



February 2019

MILITARY PERSONNEL

Strategy Needed to Improve Retention of Experienced Air Force Aircraft Maintainers

Accessible Version

GAO Highlights

Highlights of [GAO-19-160](#), a report to congressional committees

Why GAO Did This Study

Air Force aircraft maintainers are responsible for ensuring that the Air Force's aircraft are operationally ready and safe for its aviators—duties critical to successfully executing its national security mission. With more than 100,000 maintainers across the Air Force's active and reserve components, according to Air Force officials, aircraft maintenance is the Air Force's largest enlisted career field—accounting for about a quarter of its active duty enlisted personnel.

The conference report accompanying the National Defense Authorization Act for Fiscal Year 2018 included a provision for GAO to review the adequacy of the Air Force's aircraft maintainer workforce. This report assesses the extent to which, from fiscal years 2010 through 2017, the Air Force (1) had aircraft maintainer staffing gaps, (2) experienced attrition of maintainers and took steps to help retain maintainers, and (3) met its annual technical school completion rate goals for maintainers.

GAO analyzed aircraft maintainer staffing levels, loss and reenlistment rates, and technical school completion rates from fiscal years 2010-2017, the most recent data available; conducted five non-generalizable discussion groups with maintainers; and interviewed aviation industry, Department of Defense, and Air Force officials.

What GAO Recommends

GAO recommends that the Air Force develop annual retention goals and a retention strategy for aircraft maintainers. The Air Force concurred with both recommendations.

View [GAO-19-160](#). For more information, contact Brenda S. Farrell at (202) 512-3604 or farrellb@gao.gov.

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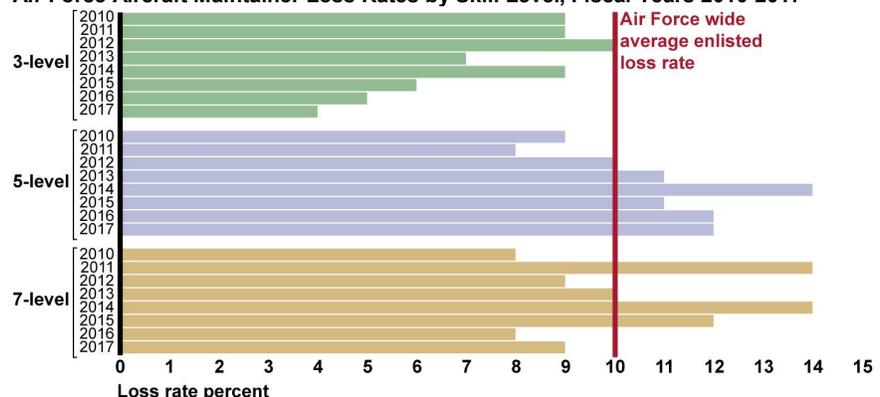
Strategy Needed to Improve Retention of Experienced Air Force Aircraft Maintainers

What GAO Found

The Air Force has reduced overall aircraft maintainer staffing gaps, but continues to have a gap of experienced maintainers. The Air Force reduced the overall gap between actual maintainer staffing levels and authorized levels from 4,016 maintainers (out of 66,439 authorized active component positions) in fiscal year 2015, to 745 in fiscal year 2017 (out of 66,559 positions). However, in 7 of the last 8 fiscal years, the Air Force had staffing gaps of experienced maintainers—those who are most qualified to meet mission needs and are needed to train new maintainers. Maintainers complete technical school as 3-levels and initially lack the experience and proficiency needed to meet mission needs. Following years of on-the-job training, among other things, maintainers upgrade to the 5- and 7-levels. In fiscal year 2017, the Air Force had gaps of more than 2,000 5-level and 400 7-level maintainers, and a surplus of over 1,700 3-levels. Air Force officials anticipate that staffing gaps will continue off and on through fiscal year 2023.

Over the past 8 fiscal years, the Air Force has increasingly lost experienced aircraft maintainers, and it does not have goals and a strategy to help retain maintainers. While overall maintainer loss rates have remained generally stable, loss rates of 5-levels increased from 9 percent in fiscal year 2010 to 12 percent in fiscal years 2016 and 2017 (see figure). Air Force officials expect 7-level loss rates to also increase. Air Force officials stated that they need to retain more maintainers to help address experience gaps, but the Air Force has not developed annual retention goals for maintainers. In addition, while the Air Force has increased its use of retention bonuses since fiscal year 2015, according to Air Force officials, it does not have a strategy to improve retention. Without goals to measure progress and a retention strategy to guide efforts, the Air Force could face further challenges in managing its maintenance workforce, including ensuring there are enough experienced maintainers to meet mission needs.

Air Force Aircraft Maintainer Loss Rates by Skill Level, Fiscal Years 2010-2017



Source: GAO analysis of Air Force data. | GAO-19-160

The Air Force consistently met technical school completion rate goals for aircraft maintainers from fiscal years 2010 through 2017. In fiscal year 2017, about 9,600 active component maintainers completed technical school, an increase from about 5,700 in fiscal year 2015. This increase in completions has helped to address overall staffing gaps, but cannot immediately resolve experience imbalances, due to the time and training needed to reach the 5- and 7-levels.

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Abbreviations

AETC Air Education and Training Command
DOD Department of Defense

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February 5, 2019

The Honorable James M. Inhofe
Chairman
The Honorable Jack Reed
Ranking Member
Committee on Armed Services
United States Senate

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

Air Force aircraft maintainers are responsible for ensuring that the Air Force's aircraft are operationally ready and safe for its aviators—duties that are critical to ensuring that the department is able to successfully execute its national security mission. Maintainers at the squadron-level perform a wide range of duties, including conducting inspections before and after flights, diagnosing and repairing system malfunctions, and loading and unloading munitions and explosives on aircraft, among many others. With more than 100,000 maintainers across the Air Force's active and reserve components, according to Air Force officials, aircraft maintenance is the Air Force's largest enlisted career field—accounting for about a quarter of its active duty enlisted personnel.

In September 2016, we reported that the Air Force cited aircraft maintainer staffing gaps—actual staffing levels that are lower than authorized levels—as a factor limiting its ability to produce the number of aircraft required to meet certain annual training requirements and that, while the Air Force was taking steps to address these gaps, it could take

several years to improve aircraft availability rates.¹ The conference report accompanying the National Defense Authorization Act for Fiscal Year 2018 included a provision for us to review the adequacy of the Air Force's aircraft maintainer workforce.² This report addresses, from fiscal years 2010 through 2017, the extent to which the Air Force: (1) had aircraft maintainer staffing gaps, (2) experienced attrition of aircraft maintainers, including any effects of competition with the commercial aviation industry, and took steps to help retain maintainers, and (3) met its annual technical school completion rate goals for aircraft maintainers.

For our first objective, we compared staffing levels authorized by the Air Force for enlisted aircraft maintainers—for the active and reserve components—with the actual number of maintainers available to staff those positions for fiscal years 2010 through 2017.³ We selected this timeframe to capture staffing levels before and after the Air Force's fiscal year 2014 reduction in end strength, and fiscal year 2017 was the most recent year for which complete data were available at the time of our review. Specifically, we analyzed the data to identify overall maintainer staffing gaps as well as any gaps by maintenance specialty and skill level. In addition, we compared maintainer personnel requirements to authorized staffing levels—the number of those requirements that were funded. To assess the reliability of the Air Force's requirements, authorized staffing levels, and actual staffing levels, we reviewed related documentation; assessed the data for errors, omissions, and inconsistencies; and interviewed officials. We determined that the data were sufficiently reliable to describe the Air Force's aircraft maintainer staffing levels and associated gaps from fiscal years 2010 through 2017. Additionally, we conducted interviews with relevant Air Force, Air National Guard, and Air Force Reserve Command officials to identify reasons for staffing challenges and actions the Air Force has taken to address them.

¹GAO, *Air Force Training: Further Analysis and Planning Needed to Improve Effectiveness*, [GAO-16-864](#) (Washington, D.C.: Sept. 19, 2016). The military services periodically review and update the human resources they determine are needed to accomplish specific jobs, workloads, missions, and programs, and state those figures (known as "requirements") in staffing documents. Once such a requirement is funded, it becomes part of the military service's end strength as an "authorized position." Actual staffing levels of various positions within the military services may differ from the number of authorized positions.

²H.R. Rep. No. 115-404, at 833-34 (2017) (Conf. Rep.).

³For the purposes of this report, when actual staffing levels are lower than authorized staffing levels, it is considered to be a staffing gap.

For our second objective, we calculated maintainer loss rates—the number of maintainers who leave the career field or the Air Force within the fiscal year over the number of maintainers at the start of the fiscal year—for the active and reserve components from fiscal years 2010 through 2017. We also analyzed overall aircraft maintainer reenlistment rates—the number of maintainers reenlisting each fiscal year over the number of maintainers eligible to reenlist—for the active component for fiscal years 2010 through 2017. To assess the reliability of the Air Force’s maintainer loss and reenlistment rate data, we reviewed related documentation; assessed the data for errors, omissions, and inconsistencies; and interviewed officials. We determined that the data were sufficiently reliable to describe both the Air Force’s aircraft maintainer loss and reenlistment rates from fiscal years 2010 through 2017. In addition, we reviewed the Air Force’s 2015 and 2017 aircraft maintainer retention survey analyses and conducted five discussion groups with a non-generalizable sample of aircraft maintainers to obtain their views on factors affecting maintainer retention, on-the-job training capacity, and commercial aviation industry opportunities, among other things.

We also reviewed the state of the commercial labor market for aircraft mechanics and aerospace engineers. We analyzed data from the Department of Labor’s Bureau of Labor Statistics’ Current Population Survey on the unemployment rate, employment, and median weekly earnings from 2012 through 2017, in accordance with economic literature. We chose this period because we previously reported on the data from 2000 through 2012.⁴ We reviewed documentation about the Bureau of Labor Statistics data and the systems that produced them, as well as our prior report, and determined the data were sufficiently reliable for the purposes of our indicator analysis. In addition, we conducted interviews with four commercial aviation industry stakeholders regarding any imbalances in aircraft mechanic demand and supply. We selected three of these organizations based on our previous work and one based on a recommendation from one of the three organizations. To determine what is known about the effects of the commercial aviation industry on the Air Force’s aircraft maintainer workforce, we conducted a literature search and review. We chose fiscal year 2010 as a starting point to match the timeframe for which we analyzed Air Force maintainer loss rates. We

⁴GAO, *Aviation Workforce: Current and Future Availability of Aviation Engineering and Maintenance Professionals*, [GAO-14-237](#) (Washington, D.C.: Feb. 28, 2014).

identified and screened 49 studies using a multi-step process to gauge their relevance and evaluate their methodology. We identified 1 study that had reliable and relevant information and we discuss the associated findings of this study below.

To assess the extent to which the Air Force has taken steps to help retain maintainers, we analyzed the number and total costs of selective retention bonuses (retention bonuses) that the Air Force awarded by maintenance specialty and skill level from fiscal years 2010 through 2017 for the active and reserve components. To assess the reliability of the Air Force's retention bonus data, we reviewed related documentation; assessed the data for errors, omissions, and inconsistencies; and interviewed officials. We determined that the data were sufficiently reliable to describe the number and total costs of the Air Force's aircraft maintainer retention bonuses from fiscal years 2010 through 2017. In addition, we conducted interviews with relevant Air Force officials regarding retention goals and monetary and non-monetary incentives to improve maintainer retention. We compared this information to *Standards for Internal Control in the Federal Government* related to monitoring activities and key principles of strategic workforce planning that we have identified in our prior work, such as developing strategies that are tailored to address gaps in numbers of people, skills, and competencies.⁵

For our third objective, we calculated technical school completion rates—the number of aircraft maintainers completing technical school compared to the number of programmed or expected completions—for the active component for fiscal years 2010 through 2017. We compared those completion rates to the Air Education and Training Command (AETC) established completion rate goal for the active component. For the Air National Guard and Air Force Reserve Command, we compared programmed completions to actual completions to determine their ability to meet training needs. To assess the reliability of the technical school completion data, we assessed the data for errors, omissions, and inconsistencies, and interviewed officials. We determined that the data were sufficiently reliable to describe the Air Force's aircraft maintainer technical school completion rates from fiscal years 2010 through 2017, rounded to the nearest hundreds up to fiscal year 2013, and more-precisely from fiscal years 2014 and beyond. In addition, we observed

⁵GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 10, 2014); and GAO, *Human Capital: Key Principles for Effective Strategic Workforce Planning*, [GAO-04-39](#) (Washington, D.C.: Dec. 11, 2003).

maintainer technical school training at Sheppard Air Force Base in Texas and Eglin Air Force Base in Florida. We selected these locations because they are two of the primary locations where aircraft maintainer technical school training occurs. Finally, we conducted interviews with technical school instructors about the training process, as well as AETC, Air National Guard, and Air Force Reserve Command officials about training challenges and programmed training needs. Our scope and methodology is described in detail in appendix I.

We conducted this performance audit from April 2018 to February 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.

Background

Air Force Aircraft Maintenance Specialties

Air Force aircraft maintainers are assigned to a specific maintenance specialty and, in some cases, also to a specific aircraft on which they are qualified to perform maintenance. As of April 2018, the Air Force had 37 enlisted maintenance specialties, each designated by an Air Force Specialty Code. See table 1 for examples of various Air Force maintenance specialties and examples of aircraft specific to those specialties, if applicable.

Table 1: Examples of Enlisted Air Force Aircraft Maintenance Specialties

Maintenance specialty	Examples of Duties and Responsibilities	Examples of aircraft/equipment
Aerospace propulsion	Inspects, maintains, modifies, tests, and repairs propellers, turboprop and turboshaft engines, jet engines, small gas turbine engines, and engine ground support equipment.	F100, F119, F135 jet engines
Aircraft electrical and environmental systems	Inspects, troubleshoots, and maintains aircraft electrical and environmental systems.	Various
Avionics test station and components	Performs and manages avionics test station functions and activities. Operates, inspects, maintains, programs, and calibrates computer and manually operated avionics test and support equipment.	A-10, B-2, C-17, F-16
Low observable aircraft structural maintenance	Evaluates, installs, removes, and repairs low observable coatings. Designs, repairs, modifies, and fabricates aircraft, metal, plastic, composite, advanced composite, low observable, and bonded structural parts and components. Applies preservative treatments to aircraft, aerospace ground equipment, and support equipment.	B-2, F-22, F-35
Nondestructive inspection	Inspects aerospace weapon systems components and support equipment for structural integrity. Performs nondestructive inspection on structures, components, and systems. Detects flaws such as cracks, processing defects, and heat damage using various methods.	Various
Remotely piloted aircraft maintenance	Maintains aircraft, support equipment, forms, and records. Performs and supervises flight chief, expediter, crew chief, repair and reclamation, quality assurance, and maintenance support functions.	MQ-1/MQ-9
Tactical aircraft maintenance	Maintains tactical aircraft, support equipment, and forms and records. Performs and supervises flight chief, expediter, crew chief, repair and reclamation, quality assurance, and maintenance support functions. Services aircraft, including end-of-runway, postflight, and preflight, and performs inspections. Uses technical data to diagnose and solve maintenance problems on aircraft systems.	A-10, U-2, F-15, F-16

Source: GAO analysis of Air Force information. | GAO-19-160

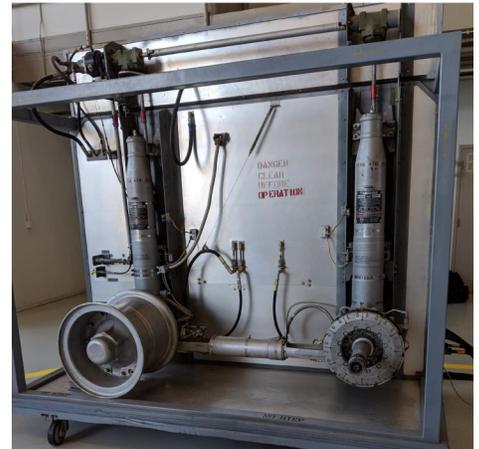
Maintainer Training Process and Skill Level Advancement

According to officials, following basic training, most airmen assigned to the aircraft maintenance career field attend some portion of technical school at Sheppard Air Force Base in Texas. Depending on the maintenance specialty, some maintainers may continue their technical training at a second location. For example, maintainers specializing on the F-35 complete additional training at Eglin Air Force Base in Florida after completing initial courses at Sheppard Air Force Base. Maintainers spend anywhere from 23 to 133 academic days in technical school learning about aircraft maintenance fundamentals and their specific maintenance specialties through a mix of classroom instruction and hands-on training. Hands-on training is conducted on both partially-functioning components of aircraft—called “trainers”—that replicate tasks on working aircraft, and on ground instructional training aircraft. Figure 1 shows various training equipment used by maintainers during technical school.

Figure 1: Examples of Air Force Aircraft Maintainer Training Equipment



F-22 cockpit trainer



C-130 main landing gear trainer



C-130 lighting, flight control, and cargo systems trainer



C-130 engine trainer

Source: GAO. | GAO-19-160

Air Force aircraft maintainers complete technical school as 3-levels, or apprentices. Maintainers are eligible to advance to the 5-level (journeyman) after completing additional coursework and a minimum of 12 months of on-the-job training. According to Air Force data, depending on the maintenance specialty, it takes an average of 1 to 2 years to advance to the 5-level. Maintainers are eligible to enter upgrade training to advance to the 7-level after being selected for the rank of Staff Sergeant. According to Air Force officials, the average time in service for promotion selection is 4.4 years. The 7-level is achieved by completing additional coursework, and completing a minimum of 12 months of on-the-job training. Depending on the maintenance specialty, it takes maintainers an average of 1 to 2 years after entering upgrade training to

advance to the 7-level.⁶ Figure 2 shows an overview of the Air Force’s aircraft maintainer training process and skill-level advancement.

Figure 2: Overview of Air Force Aircraft Maintainer Training Process and Skill-Level Advancement

Basic military training	Technical school	3-level maintainer	5-level maintainer	7-level maintainer
<ul style="list-style-type: none"> • Hands-on and classroom training on maintenance basics and introduction to aircraft work • Primary locations: Sheppard and Eglin Air Force Bases, Naval Air Station Pensacola, Joint Base Langley Eustis, Marine Corps Air Station New River • Length: 23-133 academic days • Requirements: Completion of basic training 	<ul style="list-style-type: none"> • On-the-job training • Training on maintainer specialty duties and aircraft specifics • Requirements: Completion of initial skill training courses (technical school) 	<ul style="list-style-type: none"> • Unsupervised flight line and back shop work • Trains 3-level maintainers and certifies their work • Requirements: 12 months upgrade training, mandatory courses 	<ul style="list-style-type: none"> • Unsupervised flight line and back shop work • Trains 3- and 5-level maintainers and certifies their work • Supervisory duties • Requirements: Minimum rank of Staff Sergeant, 12 months upgrade training, mandatory courses 	

Source: GAO analysis of Air Force information. | GAO-19-160

Air Force Process for Determining Maintainer Positions

Department of Defense (DOD) Directive 1100.4 states that staffing requirements are driven by workload and shall be established at the minimum levels necessary to accomplish mission and performance objectives. In addition, assigned missions shall be accomplished using the least costly mix of personnel (military, civilian, and contract) consistent with military requirements and other needs of DOD as prescribed in Title 10, United States Code.⁷ Air Force officials reported that they fill their requirements based on the number of those requirements that are funded—called authorized staffing levels—and the number of trained and qualified personnel available to be staffed to those positions. In this report, we refer to the number of maintainers available to fill authorized staffing levels as actual staffing levels.

⁶Department of Defense (DOD) officials stated that this timeline can differ for maintainers in the Air Force’s reserve component due to, among other things, technical school scheduling, time afforded by the maintainer’s civilian employer, and drill attendance.

⁷Department of Defense Directive 1100.4, *Guidance for Manpower Management* (Feb. 12, 2005).

The Air Force uses the Logistics Composite Model to determine maintainer staffing requirements.⁸ The model is a statistical simulation that estimates monthly labor-hours and personnel required to accomplish direct maintenance tasks. According to an Air Force official, locations are staffed according to the worldwide average for each particular maintenance specialty. For example, if the crew chief maintenance specialty worldwide is staffed at 88 percent, the Air Force would staff each overseas Major Command at 88 percent and distribute those resources to ensure the bases are staffed at that worldwide average, followed by domestic locations. An Air Force official stated that there are a number of reasons why a particular location may be staffed below or over the worldwide average, such as early releases from tours.

Commercial Aviation Industry and Airframe and Power Plant Certificates

Maintainers in the commercial aviation industry are commonly employed by commercial air carriers, corporate flight departments, repair stations, or manufacturers of aircraft or aircraft components. Aircraft mechanics inspect, service, and repair aircraft bodies (airframe) and engines (power plant). Aircraft mechanics can earn a mechanic certificate from the Federal Aviation Administration with an airframe rating, power plant rating, or combined airframe and power plant rating, and are referred to as certificated mechanics. According to Federal Aviation Administration data, almost all certificated mechanics hold airframe and power plant ratings. Certification is not necessary to work as an aircraft mechanic; however, without it, a mechanic cannot approve an aircraft for return to service and must be supervised by a certificated mechanic. Certificated mechanics that hold airframe and power plant ratings generally earn a higher wage and are more desirable to employers than mechanics who are not certificated, according to the Bureau of Labor Statistics.

For an applicant to be authorized to take the mechanics examination for the combined airframe and power plant rating, the applicant must either (1) complete a Federal Aviation Administration-certificated aviation maintenance technician school, and demonstrate and document relevant airframe and power plant work experience gained through on-the-job

⁸The Logistics Composite Model was created in the 1960s through a joint effort of the RAND Corporation and the Air Force Logistics Command to relate base-level logistics resources with each other and with sortie generation.

training, or (2) demonstrate and document work experience or some combination of work experience and education gained through the military working with airframes and engines.⁹

Since 2002, the Community College of the Air Force has administered the Federal Aviation Administration-approved Joint Services Aviation Maintenance Technician Certification Council (the Joint Services Council) program that, upon completion, confers a certificate of eligibility—equivalent to a training program diploma—to take the airframe and power plant exam. According to Community College of the Air Force officials, although the airframe and power plant certificate is not required for Air Force maintainer work, it does benefit maintainers' potential career prospects. The Joint Services Council's program is available to members of all services who have attained minimum requirements in aviation maintenance—typically after 3 years of experience in a related position—and includes three self-paced courses taken online in addition to on-the-job training. Additionally, the Air Force has established its Credentialing Opportunities On-Line program to help airmen find information on certifications and licenses related to their jobs. The program requires that the courses be accredited and be sought after within their industry or sector as a recognized, preferred, or required credential. The program also provides some funding assistance in obtaining airframe and power plant certificates.

The Air Force Has Significantly Reduced Overall Aircraft Maintainer Staffing Gaps but Continues to Lack Experienced Maintainers

Since fiscal year 2016, the Air Force has taken steps to significantly reduce the gap between actual aircraft maintainer staffing levels and

⁹Mechanics trained at a Federal Aviation Administration-approved aviation maintenance technician school complete, at a minimum, 1,900 curriculum hours of training: 750 curriculum hours in airframe subjects, 750 curriculum hours in power plant subjects, and 400 curriculum hours in general education subjects. Applicants seeking to take the mechanics examination for airframe and power plant ratings based on qualifying on-the-job training must provide documentary evidence of 30 months of practical experience concurrently performing the duties appropriate to the airframe and power plant ratings. In addition to education and training requirements, individuals must be at least 18 years of age and be able to read, write, speak, and understand English to be eligible for certification.

authorized levels, a gap which exceeded 4,000 maintainers in fiscal year 2015. However, gaps remain for experienced maintainers—those at the 5- and 7-levels who are most qualified to meet mission needs. The Air Force’s reserve component has also experienced aircraft maintainer staffing gaps over the past 8 fiscal years, although the Air National Guard’s gaps have been more consistent and significant than those of the Air Force Reserve Command.

The Air Force Has Made Significant Reductions to Overall Aircraft Maintainer Staffing Gaps

Since fiscal year 2016, the Air Force has taken steps to significantly reduce overall enlisted aircraft maintainer staffing gaps. According to our analysis of Air Force data, for all aircraft maintenance specialties combined, the Air Force reduced the gap between actual staffing levels and authorized levels from a peak of 4,016 maintainers (94 percent of authorized levels filled) in fiscal year 2015 to 745 maintainers (99 percent) in fiscal year 2017. In addition to a reduction in overall gaps, the number of maintenance specialties experiencing staffing gaps also decreased over this period. Specifically, while 12 maintenance specialties had actual staffing levels that were less than 90 percent of authorized levels in fiscal year 2015, only 4 did in fiscal year 2017.¹⁰ Additionally, in fiscal year 2017, actual staffing levels for 18 of the Air Force’s maintenance specialties met or exceeded authorized levels.

While the Air Force had a surplus of 1,705 maintainers in fiscal year 2010 (103 percent of authorized levels filled), actual staffing levels decreased to 99 percent of authorized levels in fiscal year 2011, and continued to decrease through fiscal year 2015. Air Force officials attributed these staffing gaps to an increase in authorized positions—due to the acquisition of the F-35 and increased maintenance needs for legacy aircraft, such as the F-15, F-16, and B-52—and a decrease in actual staffing levels, due to a reduction in end-strength from fiscal years 2014 through 2015.¹¹ These officials stated that the Air Force reduced its actual

¹⁰The four maintenance specialties with actual staffing levels less than 90 percent of authorized levels in fiscal year 2017 were: remotely piloted aircraft maintenance, helicopter/tiltrotor aircraft maintenance, bomber/special integrated communication/navigation/mission systems, and maintenance management.

¹¹Authorized end strength is the number of personnel that each component (Active, National Guard, and Reserve) of a military service is authorized by Congress to have at the end of a given fiscal year.

maintainer staffing levels through involuntary separations and reduced accessions due, in part, to the planned divestiture of the A-10 and other aircraft. However, these officials stated that the divestiture did not occur, which contributed to further staffing gaps.¹²

Since fiscal year 2016, the Air Force has taken a number of steps to reduce aircraft maintainer staffing gaps, such as increasing accessions and, beginning in fiscal year 2017, contracting out some maintenance positions. The Air Force also issued memorandums in August 2016 and September 2017 that restricted the ability of certain maintainers to retrain to a career field outside of aircraft maintenance.¹³ Additionally, from fiscal years 2016 through 2018, through the High Year of Tenure Extension Program, the Air Force extended the maximum number of years that maintainers in certain maintenance specialties could remain on active duty. According to October 2018 testimony, the Secretary of the Air Force stated that the Air Force planned to eliminate the overall maintainer staffing gap by December 2018.¹⁴ Air Force officials acknowledged that while staffing levels have started to improve since the reduction in end-strength, they anticipate that the Air Force will continue to experience maintainer staffing gaps off and on through fiscal year 2023, when the gap is projected to be about 500 maintainers, due, in part, to an increase in F-35 maintenance requirements. According to these officials, this estimate is based on recruitment cycles and retention trends, and could change if there are any programmatic changes, such as the addition or divestment of any aircraft types.

Over the past 8 fiscal years, the Air Force has accepted some level of risk in deciding how much of its maintainer requirements to fund. For example, according to our analysis, from fiscal years 2010 through 2017,

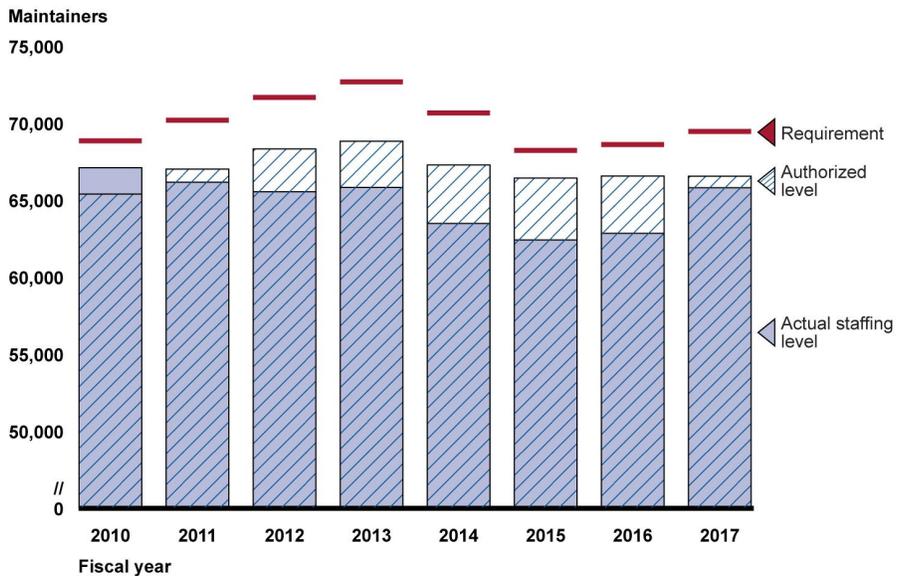
¹²In August 2016, we reported on the A-10 divestment decision, see GAO, *Force Structure: Better Information Needed to Support Air Force A-10 and Other Future Divestment Decisions*, [GAO-16-816](#) (Washington, D.C.: Aug. 24, 2016).

¹³These restrictions were, cumulatively, effective from October 1, 2016 through September 30, 2018. Air Force Logistics, Engineering & Force Protection (AF/A4) Memorandum, *Retraining Exception to Policy Requests* (Aug. 31, 2016), and Air Force Logistics, Engineering & Force Protection (AF/A4) Memorandum, *Aircraft Maintenance Retraining Exception to Policy Requests* (Sept. 30, 2017).

¹⁴*Current Readiness of the U.S. Air Force: Department of the Air Force Presentation to the Subcommittee on Readiness and Management Support of the Senate Committee on Armed Services*, 115th Congress (Oct. 10, 2018) (statement of the Honorable Heather A. Wilson, United States Secretary of the Air Force, and General Stephen W. Wilson, Vice Chief of Staff, United States Air Force).

the Air Force authorized or funded 95 to 97 percent of its maintainer requirements across maintenance specialties—that is, about 1,800 to 3,900 requirements were not funded each year. According to DOD officials, across all Air Force specialties decisions have to be made about how to fund requirements, and it is not uncommon for authorized levels to fall below requirements. Figure 3 compares the Air Force’s active component aircraft maintainer staffing levels, authorized levels, and requirements for all maintenance specialties combined over the past 8 fiscal years.

Figure 3: Air Force Active Component Aircraft Maintainer Actual Staffing Levels, Authorized Levels, and Requirements, Fiscal Years 2010-2017



Source: GAO analysis of Air Force data. | GAO-19-160

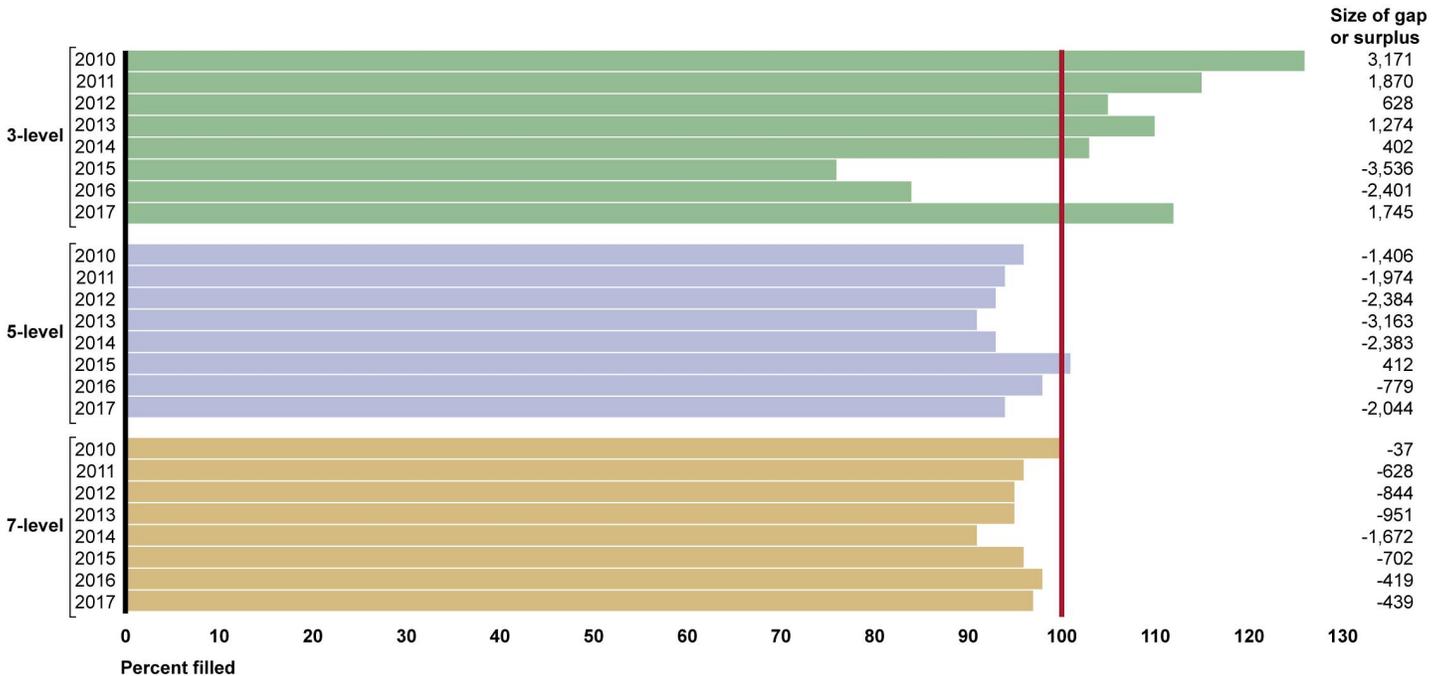
Air Force officials acknowledged that when taking into account increases in requirements—due in part to aging aircraft systems—maintainer staffing gaps have been higher than reported. Specifically, while the gap between actual and authorized staffing levels exceeded 4,000 maintainers in fiscal year 2015, when considering the number of requirements that were not funded, the gap was about 5,800 maintainers. Moreover, while maintainer requirements increased by about 1,200 between fiscal years 2015 and 2017, the number of authorized positions only increased by 120.

The Air Force Continues to Have Staffing Gaps of Experienced Aircraft Maintainers

Our analysis of Air Force data found that the Air Force has had staffing gaps of experienced aircraft maintainers—those at the 5- and 7-levels—in 7 of the past 8 fiscal years. While the Air Force’s actual maintainer staffing levels were 99 percent of authorized levels in fiscal year 2017, 3-level maintainers were the only skill level without a staffing gap. Specifically, in fiscal year 2017, the Air Force had a gap of 2,044 5-level maintainers (94 percent of authorized levels filled) and a gap of 439 7-level maintainers (97 percent).¹⁵ However, the Air Force had a surplus of 1,745 3-level maintainers (112 percent). Figure 4 compares, by skill level, actual aircraft maintainer staffing levels with authorized levels for all active component maintenance specialties combined over the past 8 fiscal years.

¹⁵Air Force officials stated that staffing level data reflect skill-levels by rank and, as a result, may not reflect the number of maintainers in the field that are qualified at the 3-, 5-, and 7- skill levels. For example, these officials stated that a maintainer may be qualified to perform 7-level maintainer duties in the field, but not yet have reached the rank of Technical Sergeant, therefore appearing in the staffing level data as a 5-level. For the purposes of staffing level data, these officials stated that 3-level maintainers are the ranks of Airman First Class and below, 5-level maintainers are the ranks of Senior Airman and Staff Sergeant, and 7-level maintainers are the ranks of Technical Sergeant and Master Sergeant.

Figure 4: Air Force Active Component Aircraft Maintainer Actual Staffing Levels Compared with Authorized Levels by Skill Level, Fiscal Years 2010-2017



Source: GAO analysis of Air Force data. | GAO-19-160

In fiscal years 2015 and 2016, the Air Force had significant gaps of 3-level maintainers—3,536 and 2,401, respectively—due to a decrease in accessions as part of its reduction in end strength. Air Force officials stated that these previous staffing gaps of 3-level maintainers have contributed to the current staffing gap of 5-level maintainers, since maintainers who were at the 3-level in fiscal years 2015 and 2016 would have likely upgraded to the 5-level by fiscal year 2017. These officials stated that, similarly, the current staffing gap of 5-level maintainers is expected to contribute to an increase in the size of the 7-level maintainer staffing gap over the next few fiscal years.

In fiscal year 2017, certain maintenance specialties and aircraft faced greater experience gaps than others. For example, the advanced fighter aircraft integrated avionics specialty had a gap of 140 7-level maintainers (70 percent of authorized levels filled) and a gap of 56 5-level

maintainers—all specifically trained on the F-35 (78 percent).¹⁶ In contrast, the aerospace ground equipment specialty had a surplus of 28 7-level maintainers (104 percent). Table 2 shows authorized versus actual staffing levels for select active component maintenance specialties and aircraft, by skill level, in fiscal year 2017.

Table 2: Staffing Levels by Skill Level for Select Active Component Aircraft Maintenance Specialties, Fiscal Year 2017

Maintenance specialty	Aircraft	Skill level	Number of authorized positions	Actual staffing level	Percent filled
Advanced fighter aircraft integrated avionics	F-35	5	254	198	78
	—	7	465	325	70
Aerospace ground equipment	—	5	1,663	1,652	99
	—	7	696	724	104
Aircraft armament systems	—	5	3,207	3,019	94
	—	7	1,420	1,444	102
Tactical aircraft maintenance (5th generation)	F-35	5	443	359	81
	F-22	5	433	433	100
	—	7	643	495	77
Remotely piloted aircraft maintenance	MQ-1/MQ-9	5	257	139	54
	RQ-4	5	71	81	114
	—	7	244	152	62

Source: GAO analysis of Air Force staffing level data and information. | GAO-19-160

Note: For some maintenance specialties, 3- and 5-level maintainers specialize on specific aircraft, but 7-level maintainers do not. For some maintenance specialties, none of the skill-levels specialize on specific aircraft. Those specialties are designated with a “—” in the table.

Air Force officials stated that it is important to have a balance of maintainer experience levels, but noted that current experience imbalances cannot be corrected as quickly as overall staffing gaps because rebuilding experience takes time. As previously discussed, depending on the maintenance specialty, the average time to upgrade from a 3-level to a 5-level ranges from 1 to 2 years, and the average time to upgrade from a 5-level to a 7-level after entering upgrade training is 1 to 2 years. Air Force officials highlighted that there is no substitute for experience.

¹⁶While 3- and 5-level maintainers assigned to the advanced fighter aircraft integrated avionics maintenance specialty specialize on a specific aircraft, 7-level maintainers assigned to the specialty do not.

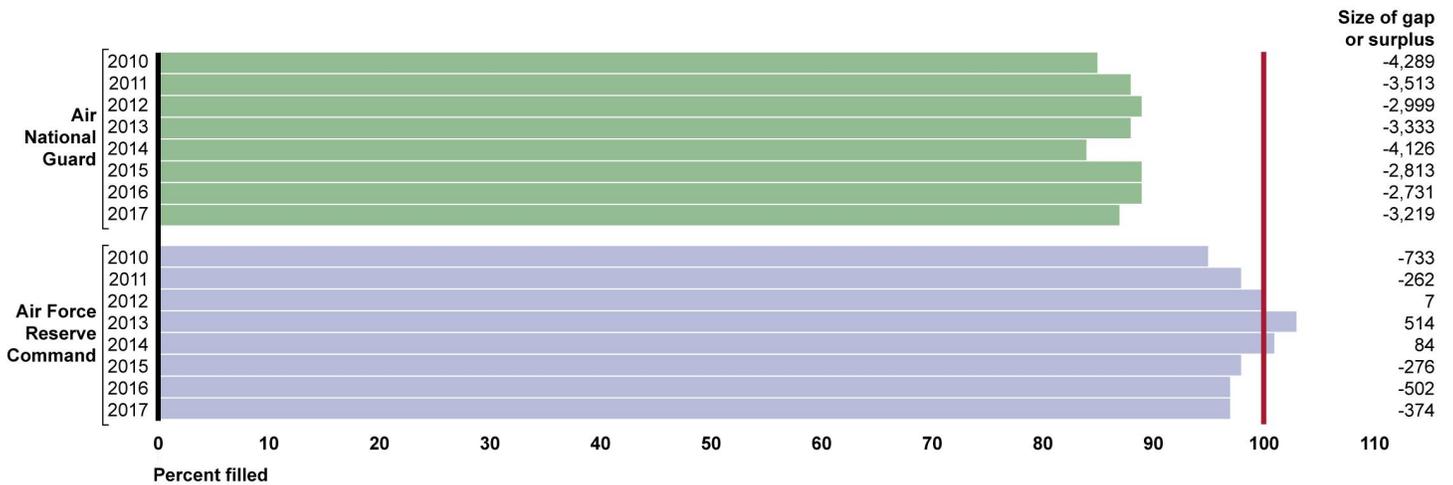
Noting that new 3-level maintainers will initially lack the experience and proficiency needed to meet mission needs—and will require supervision to oversee their technical progression—the Air Force has taken steps to ensure that experienced maintainers are assigned to maintenance roles that will improve operational readiness and influence the growing workforce. Specifically, the Air Force Deputy Chief of Staff for Logistics, Engineering and Force Protection issued a memorandum in July 2016 to all of the Major Command Vice Commanders noting the importance of maximizing utilization of experienced maintenance personnel in mission generation and repair network jobs.¹⁷ Air Force officials stated that it is critical that experienced maintainers be in the field training the surplus of new 3-level maintainers and getting them the experience they need. In addition, beginning in fiscal year 2017, in order to retrain 600 experienced maintainers on the F-35, the Air Force contracted some aircraft maintenance for three legacy aircraft in certain locations. These maintenance contracts are to run from fiscal years 2017 through 2020.

The Air National Guard Has Had Consistent Aircraft Maintainer Staffing Gaps, While Air Force Reserve Gaps Have Been Smaller

Over the past 8 fiscal years, the Air Force's reserve component has also experienced aircraft maintainer staffing gaps; however, the Air National Guard's gaps have been more consistent and significant than those of the Air Force Reserve Command. Figure 5 compares actual aircraft maintainer staffing levels with authorized levels for the Air National Guard and the Air Force Reserve Command over the past 8 fiscal years.

¹⁷U.S. Air Force Deputy Chief of Staff for Logistics, Engineering and Force Protection Memorandum, *Maximizing Utilization of Maintenance Manpower* (July 29, 2016).

Figure 5: Air Force Reserve Component Actual Aircraft Maintainer Staffing Levels Compared with Authorized Levels, Fiscal Years 2010-2017



Source: GAO analysis of Air National Guard and Air Force Reserve Command data. | GAO-19-160

According to our analysis, the Air National Guard has had consistent aircraft maintainer staffing gaps from fiscal years 2010 through 2017—ranging from 84 percent to 89 percent of authorized levels filled. In fiscal year 2017, the Air National Guard had a staffing gap of 3,219 maintainers (87 percent of authorized levels filled), which was primarily spread evenly across 5- and 7-level maintainers. The Air National Guard’s staffing gaps have remained despite a significant decrease in authorizations over this period. Specifically, the Air National Guard’s authorized positions decreased from 28,654 in fiscal year 2010, to 24,198 in fiscal year 2017. Air National Guard officials stated that the decrease in authorizations is a result of mission and aircraft changes—in particular, while the Guard has increased its use of unmanned aerial systems, it primarily relies on contract maintenance for those systems, reducing the need for Air Force maintainers.

In comparison, the Air Force Reserve Command experienced smaller maintainer staffing gaps over the past 8 fiscal years. According to our analysis, the percent of authorized levels filled ranged from a low of 95 percent in fiscal year 2010 (a gap of 733 maintainers), to a high of 103 percent in fiscal year 2013 (a surplus of 514). In fiscal year 2017, the Air Force Reserve Command had an overall staffing gap of 374 maintainers (97 percent of authorized levels filled), which primarily consisted of 7-level maintainers. Specifically, in fiscal year 2017, the Air Force Reserve Command had a gap of 777 7-level maintainers (89 percent of authorized levels filled), and a surplus of 566 5-level maintainers (108 percent).

Officials from both the Air National Guard and the Air Force Reserve Command stated that aircraft maintainer staffing levels differ by wing and location. For example, Air Force Reserve Command officials noted that maintainer requirements have recently increased at certain Air Force bases due to the arrival of fifth-generation fighter aircraft, and that while those locations are working to increase their maintainer staffing levels, they are currently below authorized levels. Air Force Reserve Command officials identified a strong economy with multiple civilian employment opportunities, disparities in active duty versus technician pay, and long hiring processes as factors affecting its full-time maintainer staffing levels. As a result, these officials noted that they are looking at ways to improve maintainer retention.¹⁸ Air National Guard officials stated that any maintainer-specific recruitment or retention challenges would be identified and addressed at the local level and that, as a result, they were unable to describe challenges Air National Guard-wide.

The Air Force Has Increasingly Lost Experienced Aircraft Maintainers and Does Not Have Goals and a Strategy to Improve Retention

The Air Force has had challenges retaining experienced maintainers, with loss rates of 5-level maintainers increasing over the past 8 fiscal years. While the commercial aviation industry is experiencing similar staffing challenges, the effects of these challenges on the Air Force's maintainer workforce are unknown. In addition, since fiscal year 2015, the Air Force has increased retention bonuses to improve retention among certain critical maintenance specialties, but the Air Force does not have retention goals or an overall strategy to help retain maintainers and sustain recent staffing level improvements.

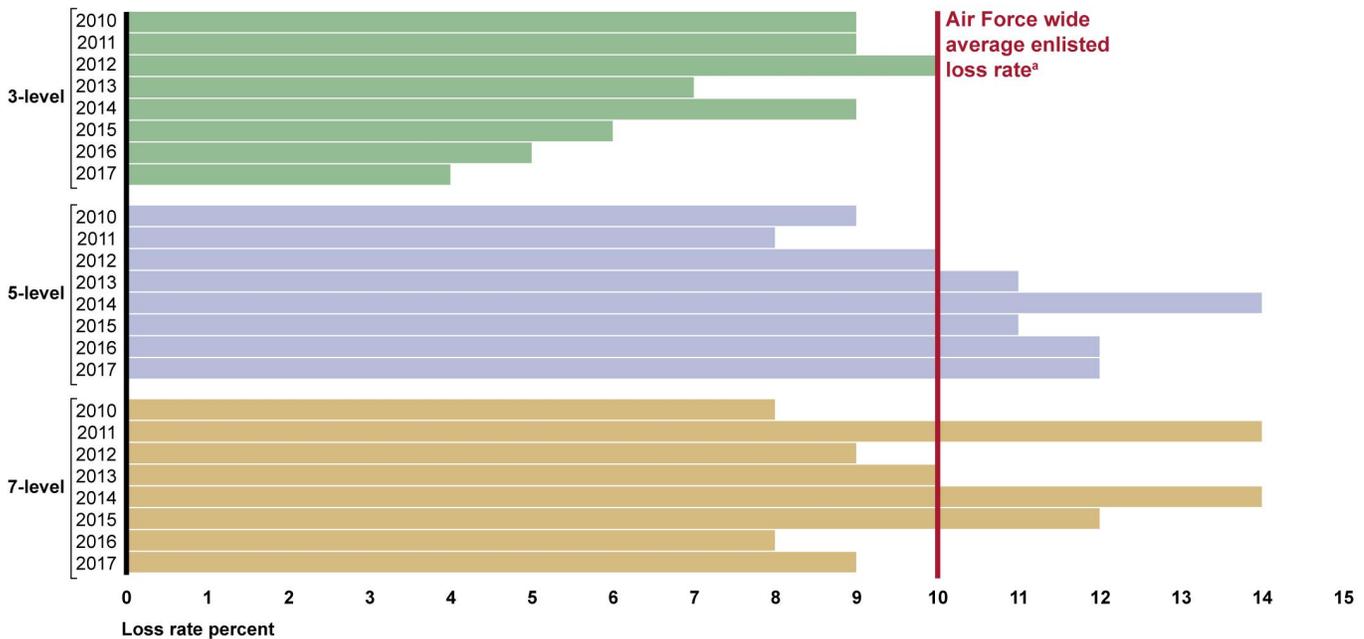
¹⁸Details on the retention of aircraft maintainers in the Air Force Reserve Command and the Air National Guard are provided in appendix II.

Air Force Losses of Experienced Maintainers Have Increased since Fiscal Year 2010

The Air Force monitors maintainer retention through loss rates—the percentage of maintainers who leave the career field or the Air Force during a given fiscal year for reasons such as separation or retirement—and reenlistment rates, according to Air Force officials. Our analysis of Air Force data found that overall enlisted aircraft maintainer loss rates have remained relatively stable over the past 8 fiscal years. Specifically, overall loss rates ranged from 9 to 10 percent—mirroring overall enlisted loss rates across the Air Force—with the exception of fiscal year 2014, when the loss rate was 13 percent due, in part, to reductions in end strength. Air Force officials stated that they need to retain more maintainers than in past fiscal years to help address experience gaps. However, gaps of experienced maintainers—those at the 5-level—have increased. Specifically, loss rates among 5-level maintainers increased from 9 percent in fiscal year 2010 to 12 percent in fiscal years 2016 and 2017. Loss rates of 7-level maintainers were 8 and 9 percent in fiscal years 2016 and 2017, respectively. Figure 6 compares, by skill level, active component maintainer loss rates with loss rates for all Air Force enlisted personnel over the past 8 fiscal years.¹⁹

¹⁹Details on Air Force Reserve Command and Air National Guard aircraft maintainer loss rates are provided in appendix II.

Figure 6: Air Force Active Component Aircraft Maintainer Loss Rates by Skill Level, Fiscal Years 2010-2017



Source: GAO analysis of Air Force data. | GAO-19-160

^aAir Force loss rates averaged approximately 10 percent since fiscal year 2010, with the exception of fiscal year 2014 when the loss rate was approximately 13 percent.

While loss rates of 7-level maintainers were comparable to overall maintainer loss rates in fiscal years 2016 and 2017, Air Force officials expect those rates to increase over the next few fiscal years due to changes in reenlistment behaviors and the current staffing gap of 5-level maintainers. According to our analysis of Air Force data, overall reenlistment rates for aircraft maintainers have generally decreased since fiscal year 2010, from a peak rate of 82 percent in fiscal year 2011, to a low of 73.4 percent in fiscal year 2017—similar to reenlistment rates for all Air Force enlisted personnel. Over this period, reenlistment rates decreased most significantly for maintainers making their first reenlistment decision—from 70.5 percent in fiscal year 2010, to 58.3 percent in fiscal year 2017. Reenlistment rates at the second reenlistment decision point decreased as well—from 88 percent in fiscal year 2010, to 81.3 percent in fiscal year 2017. Table 3 provides reenlistment rates for active component aircraft maintainers over the past 8 fiscal years.

Table 3: Air Force Active Component Aircraft Maintainer Reenlistment Rates (as percentages), Fiscal Years 2010-2017

Reenlistment	Fiscal year 2010	Fiscal year 2011	Fiscal year 2012	Fiscal year 2013	Fiscal year 2014	Fiscal year 2015	Fiscal year 2016	Fiscal year 2017
1st Reenlistment	70.5	67.7	67.2	60.2	61.7	56.5	58.4	58.3
2nd Reenlistment	88.0	86.9	86.7	86.4	85.6	84.5	81.5	81.3
3rd Reenlistment (career)	97.6	96.7	98.6	96.6	96.0	97.3	96.0	95.1
4th Reenlistment (retirement)	99.8	100	100	100	99.6	100	99.2	100
All reenlistments combined	81.6	82.0	80.8	76.9	77.7	75.0	74.9	73.4

Source: Air Force reenlistment data. | GAO-19-160

In 2015 and 2017, the Air Force conducted aircraft maintenance retention surveys in order to identify areas of opportunity to improve career experiences, job satisfaction, and to understand retention drivers. Air Force officials stated that these surveys and reports are used as informational tools, but that they are researching methods to further dive into specific concerns. Maintainers who responded to the 2017 survey cited job stress, overall job satisfaction, and satisfaction with the career field as top factors influencing them to leave the Air Force.²⁰ Survey respondents also stated that military benefits, the retirement program, and job security were the top reasons to remain in the Air Force. The survey also found that mid-tier enlisted personnel—Senior Airmen, Staff Sergeants, and Tech Sergeants—reported lower levels of satisfaction with leadership than did higher enlisted ranks.

Participants in all five of our discussion groups with maintainers cited job dissatisfaction as a factor affecting their reenlistment decisions. Specifically, participants discussed the stress of the job, physical toll of the work, heavy workload, and undesirable working conditions. In addition, participants in all discussion groups noted challenges in providing on-the-job training to the large number of 3-level maintainers arriving at their squadrons due to staffing gaps of 5- and 7-level maintainers—who are needed to supervise that training. Participants stated that the lack of experienced maintainers has increased workloads and stress levels, which they stated may negatively affect reenlistment decisions. Some participants in all five discussion groups were interested in retraining into other specialties outside of aircraft maintenance as a way to continue their Air Force careers. However, as previously discussed, since 2016, the Air Force has placed certain restrictions on

²⁰Air Force, *Air Force 2017 Aircraft Maintenance Retention Survey Analysis* (Apr. 2018).

retraining to non-maintenance career fields in an effort to address maintainer staffing challenges.

Hiring Difficulties May Exist in the Commercial Aviation Industry, but Its Effects on the Air Force’s Maintainer Workforce Are Unknown

According to our analysis of Bureau of Labor Statistics data from 2012 through 2017, unemployment rate, employment, and wage earnings for the aircraft mechanic and service technician, and aerospace engineer occupations were consistent with the existence of hiring difficulties. While no single metric can be used to say whether a labor shortage exists, it is possible to look at certain “indicators” in conjunction with views of stakeholders. Specifically, we previously found that according to economic literature, if a job shortage were to exist, one would expect (1) a low unemployment rate signaling limited availability of workers in that profession, (2) increases in employment due to increases in demand for that occupation, and (3) increases in wages offered to draw people into that profession.²¹ Table 4 shows these specific indicators from 2012 to 2017, since we last reported, measured using the Bureau of Labor Statistics’ Current Population Survey.

Table 4: Selected Labor Market Indicators for Aerospace Engineers and Aircraft Mechanics and Service Technicians, 2012-2017

Occupation	Annual percent change in median wages ^a	Annual percent changes in employment ^b	Average unemployment ^c
Aerospace engineers	1.5	1.3	1.5
Aircraft mechanics and service technicians	2.0	1.2	2.5
All occupations	0.9	2.0	6.0

Source: GAO Analysis of Current Population Survey Data. | GAO-19-160

^aWe calculated the “annual percent change in median wages” as the annualized percent change in median weekly earnings among full-time wage and salary workers in that occupation (the boundary between the highest paid 50 percent and the lowest paid 50 percent in that occupation). The changes in median wages are adjusted for inflation using the Consumer Price Index for All Urban Consumers.

²¹GAO, *Aviation Workforce: Current and Future Availability of Airline Pilots*, [GAO-14-232](#) (Washington, D.C.: Feb. 28, 2014); see Carolyn M. Veneri, “Can Occupational Labor Shortages be Identified Using Available Data?,” *Monthly Labor Review*, vol. 122, no. 3, pp. 15-21 (March 1999); and Malcolm S. Cohen, *Labor Shortages: As America Approaches the Twenty-first Century* (Ann Arbor, Michigan: University of Michigan Press, 1995).

^bWe calculated the “annual percent change in employment” as the annualized percent change in employment among full time workers in that occupation over the period.

^cThe unemployment rate is the percentage of persons aged 16 years or older that had no employment, but were seeking employment, out of the entire labor force. The unemployment rate for an occupation includes those unemployed in that occupation based on their most recent job. We calculated “average unemployment” as the average unemployment rate in that occupation over the period.

As table 4 indicates, the direction of all three of these indicators is consistent with difficulty in hiring of both aircraft mechanics and aerospace engineers. However, the indicators should be viewed with appropriate caveats.²² First, from 2012 to 2017, median wages for aerospace engineers and aircraft mechanics increased at a greater percentage than wages for all occupations, approximately 1.5 and 2.0 percent per year, respectively, compared to about 1 percent for all occupations. However, while median wages increased for aerospace engineers and aircraft mechanics during this entire period, it did not increase in every year, and it exhibited swings by as much as 13 percent. Second, from 2012 to 2017, employment for aerospace engineers and aircraft mechanics increased by approximately 1.3 and 1.2 percent per year, respectively. In comparison, for all occupations, employment increased by about 2 percent per year over this period. Finally, over this period, the average unemployment rate for aerospace engineers and aircraft mechanics was approximately 1.5 and 2.5 percent on average, respectively, compared to about 6 percent for all occupations.

In addition, according to the Bureau of Labor Statistics Occupational Outlook Handbook, overall employment of aircraft and avionics equipment mechanics and technicians is projected to grow 5 percent from 2016 to 2026, about as fast as the average for all occupations. Job opportunities are expected to be good because there will be a need to replace those workers leaving the occupation.²³ Industry stakeholders we spoke with anticipate similar growth in demand for labor, and cited ways companies were recruiting maintainers into the industry, such as raising

²²We previously reported on important limitations to these indicators, as measured using the Current Population Survey data, in [GAO-14-232](#). Those data are collected through a household survey and are subject to response and sampling error. Moreover, the Bureau of Labor Statistics collects information on workers at all stages in their career—so it may not be informative of changes in starting salaries.

²³U.S. Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook: Aircraft and Avionics Equipment Mechanics and Technicians*, <https://www.bls.gov/ooh/installation-maintenance-and-repair/aircraft-and-avionics-equipment-mechanics-and-technicians.htm> (visited October 11, 2018).

wages, incorporating additional training, and paying maintainers during their airframe and power plant certificate coursework.

The effects of the commercial aviation industry's hiring difficulties on the Air Force's maintainer workforce are unknown. Air Force officials stated that the Air Force has not assessed the effects, and that while some maintainers will leave the Air Force to work for the commercial aviation industry, they do not believe it is an overarching issue. However, Air National Guard and Air Force Reserve Command officials noted that a base's location, in particular its proximity to commercial aviation industry opportunities, may affect its ability to recruit and retain maintainers. While the industry stakeholders we spoke with noted that military maintainers are attractive to the commercial aviation industry because of their previous training, work ethic, and discipline, they also noted challenges in recruiting military maintainers. Specifically, one stakeholder stated that many military maintainers require similar training for private sector positions as their non-military peers, citing to the specificity of training military maintainers receive compared to the broader approach taken by the commercial aviation sector.

Only one study we identified through our literature search examined the potential effects of the commercial aviation industry—specifically the commercial airlines—on Air Force aircraft maintainer staffing levels. This study, published in 2016 by RAND and reviewing data from fiscal years 2004 through 2013, did not estimate the effect of any specific development in the commercial aviation industry on the Air Force. However, it identified several factors that suggest that the effects, if any, are likely to be limited.²⁴ It found this based on four indicators: (1) the Air Force kept steady maintainer retention rates while the airline maintainer population fluctuated over the same period of time; (2) the Air Force offered competitive maintainer salaries compared with several airlines, making it unlikely that maintainers would separate or retire for better earnings potential alone; (3) few Air Force maintainers seemed to be pursuing airframe and power plant certification, which is often a prerequisite to employment in the airline industry; and (4) on average, there were considerably more qualified Air Force maintainers separating or retiring than projected airline maintenance jobs available. However, the report focused only on the commercial airlines. Air Force officials stated

²⁴RAND Project AIR FORCE, RAND Corporation, *Can the Air Force and Airlines Collaborate for Mutual Benefit? An Exploration of Pilot and Maintenance Workforce Options* (Santa Monica, Calif.: RAND Corporation, 2016).

that they are more likely to experience outside recruitment of maintainers from defense contractors than from commercial airlines.

Participants in four of our five discussion groups with maintainers cited better pay as a reason to transition from the Air Force to the commercial aviation industry. They also noted consistent schedules, 8-hour work days, and overtime pay as additional benefits. However, participants in all of our discussion groups also discussed an interest in careers outside of aircraft maintenance, such as police work, firefighting, cyber security, information technology, and real estate, among others.

For maintainers who want to pursue a career in the commercial aviation industry upon separation or retirement from the Air Force, DOD has undertaken several actions to facilitate airframe and power plant certification of its servicemembers. For example, as previously discussed, since 2002 the Community College of the Air Force has administered the Federal Aviation Administration-approved Joint Services Council program that, upon completion, confers a certificate of eligibility to take the airframe and power plant exam. According to Community College of the Air Force data, in fiscal year 2017, there were 95 graduates from the Joint Services Council’s airframe and power plant preparation program. Table 5 shows the number of Air Force personnel that enrolled in and graduated from the Joint Services Council’s airframe and power plant program from fiscal years 2010 through 2017.

Table 5: Joint Services Aviation Maintenance Technician Certification Council Program, Enrollment and Graduate Counts, Fiscal Years 2010-2017

Count Type	Fiscal year 2010	Fiscal year 2011	Fiscal year 2012	Fiscal year 2013	Fiscal year 2014	Fiscal year 2015	Fiscal year 2016	Fiscal year 2017
Enrollments	673	870	1,257	952	1,025	598	77	143
Graduates	23	24	44	44	51	60	68	95

Source: Community College of the Air Force data. | GAO-19-160

Air Force officials noted a decrease in enrollments since fiscal year 2015 due to additional enrollment requirements, including completing initial coursework. From fiscal years 2015 through 2017, about 900 personnel used Air Force funding for airframe and power plant certificates through the Air Force Credentialing Opportunities On-Line program, which was established in fiscal year 2015.

The Air Force Has Increased Its Use of Retention Bonuses for Some Maintenance Specialties, but Does Not Have Retention Goals or a Maintainer Specific Strategy to Improve Retention

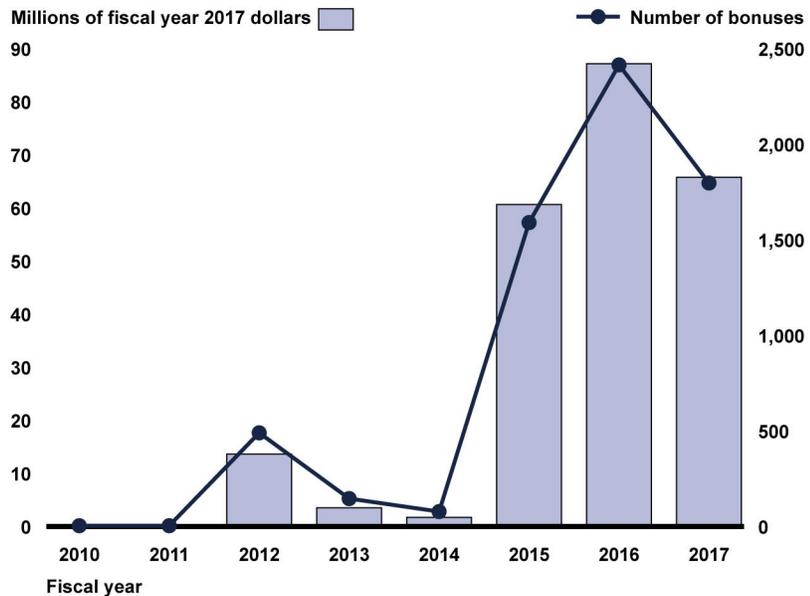
The Air Force has increased its use of retention bonuses since fiscal year 2015 to help retain critical maintenance specialties. Per DOD Instruction 1304.31, the secretary of a military department may use service retention bonuses to obtain the reenlistment or voluntary extension of an enlistment in exchange for a military service member's agreement to serve for a specified period in at least one of the following categories: a designated military skill, career field, unit, or grade; or to meet some other condition of service.²⁵ In fiscal year 2015, the Air Force awarded 1,590 bonuses to aircraft maintainers in certain specialties, totaling more than \$60 million.²⁶ Bonuses increased in fiscal year 2016—with 2,415 bonuses awarded at a total cost of more than \$87 million. Bonuses decreased slightly in fiscal year 2017—with 1,797 bonuses awarded primarily to 5-level maintainers, at a total cost of over \$65 million.²⁷ Figure 7 shows the increases in the number and total costs of Air Force active component retention bonuses awarded to aircraft maintainers over the past 8 fiscal years.

²⁵According to DOD Instruction 1304.31, when designating a military skill for purposes of paying a retention bonus, the secretary of a military department shall consider, among other things: the critical personnel shortage in a particular military skill with respect to at least three of the preceding year groups, as defined by the secretary concerned; the potential impact of critical staffing challenges on the mission of the military department; the degree to which retention in a particular military skill does not meet established retention objectives; and the high cost of training associated with the military skill. DOD Instruction 1304.31, *Enlisted Bonus Program (EBP)* (Mar. 12, 2013).

²⁶Retention bonus amounts are inflation-adjusted monetary amounts in fiscal year 2017 dollars.

²⁷Details on the Air Force Reserve Command and Air National Guard's use of retention bonuses to improve aircraft maintainer retention are provided in appendix II.

Figure 7: Air Force Active Component Aircraft Maintainer Retention Bonuses, Fiscal Years 2010-2017



Source: GAO analysis of Air Force data. | GAO-19-160

According to Air Force officials, retention bonuses remain a critical incentive for reenlistment. Participants in four of our five discussion groups with maintainers highlighted retention bonuses as a motivating factor to remain in the Air Force. Some participants stated that they were a major factor in their decision-making, while others were unsure of the availability or amount of bonuses, making it difficult to appropriately consider them in their decisions.

Air Force officials have stated that they need to retain more maintainers than in past fiscal years to help address experience gaps, but the Air Force has not established retention goals for maintainers. *Standards for Internal Control in the Federal Government* states that management should establish and operate monitoring activities and evaluate the results. In addition, the *Standards* provide that, in reviewing actual performance, management tracks achievements and compares them to plans, goals, and objectives.²⁸ While the Air Force has mechanisms to monitor the health of the maintenance career field, such as through loss and reenlistment rates, it has not developed annual retention goals for

²⁸[GAO-14-704G](#).

maintainers. As a result, the Air Force cannot identify how many 5-level and 7-level maintainers it needs to retain to support new 3-level maintainers in training and certification of flight line work. Given increases in losses of experienced maintainers and decreasing reenlistment rates, the Air Force faces challenges in managing the overall maintenance workforce, including ensuring that there are enough experienced maintainers to fulfill mission and training needs. Without annual retention goals—for both loss and reenlistment rates—the Air Force cannot assess how many maintainers it needs to retain each year, by skill level, to sustain recent staffing level improvements and, ultimately, to ensure the health of its maintenance workforce.

The Air Force also lacks a retention strategy to focus its efforts in retaining maintainers. As previously discussed, the Air Force has conducted aircraft maintenance retention surveys to gauge the health of the workforce and identify opportunities to improve the career field, but Air Force officials have stated that these surveys are currently used only for informational purposes. In addition, while the Air Force offers retention bonuses for certain maintenance specialties—and has extended the maximum number of years maintainers in certain specialties can remain on active duty through the High Year of Tenure Extension Program—according to Air Force officials, it does not have a maintainer specific strategy or other initiatives (either monetary or non-monetary) that address the factors the Air Force has identified through its biennial surveys as negatively influencing maintainer retention. A key principle of strategic workforce planning is developing strategies that are tailored to address gaps in number, deployment, and alignment of human capital approaches for enabling and sustaining the contributions of all critical skills and competencies.²⁹

Without a retention strategy—including initiatives that are tailored to the specific needs and challenges of maintainers—the Air Force may be missing opportunities to retain experienced 5- and 7-level maintainers, who are needed to train the recent increase of new 3-level maintainers in the field. According to participants from our discussion groups with maintainers, increases in 3-level maintainers could negatively affect retention of experienced maintainers if this increase continues to affect their workloads. While the Air Force has some tools in place to monitor retention and identify factors affecting reenlistment decisions, such as its

²⁹[GAO-04-39](#).

retention surveys, without a retention strategy to address concerns raised in these surveys, and goals against which to measure progress, it may not be able to sustain recent staffing level improvements or improve the overall health of the maintenance workforce as effectively.

The Air Force Has Consistently Met Technical School Completion Rate Goals for Aircraft Maintainers

Over the past 8 fiscal years, the Air Force has consistently met overall aircraft maintainer technical school completion rate goals. However, after technical school, additional on-the-job training is required to produce a fully qualified maintainer. In addition, the Air Force reserve component's programmed technical school completions have consistently exceeded actual completions over this period.

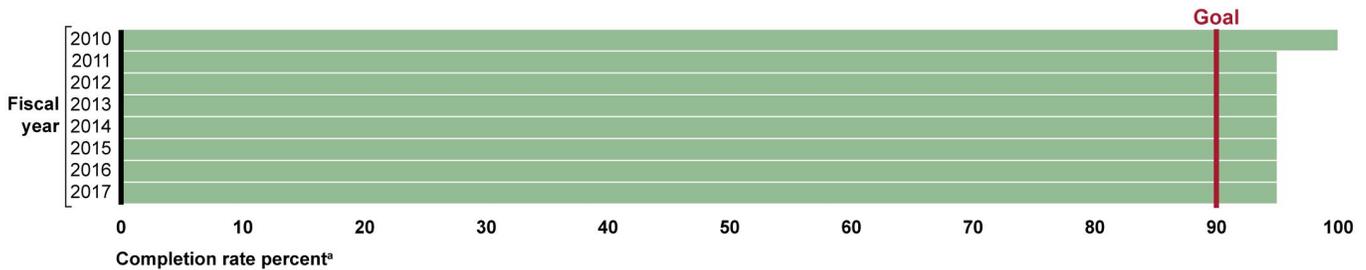
The Air Force Has Met Overall Technical School Completion Rate Goals for Aircraft Maintainers Since Fiscal Year 2010

Our analysis of Air Force data found that the Air Force consistently met technical school completion rate goals from fiscal years 2010 through 2017. According to Air Education and Training Command (AETC) officials, AETC established a maintainer technical school completion rate goal for the active component of 90 percent—that is, the number of actual technical school completions compared to the number of programmed or expected completions. According to AETC officials, the goal is not documented, but it has been in place since at least fiscal year 2010 and is intended to measure the health and well-being of the training program. In fiscal year 2017, the completion rate was 97 percent, with all but two maintenance specialties meeting their goals.³⁰ According to AETC officials, there are a number of reasons a particular maintenance

³⁰The two maintenance specialties that did not meet their technical school completion rate goals in fiscal year 2017 were Special Operations Forces/Personnel Recovery Integrated Electronic Warfare Systems (89 percent completion rate) and Nuclear Weapons (80 percent completion rate). Over the past 8 fiscal years, the Nuclear Weapons specialty only met technical school completion rate goals in 1 year. AETC officials stated that the security clearance backlog and Personnel Reliability Program disqualifications have contributed to the low completion rates.

specialty may not meet its technical school completion rate goals, such as low technical school entry rates, security clearance delays, and challenging course topics. Figure 8 shows the Air Force’s active component technical school completion rates for all maintenance specialties combined over the past 8 fiscal years.

Figure 8: Air Force Active Component Aircraft Maintainer Actual Technical School Completions Compared with Programmed Completions, Fiscal Years 2010-2017



Source: GAO analysis of Air Force data. | GAO-19-160

^aThe technical school completion rates are rounded to the nearest 5 percent due to the reliability of the data in at least fiscal years 2010 through 2013.

In fiscal year 2017, approximately 9,600 active component maintainers completed technical school, an increase from about 7,200 and 5,700 in fiscal years 2016 and 2015, respectively. While increased technical school completions help to address overall aircraft maintainer staffing gaps, they cannot immediately resolve staffing imbalances across experience levels. Air Force officials noted that while they track the number of maintainers they are producing by technical school completions (the number of new 3-level maintainers), maintainers are not fully qualified for the job until they are 5-levels, which requires, as previously discussed, at least a year of on-the-job training, among other things. Technical school instructors agreed that while technical school is important for teaching basic concepts, on-the-job training is what produces a fully-qualified maintainer.

AETC officials stated that the technical schools continue to have the capacity to meet completion rate goals even with the increase in students, but that they have experienced significant challenges in recent years receiving enough instructors in a timely manner—both civilian and military—and getting them qualified to teach. These officials stated that this is a result of issues with the formula that determines instructor staffing needs, the instructor staffing process for military personnel, and civilian hiring delays, among other things. According to AETC officials, they have been able to consistently meet completion rate goals despite

these challenges by waiving some course requirements for multiple instructors (except when there are safety concerns), contracting some instruction, and assigning temporary duty personnel to serve as instructors. These officials noted that while those actions have allowed them to continue to meet their mission, they have also masked the severity of the instructor staffing challenges and increased existing instructors' stress and workloads. This was confirmed by the technical school instructors with which we spoke. Additionally, AETC officials noted challenges with aging infrastructure and hangars, and in obtaining high fidelity, realistic aircraft and trainers. However, they did highlight a recent success in acquiring updated avionics trainers.

Over the past few fiscal years, AETC has conducted annual field interviews with technical school graduates and graduate supervisors to evaluate the technical school training program.³¹ Specifically, AETC uses the interviews to gauge satisfaction with the graduates' abilities to perform tasks required in the career field, and to identify areas to improve training quality or revise training standards. In the memorandum resulting from the fiscal year 2017 field interviews, AETC made a number of recommendations to improve maintainer technical school training, such as improving knowledge and task retention by increasing hands-on repetition and decreasing delays between technical school and a maintainer's first assignment, reexamining aspects of the technical school training curriculum, and improving instruction related to maintenance forms and technical orders.

The memorandum also noted that while there are initiatives that the technical schools can undertake to increase overall satisfaction, there are some disconnects between supervisor expectations in the field and the training program that should be resolved. Technical school instructors agreed that there is a disconnect between what students learn in technical school and what their supervisors in the field expect them to have learned in technical school versus on the job. The memorandum identified opportunities to clarify these expectations, such as workshops to identify training requirements.

³¹The Field Interview Reports are specific to the 82nd Training Group's training program.

The Air Force Reserve Component's Programmed Technical School Completions Have Consistently Exceeded Actual Completions

Over the past 8 fiscal years, the Air Force reserve component's programmed technical school completions for aircraft maintainers have consistently exceeded actual completions. Specifically, according to our analysis, from fiscal years 2010 through 2017, the Air National Guard's actual technical school completions, as compared to programmed completions, ranged from about 60 to 95 percent. Similarly, the Air Force Reserve Command's completion rates ranged from about 50 to 85 percent.³² The highest completion rate for both was in fiscal year 2017. According to Air National Guard and Air Force Reserve Command officials, they do not have technical school completion rate goals like the active component since they also recruit prior servicemembers, as discussed below. Table 6 compares the Air Force reserve component's programmed versus actual technical school completions over the past 8 fiscal years.

Table 6: Air Force Reserve Component Actual Aircraft Maintainer Technical School Completions Compared with Programmed Completions, Fiscal Years 2010-2017

Fiscal year	Air National Guard			Air Force Reserve Command		
	Programmed completions	Actual completions	Completion rate (as percent)	Programmed completions	Actual completions	Completion rate (as percent)
2010	2600	2200	80	1100	1000	85
2011	3500	2700	75	1500	1300	85
2012	3000	1900	60	2300	1700	70
2013	2500	1600	65	2800	1400	50
2014	2500	1500	60	2200	1000	50
2015	2300	1700	75	1500	900	55
2016	1700	1300	80	1100	700	65
2017	1500	1400	95	800	700	85

Source: GAO analysis of Air Force technical school training data. | GAO-19-160

Note: Technical school programmed completions and actual completions are rounded to the nearest hundreds and completion rates are rounded to the nearest 5 percent due to the reliability of the data in at least fiscal years 2010 through 2013.

³²Technical school completion rates are rounded to the nearest 5 percent due to the reliability of the data in at least fiscal years 2010 through 2013.

According to an AETC official, it is common for the reserve component to have significantly more programmed completions than actual technical school completions in a given fiscal year. For example, this official stated that the Air National Guard and Air Force Reserve Command program their training spaces 2 to 3 years in advance and it can be difficult to anticipate training needs. Specifically, Air National Guard officials stated that the number of training spaces requested each year are to fill vacancies and that those vacancies are filled by both prior servicemembers (who may have already attended maintainer technical school and do not need to do so again) and non-prior servicemembers (who will need to attend technical school). An AETC official noted that the number of personnel that will fall into each category each year is difficult to anticipate. For example, according to Air Force Reserve Command officials, the number of non-prior service accessions has decreased over the past 8 fiscal years, accounting for about 33 percent of accessions in fiscal year 2017, a decrease from about 43 percent in fiscal year 2010. Air National Guard officials stated that if they do not program enough training spaces, it can be difficult to add spaces later.

Air National Guard officials stated that they have been conservative in programming training spaces since fiscal year 2016—to minimize unfilled spaces—which, along with high maintainer turnover, is reflected in increased completion rates. Specifically, in fiscal year 2017, the Air National Guard programmed 1,528 completions and the number of actual completions was 1,418, amounting to a completion rate of 93 percent—its highest rate over the past 8 fiscal years. Air National Guard officials noted that the training spaces it did not fill over the past 2 fiscal years were generally due to last minute cancellations for health, family, or civilian employment issues. AETC officials stated that they can fill unused reserve component training spaces with active duty maintainers or students from international partners, which has provided AETC more flexibility to increase active duty maintainer training over the past few fiscal years.

Conclusions

The Air Force has significantly reduced overall aircraft maintainer staffing gaps since fiscal year 2016, in part by increasing accessions. While the Air Force has consistently met its technical school completion rate goals for newly accessed aircraft maintainers, it continues to have staffing gaps of experienced maintainers—who are needed to supervise and provide on-the-job training to those new maintainers following technical school. Air Force officials have highlighted the need to retain more aircraft maintainers to help address experience gaps, but losses of experienced maintainers have increased since fiscal year 2010, and the Air Force expects losses to continue to increase for certain maintainers over the next few fiscal years. While the Air Force has increased its use of retention bonuses for some critical maintenance specialties, it does not have annual retention goals for aircraft maintainers or a maintainer-specific retention strategy to help it meet such goals and to sustain recent staffing level improvements. As a result, the Air Force may continue to face challenges in managing its largest enlisted career field and may miss opportunities to retain a sufficient number of experienced maintainers to meet mission needs.

Recommendations for Executive Action

We are making the following two recommendations to DOD:

The Secretary of the Air Force should develop annual retention goals for aircraft maintainers by skill level—for both loss and reenlistment rates—in alignment with authorized levels. (Recommendation 1)

The Secretary of the Air Force should develop an aircraft maintainer retention strategy, including initiatives that are tailored to the specific needs and challenges of maintainers to help ensure that the Air Force can meet and retain required staffing levels. (Recommendation 2)

Agency Comments

In written comments on a draft of this report, the Air Force concurred with both of the recommendations. The Air Force also noted initial actions it has taken to develop an aircraft maintainer retention strategy. The Air Force's comments are reprinted in appendix III.

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

If you or your staff have any questions regarding this report, please contact me at (202) 512-3604 or farrellb@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 significant contributions to this report are listed in appendix IV.



Brenda S. Farrell
Director, Defense Capabilities and Management

Appendix I: Scope and Methodology

To assess the extent to which the Air Force had aircraft maintainer staffing gaps, we compared staffing levels authorized by the Air Force for enlisted aircraft maintainers—for the active and reserve components—with the actual number of maintainers available to staff those positions for fiscal years 2010 through 2017.¹ We selected this timeframe to capture staffing levels before and after the Air Force’s fiscal year 2014 reduction in end strength, and fiscal year 2017 was the most recent year for which complete data were available at the time of our review. Specifically, we analyzed the data to identify overall maintainer staffing gaps, as well as any gaps by maintenance specialty and skill level. In addition, we compared maintainer personnel requirements to authorized staffing levels—the number of those requirements that are funded—for the overall maintainer population, each maintenance specialty, and each skill level. To assess the reliability of the Air Force’s requirements, authorized staffing levels, and actual staffing levels (for both the active and reserve components), we reviewed related documentation; assessed the data for errors, omissions, and inconsistencies; and interviewed officials. We determined that the data were sufficiently reliable to describe the Air Force’s aircraft maintainer staffing levels and associated gaps from fiscal years 2010 through 2017. Additionally, we conducted interviews with relevant Air Force, Air National Guard, and Air Force Reserve Command officials to identify reasons for staffing challenges and actions the Air Force has taken to address them.

To assess the extent to which the Air Force experienced attrition of aircraft maintainers, we calculated maintainer loss rates—the number of maintainers who leave the career field or the Air Force within the fiscal year (for reasons such as separation or retirement) over the number of maintainers at the start of the fiscal year—for fiscal years 2010 through 2017. We calculated loss rates for the overall maintainer population as well as by skill level and maintenance specialty for the active and reserve components. We also analyzed overall aircraft maintainer reenlistment

¹For the purposes of this report, when actual staffing levels are lower than authorized staffing levels, it is considered to be a staffing gap.

rates—the number of maintainers reenlisting each fiscal year over the number of maintainers eligible to reenlist—for the active component for fiscal years 2010 through 2017. To assess the reliability of the Air Force’s maintainer loss and reenlistment rate data, we reviewed related documentation; assessed the data for errors, omissions, and inconsistencies; and interviewed officials. We determined that the data were sufficiently reliable to describe the Air Force’s aircraft maintainer loss and reenlistment rates from fiscal years 2010 through 2017.

In addition, we reviewed the Air Force’s 2015 and 2017 aircraft maintainer retention survey analyses² and conducted discussion groups with a non-generalizable sample of aircraft maintainers to obtain their views on factors affecting maintainer retention, on-the-job training capacity, and commercial aviation industry opportunities, among other things. We selected Tinker Air Force Base in Oklahoma and Eglin Air Force Base in Florida as the locations for these discussion groups based on geographic diversity, base size, and the types of aircraft maintained at each base. At each location, we moderated two to three discussion groups with aircraft maintainers for a total of five discussion groups ranging from between 3 and 12 maintainers per group. While these discussion groups allowed us to learn about many important aspects of the aircraft maintenance workforce from the perspective of aircraft maintainers, they were designed to provide anecdotal information and not results that would be representative of all the Air Force’s more than 100,000 aircraft maintainers as of fiscal year 2017.

To review the state of the commercial labor market for aircraft mechanics and aerospace engineers, we analyzed data from the Department of Labor’s Bureau of Labor Statistics’ Current Population Survey on the unemployment rate, employment, and median weekly earnings from 2012 through 2017, in accordance with economic literature we reviewed for a prior report.³ These data can be used as indicators of whether labor market conditions are consistent with a shortage. We chose this period because we had previously reported on the data from 2000 through 2012, and 2017 was the most recent data at the time of our review.⁴ We

²Air Force, *Air Force 2017 Aircraft Maintenance Retention Survey Analysis* (Apr. 2018), and Air Force, *Air Force 2015 Enlisted Maintenance Retention Survey Results and Recommendations* (July 2016).

³GAO, *Aviation Workforce: Current and Future Availability of Aviation Engineering and Maintenance Professionals*, [GAO-14-237](#) (Washington, D.C.: Feb. 28, 2014).

⁴[GAO-14-237](#).

reviewed documentation about the Bureau of Labor Statistics data and the systems that produced them, as well as our prior report that used the data. Based on prior testing of the data from these systems, we determined the data were sufficiently reliable for the purposes of our indicator analysis to provide context on the labor market. We also reviewed the Bureau of Labor Statistics' Occupational Outlook for Aircraft and Avionics Equipment Mechanics and Technicians for 2016 to 2026 to determine anticipated future workforce trends. In addition, we conducted interviews with four commercial aviation industry stakeholders regarding any imbalances in demand and supply, and actions the industry is taking to address them. Specifically, we conducted interviews with officials from the Aeronautical Repair Station Association, the Aerospace Industries Association, Aerotek, and the General Aviation Manufacturers Association. We selected three of these organizations based on our previous work and one based on a recommendation from one of the three organizations.

To determine what is known about the extent to which the commercial aviation industry affects the Air Force's aircraft maintainer staffing levels, we conducted a literature search and review to identify relevant studies. Specifically, we conducted a literature search for studies published in books, reports, peer-reviewed journals, and dissertations since fiscal year 2010. We chose fiscal year 2010 as a starting point so that the scope of the search would match the timeframe for which we analyzed Air Force maintainer loss rates. We searched five databases, including ProQuest, Scopus, and EBSCO. Our search used Boolean search phrases, including variations of words such as aviation, maintenance, and retention. We identified and screened 49 studies using a multi-step process to gauge their relevance and evaluate their methodology. We excluded studies that did not specifically focus on our objective, military maintainers, or the U.S. commercial aviation industry. We retained 1 study after screening and reviewed its methodology, findings, and limitations.⁵ Three GAO staff (two analysts and an economist) were involved in the screening and a systematic review of the study, which was determined to be sufficiently relevant and methodologically rigorous.

We also analyzed data on the number of Air Force personnel completing the Joint Services Aviation Maintenance Technician Certification Council

⁵The study we reviewed was RAND Project AIR FORCE, RAND Corporation, *Can the Air Force and Airlines Collaborate for Mutual Benefit? An Exploration of Pilot and Maintenance Workforce Options* (Santa Monica, Calif.: RAND Corporation, 2016).

(Joint Services Council) airframe and power plant certificate program from fiscal years 2010 through 2017, and the number of Air Force personnel receiving airframe and power plant certificate funding from the Community College of the Air Force's Air Force Credentialing Opportunities On-line program from fiscal years 2015 through 2017. We selected this timeframe because the Air Force's airframe and power plant funding program began in fiscal year 2015, and fiscal year 2017 was the most recent data available at the time of our review. To assess the reliability of the Air Force's airframe and power plant certificate program data, we interviewed officials. We determined that the data were sufficiently reliable to describe the number of Air Force personnel completing the Joint Services Council's airframe and power plant certificate program from fiscal years 2010 through 2017 and the number of personnel receiving funding from fiscal years 2015 through 2017.

To assess the extent to which the Air Force has taken steps to help retain maintainers, we analyzed the number and total costs of selective retention bonuses (retention bonuses) that the Air Force awarded, by maintenance specialty and skill level, from fiscal years 2010 through 2017 for the active and reserve components. We normalized the cost data to constant fiscal year 2017 data. To assess the reliability of the Air Force's retention bonus data, we reviewed related documentation; assessed the data for errors, omissions, and inconsistencies; and interviewed officials. We determined that the data were sufficiently reliable to describe the number and total costs of the Air Force's aircraft maintainer retention bonuses from fiscal years 2010 through 2017. In addition, we conducted interviews with relevant Air Force officials regarding retention goals and monetary and non-monetary incentives to improve maintainer retention, and Department of Defense officials regarding retention bonuses. We compared this information to *Standards for Internal Control in the Federal Government* related to monitoring activities and key principles of strategic workforce planning that we have identified in our prior work, such as developing strategies that are tailored to address gaps in numbers of people, skills, and competencies.⁶

To assess the extent to which the Air Force met its annual technical school completion rate goals for aircraft maintainers, we calculated technical school completion rates—the number of aircraft maintainers

⁶GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 10, 2014); and GAO, *Human Capital: Key Principles for Effective Strategic Workforce Planning*, [GAO-04-39](#) (Washington, D.C.: Dec. 11, 2003).

completing technical school compared to the number of programmed or expected completions—for the overall maintainer population and each maintenance specialty for the active component, for fiscal years 2010 through 2017. We compared those completion rates to the Air Education and Training Command (AETC) established active component completion rate goal. For the Air National Guard and Air Force Reserve Command, we compared programmed completions to actual completions to determine the extent to which they met their technical school training needs. To assess the reliability of the technical school completion data (for both the active and reserve components), we assessed the data for errors, omissions, and inconsistencies, and interviewed officials. We determined that the data were sufficiently reliable to describe the Air Force's aircraft maintainer technical school completion rates from fiscal years 2010 through 2017, rounded to the nearest hundreds up to fiscal year 2013, and more-precisely from fiscal years 2014 and beyond.

In addition, we observed maintainer technical school training—both classroom-based and hands-on—as well as training equipment at Sheppard Air Force Base in Texas and Eglin Air Force Base in Florida. We selected these locations because they are two of the primary locations where aircraft maintainer technical school training occurs. Specifically, according to Air Force officials, the majority of aircraft maintainers receive at least a portion of their technical school training at Sheppard Air Force Base, and all F-35-specific maintainer training occurs at Eglin Air Force Base. Additionally, as part of our previously discussed non-generalizable sample of discussion groups with aircraft maintainers, we obtained maintainers' perspectives on technical school and on-the-job training. We also reviewed training policies as well as other documentation, such as Career Field Education and Training Plans and training evaluations. Finally, we conducted interviews with technical school instructors and supervisors about the maintainer training process as well as AETC, Air National Guard, and Air Force Reserve Command officials about training challenges and programmed training needs.

We conducted this performance audit from April 2018 to February 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: Air Force Reserve Component Aircraft Maintainer Retention from Fiscal Years 2010-2017

According to Air National Guard and Air Force Reserve Command officials, they monitor retention of aircraft maintainers through loss rates—the number of maintainers who leave the career field or the Air Force within the fiscal year, over the number of maintainers at the start of the fiscal year—and have used selective retention bonuses (retention bonuses) and taken other actions to improve retention.

According to our analysis of Air National Guard data, aircraft maintainer loss rates have fluctuated over the past 8 fiscal years. For example, loss rates increased significantly for all maintenance specialties and skill levels combined, from 12 percent in fiscal year 2010, to 36 percent and 30 percent in fiscal years 2012 and 2013, respectively. While Air National Guard maintainer loss rates decreased from fiscal years 2014 through 2017, they remained higher than fiscal year 2010 rates. Table 7 provides loss rates for Air National Guard aircraft maintainers over the past 8 fiscal years.

Table 7: Air National Guard Aircraft Maintainer Loss Rates (as percentages), Fiscal Years 2010-2017

Level	Fiscal year 2010	Fiscal year 2011	Fiscal year 2012	Fiscal year 2013	Fiscal year 2014	Fiscal year 2015	Fiscal year 2016	Fiscal year 2017
5-Level maintainers	11	13	45	34	23	20	18	18
7-Level maintainers	12	13	27	28	20	15	15	15
All skill levels (0 to 9)	12	14	36	30	21	18	17	17

Source: GAO analysis of Air National Guard loss rate data. | GAO-19-160

Air National Guard officials stated that maintainer loss rates are often location dependent, and that retention bonuses are the primary tool used to improve retention. According to these officials, while the Air National Guard looks at nationwide staffing when determining which occupational specialties are eligible for bonuses, some locations may have more critical needs than others. The number of retention bonuses that the Air

National Guard has awarded to aircraft maintainers has decreased over the past 8 fiscal years, while the total cost has increased. Specifically, in fiscal year 2010, the Air National Guard awarded 1,587 retention bonuses at a total cost of \$4,580,295.¹ However, in fiscal year 2017, the Air National Guard awarded 653 retention bonuses at a total cost of \$5,373,000. Over the past 8 fiscal years, the majority of its retention bonuses were awarded to 7-level maintainers.

The Air Force Reserve Command’s aircraft maintainer loss rates over the past 8 fiscal years have ranged from 10 to 13 percent. In addition, the loss rates of 5- and 7-level maintainers have been similar to the loss rates of all skill levels combined over this period. Similar to the Air National Guard, Air Force Reserve Command officials stated that maintainer staffing challenges and loss rates are partly location dependent, though they also cited opportunities and higher pay in the civilian labor market; high operations tempo; lack of career growth, opportunities, and flexibility; and pay disparities with the active component as factors affecting retention. Table 8 provides loss rates for Air Force Reserve Command aircraft maintainers over the past 8 fiscal years.

Table 8: Air Force Reserve Command Aircraft Maintainer Loss Rates (as percentages), Fiscal Years 2010-2017

Level	Fiscal year 2010	Fiscal year 2011	Fiscal year 2012	Fiscal year 2013	Fiscal year 2014	Fiscal year 2015	Fiscal year 2016	Fiscal year 2017
5-Level maintainers	11	11	12	12	13	12	10	12
7-Level maintainers	11	11	11	10	13	13	11	13
All skill levels (0 to 9)	11	11	11	11	13	12	10	12

Source: GAO analysis of Air Force Reserve Command loss rate data. | GAO-19-160

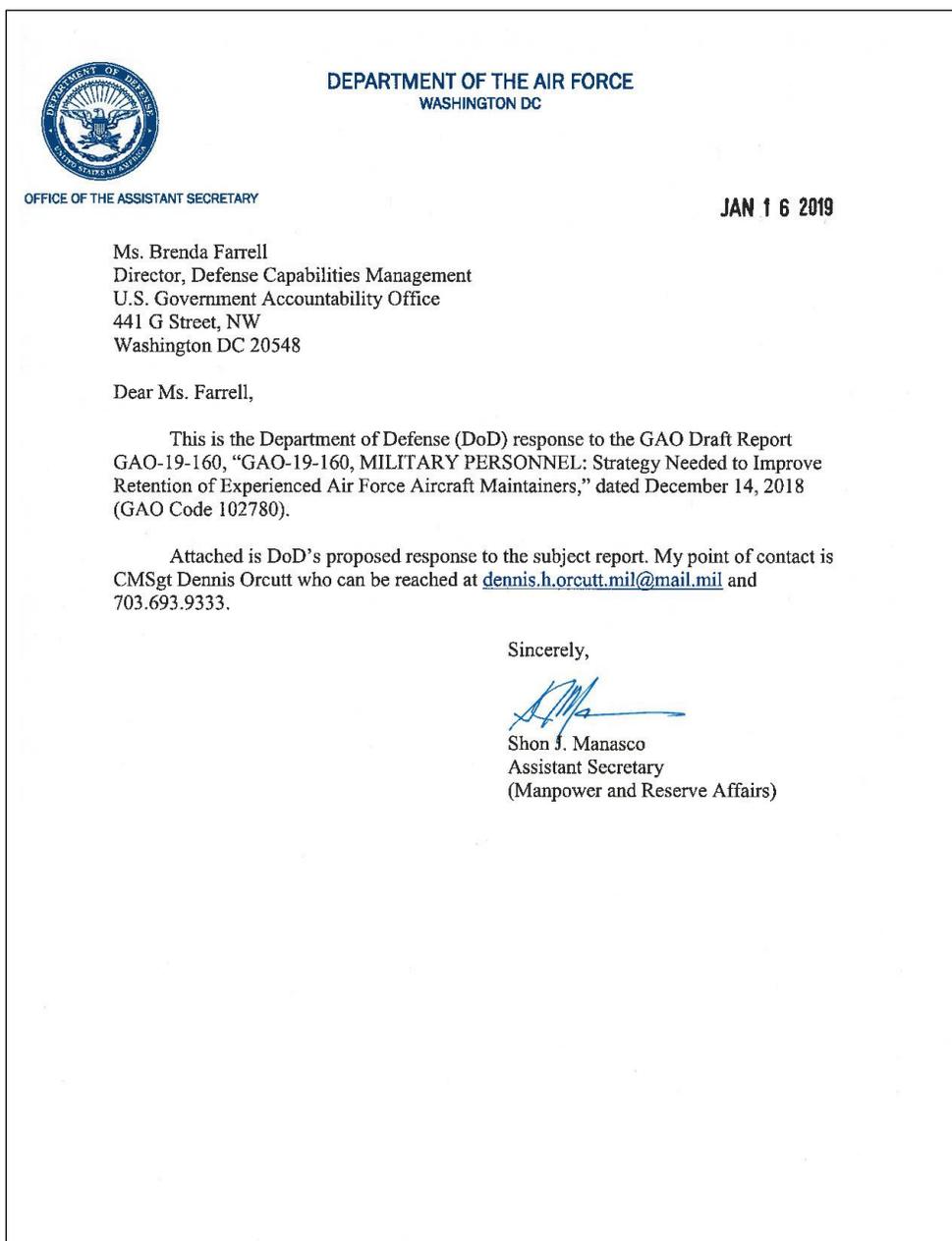
The Air Force Reserve Command has also used retention bonuses to help improve retention. Specifically, over the past 8 fiscal years, the Air Force Reserve Command has increased the number of retention bonuses awarded and their total costs. For example, in fiscal year 2012, the Air Force Reserve Command awarded 15 retention bonuses totaling \$242,593.² In fiscal year 2015, it increased to 572 bonuses awarded totaling \$8,913,229. In fiscal year 2017, the Air Force Reserve Command awarded 317 retention bonuses at a total cost of \$4,550,000. According

¹Retention bonus amounts are inflation-adjusted monetary amounts in fiscal year 2017 dollars.

²Retention bonus amounts are inflation-adjusted monetary amounts in fiscal year 2017 dollars.

to Air Force Reserve Command officials, the Air Force Reserve Command has taken a number of steps to help improve technician retention, such as paid permanent change of station and student loan repayment. These officials stated that they are also currently working to improve career path options and medical benefits for technicians. Further, Air Force Reserve Command officials highlighted Human Capital Management 2.0 as an effort focused on balancing the human capital supply and demand across the Air Force Reserve Command, including improving recruitment and retention.

Appendix III: Comments from the Department of Defense



GAO DRAFT REPORT DATED DECEMBER 14, 2018
GAO-19-160 (GAO CODE 102780)

“MILITARY PERSONNEL: STRATEGY NEEDED TO IMPROVE RETENTION OF
EXPERIENCED AIR FORCE AIRCRAFT MAINTAINERS”

DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATION

RECOMMENDATION 1: The GAO recommends that the Secretary of the Air Force should develop annual retention goals for aircraft maintainers by skill level—for both loss and reenlistment rates—in alignment with authorized levels.

DoD RESPONSE: Concur. The report provides a fair assessment of how we got there, why, and what we have done thus far. It is understood that the maintenance manpower deficit did not merely occur due to maintainers volunteering to separate in mass numbers in the past decade. Instead, force management and budgetary actions involuntarily pushed our maintainers out of the USAF. While rebuilding our inventory, retaining maintainers in the right AFSCs and skill levels has also been a priority. We have utilized tools such as Selective Reenlistment Bonuses and High Year of Tenure extensions in order to curb the experience gap created by force management actions.

RECOMMENDATION 2: The GAO recommends that the Secretary of the Air Force should develop an aircraft maintainer retention strategy, including initiatives that are tailored to the specific needs and challenges of maintainers to help ensure that the Air Force can meet and retain required staffing levels. ...

DoD RESPONSE: Concur. The Air Force Deputy Chief of Staff for Logistics as well as Manpower, Personnel, and Services, have started initial planning on a retention strategy for aircraft maintainers and will continue to explore options for enactment of the recommendations.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Brenda S. Farrell, (202) 512-3604 or farrellb@gao.gov

Staff Acknowledgments

In addition to the contacts named above, Lori Atkinson (Assistant Director), Benjamin Bolitzer, Molly Callaghan, Timothy Carr, Christopher Curran, Matthew Dobratz, Amie Lesser, Grant Mallie, Mike Silver, Carter Stevens, and Lillian M. Yob made significant contributions to this report.

Appendix V: Accessible Data

Data Tables

Data Table for Air Force Aircraft Maintainer Loss Rates by Skill Level, Fiscal Years 2010-2017

Level	2010	2011	2012	2013	2014	2015	2016	2017
3-level	9	9	10	7	9	6	5	4
5-level	9	8	10	11	14	11	12	12
7-level	8	14	9	10	14	12	8	9

Data Table for Figure 3: Air Force Active Component Aircraft Maintainer Actual Staffing Levels, Authorized Levels, and Requirements, Fiscal Years 2010-2017

Year	Actual staffing level	Authorized level	Requirement
2010	67110	65405	68863
2011	66173	67021	70202
2012	65552	68329	71674
2013	65833	68829	72687
2014	63491	67297	70669
2015	62423	66439	68241
2016	62858	66570	68618
2017	65814	66559	69467

Data Table for Figure 4: Air Force Active Component Aircraft Maintainer Actual Staffing Levels Compared with Authorized Levels by Skill Level, Fiscal Years 2010-2017

Level	2010	2011	2012	2013	2014	2015	2016	2017
3-level	126	115	105	110	103	76	84	112
5-level	96	94	93	91	93	101	98	94
7-level	100	96	95	95	91	96	98	97

Data Table for Figure 5: Air Force Reserve Component Actual Aircraft Maintainer Staffing Levels Compared with Authorized Levels, Fiscal Years 2010-2017

Position	2010	2011	2012	2013	2014	2015	2016	2017
Air National Guard	85	88	89	88	84	89	89	87
Air Force Reserve Command	95	98	100	103	101	98	97	97

Data Table for Figure 6: Air Force Active Component Aircraft Maintainer Loss Rates by Skill Level, Fiscal Years 2010-2017

Level	2010	2011	2012	2013	2014	2015	2016	2017
3-level	9	9	10	7	9	6	5	4
5-level	9	8	10	11	14	11	12	12
7-level	8	14	9	10	14	12	8	9

Data Table for Figure 7: Air Force Active Component Aircraft Maintainer Retention Bonuses, Fiscal Years 2010-2017

Year	Millions of fiscal year 2017 dollars	Number of bonuses
2010	0.07	4
2011	0.07	4
2012	13.63	490
2013	3.52	146
2014	1.73	78
2015	60.64	1590
2016	87.16	2415
2017	65.78	1797

Data Table for Figure 8: Air Force Active Component Aircraft Maintainer Actual Technical School Completions Compared with Programmed Completions, Fiscal Years 2010-2017

Level	2010	2011	2012	2013	2014	2015	2016	2017
3-level	100	95	95	95	95	95	95	95

Agency Comment Letter

Text of Appendix III: Comments from the Department of Defense

Page 1

Ms. Brenda Farrell
Director, Defense Capabilities Management
U.S. Government Accountability Office 441 G Street, NW
Washington DC 20548 Dear Ms. Farrell,

This is the Department of Defense (DoD) response to the GAO Draft Report GAO-19-160, "GAO-19-160, MILITARY PERSONNEL: Strategy Needed to Improve Retention of Experienced Air Force Aircraft Maintainers," dated December 14, 2018 (GAO Code 102780).

Attached is DoD's proposed response to the subject report. My point of contact is CMSgt Dennis Orcutt who can be reached at dennis.h.orcutt.mil@mail.mil and 703.693.9333.

Sincerely,

Shon J. Manasco Assistant Secretary
(Manpower and Reserve Affairs)

Page 2

**GAO DRAFT REPORT DATED DECEMBER 14, 2018 GAO-19-160
(GAO CODE 102780)
"MILITARY PERSONNEL: STRATEGY NEEDED TO IMPROVE
RETENTION OF EXPERIENCED AIR FORCE AIRCRAFT
MAINTAINERS"
DEPARTMENT OF DEFENSE COMMENTS TO THE GAO
RECOMMENDATION**

RECOMMENDATION 1:

The GAO recommends that the Secretary of the Air Force should develop annual retention goals for aircraft maintainers by skill level-for both loss and reenlistment rates-in alignment with authorized levels.

DoD RESPONSE:

Concur. The report provides a fair assessment of how we got there, why, and what we have done thus far. It is understood that the maintenance manpower deficit did not merely occur due to maintainers volunteering to separate in mass numbers in the past decade. Instead, force management and budgetary actions involuntarily pushed our maintainers out of the USAF. While rebuilding our inventory, retaining maintainers in the right AFSCs and skill levels has also been a priority. We have utilized tools such as Selective Reenlistment Bonuses and High Year of Tenure extensions in order to curb the experience gap created by force management actions.

RECOMMENDATION 2:

The GAO recommends that the Secretary of the Air Force should develop an aircraft maintainer retention strategy, including initiatives that are tailored to the specific needs and challenges of maintainers to help ensure that the Air Force can meet and retain required staffing levels....

DoD RESPONSE:

Concur. The Air Force Deputy Chief of Staff for Logistics as well as Manpower, Personnel, and Services, have started initial planning on a retention strategy for aircraft maintainers and will continue to explore options for enactment of the recommendations.

Related GAO Products

DOD Depot Workforce: Services Need to Assess the Effectiveness of Their Initiatives to Maintain Critical Skills. [GAO-19-51](#). Washington, D.C.: December 14, 2018.

Air Force Readiness: Actions Needed to Rebuild Readiness and Prepare for the Future. [GAO-19-120T](#). Washington, D.C.: October 10, 2018.

Military Aviation Mishaps: DOD Needs to Improve Its Approach for Collecting and Analyzing Data to Manage Risks. [GAO-18-586R](#). Washington, D.C.: August 15, 2018.

Military Personnel: Collecting Additional Data Could Enhance Pilot Retention Efforts. [GAO-18-439](#). Washington, D.C.: June 21, 2018.

Military Personnel: DOD Needs to Reevaluate Fighter Pilot Workforce Requirements. [GAO-18-113](#). Washington, D.C.: April 11, 2018.

Department of Defense: Actions Needed to Address Five Key Mission Challenges. [GAO-17-369](#). Washington, D.C.: June 13, 2017.

Military Compensation: Additional Actions Are Needed to Better Manage Special and Incentive Pay Programs. [GAO-17-39](#). Washington, D.C.: February 3, 2017.

Unmanned Aerial Systems: Air Force and Army Should Improve Strategic Human Capital Planning for Pilot Workforces. [GAO-17-53](#). Washington, D.C.: January 31, 2017.

Air Force Training: Further Analysis and Planning Needed to Improve Effectiveness. [GAO-16-864](#). Washington, D.C.: September 19, 2016.

Unmanned Aerial Systems: Further Actions Needed to Fully Address Air Force and Army Pilot Workforce Challenges. [GAO-16-527T](#). Washington, D.C.: March 16, 2016.

Unmanned Aerial Systems: Actions Needed to Improve DOD Pilot Training. [GAO-15-461](#). Washington, D.C.: May 14, 2015.

Air Force: Actions Needed to Strengthen Management of Unmanned Aerial System Pilots. [GAO-14-316](#). Washington, D.C.: April 10, 2014.

Aviation Workforce: Current and Future Availability of Airline Pilots. [GAO-14-232](#). Washington, D.C.: February 28, 2014.

Aviation Workforce: Current and Future Availability of Aviation Engineering and Maintenance Professionals. [GAO-14-237](#). Washington, D.C.: February 28, 2014.

Military Cash Incentives: DOD Should Coordinate and Monitor Its Efforts to Achieve Cost-Effective Bonuses and Special Pays. [GAO-11-631](#). Washington, D.C.: June 21, 2011.

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