appearing to read "Arnold W. Bunch, Jr.".

ARNOLD W. BUNCH, JR., Lt Gen, USAF
Military Deputy, Office of the Assistant Secretary of
the Air Force (Acquisition, Technology & Logistics)

Attachments:

1. DoD Comments to the GAO Recommendations

GAO DRAFT REPORT DATED JANUARY 25, 2019
GAO-19-240 (GAO CODE 102424)

**“DEFENSE SPACE SYSTEMS: DOD SHOULD COLLECT AND MAINTAIN DATA
ON IT SPACE ACQUISITION WORKFORCE”**

**DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATIONS**

The GAO recommends that the Secretary of Defense should direct the military services and other DOD components to identify the universe of space acquisition programs, as well as the various organizations that support these programs, and report this information to Congress. In doing so, DOD should implement procedure to maintain and periodically update the list (Recommendation 1).

DoD RESPONSE: Concur. The Services currently identify space programs using budget documentation; the Major Force Program-12 (MFP-12) clearly delineates via the budget documentation what is a space program and what is not each year. However, there is no universally accepted common definition of what programs fall into the category of “space acquisition program”. This report alludes to four segments: space, ground, user and launch that are needed to make a space capability fully functional. For acquisition programs in these four segments clear guidance, using a common taxonomy, which determines what attributes identify them as a part of the space acquisition program universe is required. This will allow the department to better communicate what is a space program to Congress but it will not enhance the efficiency of the Departments acquisition process.

The GAO recommends that the Under Secretary of Defense for Acquisition and Sustainment, in conjunction with the Under Secretaries of Defense for Research and Development and for Personnel and Readiness, should collect and maintain data on acquisition-coded military and civilian personnel, as well as contractor and FFRDC personnel that support space acquisition programs and related activities-including those that may do so less than full time (Recommendation 2).

DoD RESPONSE: Non-concur. The Department non-concurs with this recommendation due to the lack of specificity in defining the workforce and the complexities of the human capital system where resources are developed across the breadth of acquisition programs and mission areas.

Acquisition-coded military and civilian personnel are the only segment of this recommendation that meet the definition of Department of Defense acquisition workforce members as stated in Chapter 87 of Title 10. These workforce members are managed and tracked by the Services who in turn accomplish the development of these employees through unique training, education and experiences. The services support acquisition programs in multiple mission areas in multiple domains. Members of the workforce do not follow one developmental model; some are deep in

a particular mission set while others develop across a breadth of mission areas and mission domains. The level of depth an individual has in particular domain or mission area is not currently tracked as the boundaries across these two terms are fluid and not clearly defined. The development of these employees contains aspects that are common across different types of acquisition programs and aspects that are acquisition program type specific. In addition employees are mobile across acquisition domains; they may be assigned to a space acquisition program for a period of time then move to a supporting staff function or to a program in another warfighting domain. An employee's utilization in support of a space acquisition program is not a constant across a career, yet their experience in that domain does make them a resource to be utilized across the time spectrum of growth and development. Human Resources are not static and their applicability as a space acquisition resource does not change with a change in position.

The recommendation as written seems to confuse the intricacies of personnel management and manpower (position) management. Defining positions—military and civilian—supporting exact programs is not easily accomplished due to alignment of personnel data in our current data systems but it is able to be accomplished. Again, in the dynamic personnel and manpower execution system these position alignments are not a constant. As programs progress manpower requirements are adjusted. Making a point in time assessments will not give the true cost in terms of manpower required to execute a particular program.

The other human resources aspect of the acquisition system is support in the form of staff years of technical effort (STE) provided through FFRDC's and Assistance and Advisory Services (A&AS) contracts. The Department does allocate STE on an annual basis based on requests from the services. STE is a common term used in execution of a particular level of effort and does not equate to an exact number of personnel. A single-STE effort may be executed by multiple individuals based on the time and amount of work required to accomplish a task under the contractual agreement. Any requirement for FFRDC's to identify specific personnel that support space programs specifically would require a contract action with well-defined criteria as personnel may support on a part time basis and also they may support multiple acquisition programs. This report does not show a clear understanding of the contractual challenges and complexities tied to execution of STE by our FFRDC partners. The Department has a clear understanding of the contractual requirements placed on our FFRDC partners, but that does not translate into a human resources alignment of people supporting programs.

The second aspect of human resources support comes in the form of A&AS Contracts. There are multiple contracts that are made across the DOD in support of multiple mission sets. Some of these contracts are clearly aligned with a particular acquisition program but many are not. The complexities of the recommendation put forth by the GAO are well outside contractual requirements that have already been established in contract actions. The Department collects data from contractors using the Contractor Manpower Reporting Application (CRMA); however, this data is not easily tied to exact acquisition programs. The current process gives the department visibility into what manpower levels are required to support the Department in multiple mission areas but not the visibility of the actual individuals that are supporting an exact acquisition program or program type. With multiple contracts supporting acquisition programs the burden of breaking this down to exact numbers of people, and as implies in this

recommendation the exact individuals, supporting a type of acquisition program would be a manual effort fraught with errors and data that would not effectively support decision making.

For the last two areas discussed, FFRDC's and A&AS contracts, the department has information at the aggregate level as it pertains to the level of effort required, but not down to the individual workforce members providing that level of effort. To gain that level of insight is impractical and would be contractually burdensome.

The outcomes of the GAO report that lead to this recommendation are more focused on a manpower position definition than a definition of human resources that are being developed by the Services to support acquisition programs. Thus the Department non-concurs with this recommendation due to the complexities within the military and civilian human resource and development systems that do not make it practical to identify, collect and maintain data on individuals that support space acquisition programs and related activities. Also, due to the multiple contractual and definition misunderstandings highlighted within this report in relation to the support provided by FFRDC's and A&AS contractors, it is impractical to collect and maintain data on the individuals being used to meet these contractual obligations.

Appendix III: GAO Contact and Staff Acknowledgements

GAO Contact

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Staff Acknowledgements

In addition to the contact named above, Cheryl K. Andrew (Assistant Director), Peter W. Anderson, R. Eli DeVan, Lorraine R. Ettaro, Lisa L. Fisher, Miranda Riemer, Anne Louise Taylor, and Lauren M. Wright made key contributions to this report.

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