



# AVIATION MAINTENANCE

## Additional Coordination and Data Could Advance FAA Efforts to Promote a Robust, Diverse Workforce

Accessible Version

February 2020

## Why GAO Did This Study

FAA requires that only mechanics who are “certificated” by the FAA approve aircraft for return to service. The required training to become a certificated mechanic can take between 1 and 3 years. FAA also oversees the certification of repairmen who work on aircraft parts. Some stakeholders have expressed concern that retirements and attrition could adversely affect the capacity of this workforce to meet the growing demand for air travel, and that mechanic curriculum is outdated.

The FAA Reauthorization Act of 2018 included provisions for GAO to examine the aviation workforce. This report examines (1) what available federal data reveal about the FAA-certificated aviation maintenance workforce; (2) how selected government agencies, educational institutions, and businesses provide support and coordinate to develop the aviation maintenance workforce; and (3) the progress FAA has made in updating its curriculum and testing standards for mechanics. GAO analyzed FAA data on certificate holders as of December 2018; reviewed BLS employment data for 2013 through 2018; reviewed relevant federal laws and regulations; and interviewed selected federal agency, industry, and AMT School officials.

## What GAO Recommends

GAO recommends that FAA use its existing data and coordinate with other federal agencies to identify and gather information to measure progress and target resources toward its goal of promoting a robust, qualified, and diverse aviation maintenance workforce. FAA agreed with the recommendation.

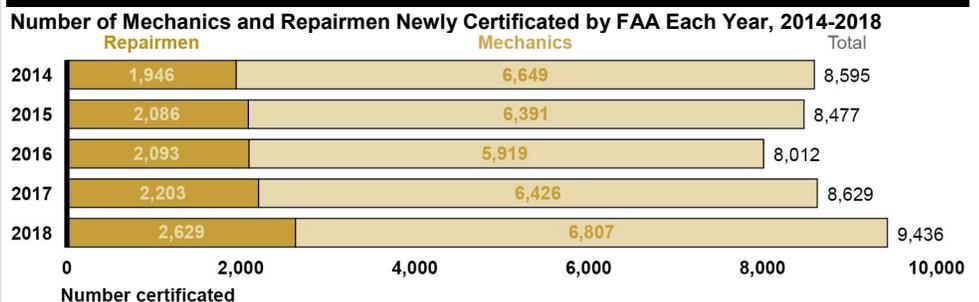
View [GAO-20-206](#). For more information, contact Chelsa Gurkin at (202) 512-7215 or [gurkinc@gao.gov](mailto:gurkinc@gao.gov).

## AVIATION MAINTENANCE

### Additional Coordination and Data Could Advance FAA Efforts to Promote a Robust, Diverse Workforce

## What GAO Found

Federal data provide an incomplete picture of the Federal Aviation Administration (FAA)-certificated aviation maintenance workforce. A sufficient supply of certificated workers is critical for safety and to meet the growing demand for air travel. However, supply and demand data for certificated workers are limited. FAA maintains data on the number of individuals newly certificated each year (see figure), but less is known about how many certificated individuals exit the aviation industry each year and the extent of growing demand. Bureau of Labor Statistics (BLS) data provide some information on pay and demand for aviation maintenance workers more broadly, but do not differentiate between FAA-certificated and non-certificated workers due to data collection challenges. Demographic data may also be useful for workforce analysis and planning. FAA data provide some demographic information on certificated mechanics and repairmen, such as age and sex, but the agency lacks data on race and ethnicity. According to GAO analysis of FAA data, over half of the roughly 330,000 mechanics and repairmen FAA had certificated as of December 2018 were between 50 and 70 years old and 97 percent were men.



Source: GAO analysis of Federal Aviation Administration (FAA) data. | GAO-20-206

Government agencies, educational institutions, and businesses coordinate to some extent in support of this workforce, but FAA lacks certain information—including information maintained by other agencies that administer related programs—that could advance its workforce development efforts. One of FAA’s strategic objectives includes promoting the development of a robust, skilled aviation workforce, and the agency established a committee, in part, to explore ways to diversify this workforce; however, FAA is not currently positioned to understand whether its efforts are optimally targeted or effective. Without routinely analyzing its own data or leveraging others’ data, FAA may not have certain information it needs to track or ensure progress toward its workforce development goals.

FAA has acknowledged that curriculum requirements for Aviation Maintenance Technician (AMT) Schools and mechanic testing standards are outdated. Efforts to revise the curriculum requirements for AMT Schools are ongoing and FAA officials told GAO that a final rule will be published some time toward the end of 2020. FAA officials indicated that the revised mechanic testing standards would likely be finalized after.

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# Contents

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Letter		1
	Background	3
	Existing Data Provide Limited Information about the Current Workforce and Potential Future Demand	10
	Government and Industry Programs Support the Workforce, but FAA Lacks Information that Could Advance Its Workforce Development Efforts	17
	FAA Has Proposed Changing Its Decades Old Mechanic Curriculum Requirements and Its Testing Standards, and Revisions to Them Are Ongoing	24
	Conclusions	29
	Recommendation for Executive Action	29
	Agency Comments	30
<hr/>		
Appendix I: Labor Market Indicator Analysis		31
Appendix II: Department of Transportation Agency Comments		34
Appendix III: GAO Contact and Staff Acknowledgments		36
Appendix IV: Accessible Data		37
	Data Tables	37
	Agency Comment Letter	42
<hr/>		
Tables		
	Table 1: Federal Aviation Administration (FAA) History and Attempts to Update Curriculum for Aviation Maintenance Technician (AMT) Schools	25
	Table 2: Selected Labor Market Indicators for Aircraft Mechanics and Service Technicians, 2013-2018	31
<hr/>		
Figures		
	Figure 1: Pathways to Federal Aviation Administration (FAA) Certification for Mechanics	5

Figure 2: Bureau of Labor Statistics Standard Occupational Classification (SOC) Codes and Descriptions for Avionics Technicians and Aircraft Mechanics and Service Technicians	8
Figure 3: Age Distribution of Federal Aviation Administration (FAA) Certificated Mechanics and Repairmen as of December 2018	11
Figure 4: Career Pathways for Federal Aviation Administration (FAA) Certificated Mechanics, 2015 through 2018	12
Figure 5: Number of Mechanics and Repairmen Newly Certificated by the Federal Aviation Administration (FAA) Each Year, 2014-2018	13
Figure 6: Excerpts from the Federal Aviation Administration's (FAA) October 2015 Notice of Proposed Rulemaking (NPRM) and April 2019 Supplemental NPRM (SNPRM) related to the Part 147 Regulations for Aviation Maintenance Technician (AMT) Schools	26
Figure 7: Timeline of Relevant Federal Aviation Administration (FAA) Working Groups and Activities Related to Updating Curriculum Requirements for Aviation Maintenance Technician Schools and Mechanic Testing Standards (2007-2019)	28
Accessible Data for Number of Mechanics and Repairmen Newly Certificated by FAA Each Year, 2014-2018	37
Accessible Data for Figure 1: Pathways to Federal Aviation Administration (FAA) Certification for Mechanics	37
Accessible Data for Figure 2: Bureau of Labor Statistics Standard Occupational Classification (SOC) Codes and Descriptions for Avionics Technicians and Aircraft Mechanics and Service Technicians	37
Accessible Data for Figure 3: Age Distribution of Federal Aviation Administration (FAA) Certificated Mechanics and Repairmen as of December 2018	38
Accessible Data for Figure 4: Career Pathways for Federal Aviation Administration (FAA) Certificated Mechanics, 2015 through 2018	40
Accessible Data for Figure 5: Number of Mechanics and Repairmen Newly Certificated by the Federal Aviation Administration (FAA) Each Year, 2014-2018	40
Accessible Data for Figure 6: Excerpts from the Federal Aviation Administration's (FAA) October 2015 Notice of Proposed Rulemaking (NPRM) and April 2019 Supplemental NPRM	

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(SNPRM) related to the Part 147 Regulations for Aviation Maintenance Technician (AMT) Schools	40
Accessible Data for Figure 7: Timeline of Relevant Federal Aviation Administration (FAA) Working Groups and Activities Related to Updating Curriculum Requirements for Aviation Maintenance Technician Schools and Mechanic Testing Standards (2007-2019)	41

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### Abbreviations

A&P	airframe and powerplant
AMT	aviation maintenance technician
BLS	Bureau of Labor Statistics
COOL	Credentialing Opportunities On-Line
DOD	Department of Defense
DOL	Department of Labor
DOT	Department of Transportation
Education	Department of Education
FAA	Federal Aviation Administration
NPRM	Notice of Proposed Rulemaking
Post-9/11 GI Bill	Post-9/11 Veterans Educational Assistance Act of 2008
SNPRM	Supplemental Notice of Proposed Rulemaking
SOC	Standard Occupational Classification
VA	Department of Veterans Affairs

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February 6, 2020

The Honorable Roger Wicker  
Chairman  
The Honorable Maria Cantwell  
Ranking Member  
Committee on Commerce, Science, and Transportation  
United States Senate

The Honorable Peter DeFazio  
Chairman  
The Honorable Sam Graves  
Ranking Member  
Committee on Transportation and Infrastructure  
House of Representatives

Each year, hundreds of millions of passengers rely on airlines to get them safely to their destination. Public confidence in safety is critical to the aviation industry, and the Federal Aviation Administration (FAA) requires repaired aircraft be approved for return to service only by mechanics who are “certificated” by the FAA.<sup>1</sup> A sufficient supply of qualified aviation maintenance workers, including FAA-certificated mechanics and repairmen, is necessary for repairing aircraft and maintaining a safe and robust aviation system.<sup>2</sup> Changes in technology in the aviation industry are ongoing and expected to continue at a rapid pace, which could affect the training of these workers. In addition, FAA and the aviation industry anticipate that the demand for air travel will grow in coming years. Federal and aviation industry stakeholders have expressed concern over the capacity of the aviation maintenance workforce to meet projected needs due to retirements, attrition, fleet growth, and the growing demand for air travel.

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<sup>1</sup>See 14 C.F.R. §§ 65.85, 65.87.

<sup>2</sup>The requirements for becoming a certificated mechanic are prescribed in 14 C.F.R. part 65, subpart D, §§ 65.71 - 65.95, and for a certificated repairman in 14 C.F.R. part 65, subpart E, §§ 65.101 - 65.107. We use the term “repairmen” throughout this report, which is the term used in regulation, to include both men and women.

The FAA Reauthorization Act of 2018 included a provision for us to examine different aspects of the aviation maintenance workforce.<sup>3</sup> This report examines (1) what available federal data reveal about the FAA-certificated aviation maintenance workforce, (2) how selected government agencies, educational institutions, and businesses provide support and coordinate to develop the aviation maintenance workforce, and (3) the progress FAA has made in updating its curriculum, certification, and testing standards for mechanics.

To examine the characteristics of FAA-certificated mechanics and repairmen, we analyzed cumulative FAA data as of December 2018 for demographic characteristics such as age and sex.<sup>4</sup> To examine the employment characteristics of aviation maintenance workers—such as wages and unemployment—we analyzed Bureau of Labor Statistics (BLS) Current Population Survey data for selected labor market indicators from 2013 through 2018, and we reviewed all 50 states' most recent Workforce Innovation and Opportunity Act plans. See appendix I for our labor market indicator analysis.

To describe stakeholder support and assess stakeholder coordination on efforts to develop this workforce, we interviewed agency officials from FAA and the Departments of Labor (DOL), Education (Education), Defense (DOD), and Veterans Affairs (VA) about related data, programs, and funding for this workforce.<sup>5</sup> We selected these agencies based on a prior report in which we identified them as relevant to the aviation workforce.<sup>6</sup> To describe examples of stakeholder coordination, we also conducted semi-structured interviews with a non-generalizable sample of

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<sup>3</sup>Pub. L. No. 115-254, § 624, 132 Stat. 3186, 3405. The FAA Reauthorization Act of 2018 included another provision for us that relates to this workforce that will result in a separate, forthcoming report. Work in this area is ongoing. Pub. L. No. 115-254, § 622, 132 Stat. 3186, 3404.

<sup>4</sup>We used this time frame for our analysis because complete data for calendar year 2019 were not yet available. We limited the scope of our analysis to those individuals who were issued a plastic certificate by FAA, which is required for certificated workers to exercise their privileges after March 31, 2013. See 14 C.F.R. §§ 63.15(d) and 65.15(d). FAA began issuing plastic certificates in July 2003. We excluded those individuals over 90 years old and whose certification was suspended, surrendered, or revoked. FAA publishes some demographic data for certificated mechanics and repairmen on its website, including data on sex.

<sup>5</sup>Unless otherwise noted, dollar amounts included in this report were not adjusted for inflation.

<sup>6</sup>GAO, *Aviation Workforce: Current and Future Availability of Aviation Engineering and Maintenance Professionals*, [GAO-14-237](#) (Washington, D.C.: Feb. 28, 2014).

16 stakeholders including employers, Aviation Maintenance Technician (AMT) Schools, unions, industry associations, and workforce training organizations selected based on stakeholder recommendations, among other factors, and conducted two site visits. We visited an AMT School that serves the District of Columbia area and an aviation repair station, a major commercial airline, and a state workforce organization in Georgia. We selected these stakeholders and conducted these site visits to obtain a range of perspectives and based on factors such as type of work performed and geographic location. In addition, we reviewed relevant agency documents, such as FAA's 2019-2022 strategic plan and its Aviation Workforce Steering Committee charter.

To describe what progress FAA has made on updating training curriculum requirements for AMT Schools and certification testing standards for mechanics, we reviewed relevant federal laws, regulations, and FAA documents, and interviewed FAA officials.

We conducted this performance audit from January 2019 to February 2020 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.

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## Background

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### Aviation Maintenance Workforce

Different aviation industry employers have distinct workforce needs and may require workers with specific skillsets depending on the type of work performed. The aviation maintenance workforce includes FAA-certificated mechanics and repairmen, as well as non-certificated workers.

- **FAA-certificated mechanics** inspect, service, and repair aircraft bodies (airframe) and engines (powerplant), and only they can approve an aircraft for return to service. FAA-certificated mechanics can earn an airframe rating, a powerplant rating, or an airframe and powerplant (A&P) rating. It can take between 1 and 3 years to obtain the required education or training to become certificated. If an FAA-certificated mechanic changes employers, the certificate remains valid.

- **FAA-certificated repairmen** service aircraft components and must be recommended for certification by their employer to perform specific tasks such as welding or painting. It can take more than a year to obtain the required experience or training to become certificated. FAA-certificated repairmen are employed by entities such as repair stations that are authorized by FAA to perform specific tasks. A repairman certificate is only valid at the employer for which it was issued.<sup>7</sup>
- **Non-certificated aviation maintenance workers** include individuals who are supervised by certificated mechanics or repairmen in performing repair work.

FAA maintains data on certificated mechanics and repairmen, including data on characteristics such as age and sex. FAA also maintains some data on non-certificated workers, such as the number employed by FAA-certificated repair stations, but neither the federal government nor the aviation industry maintains data on the total number of non-certificated aviation maintenance workers.

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## Pathways to Becoming FAA-Certificated

Career pathways consist of education, training, and support services that enable individuals to obtain industry-relevant certification and employment. There are three distinct pathways to become eligible to take the FAA mechanic tests—military training and experience, AMT School, and practical, or civil work experience (see fig. 1). FAA collects data on the use of the different pathways to becoming a certificated mechanic.<sup>8</sup> Individuals must pass the FAA mechanic tests to become certificated, regardless of the pathway they take to become eligible to take the tests.<sup>9</sup>

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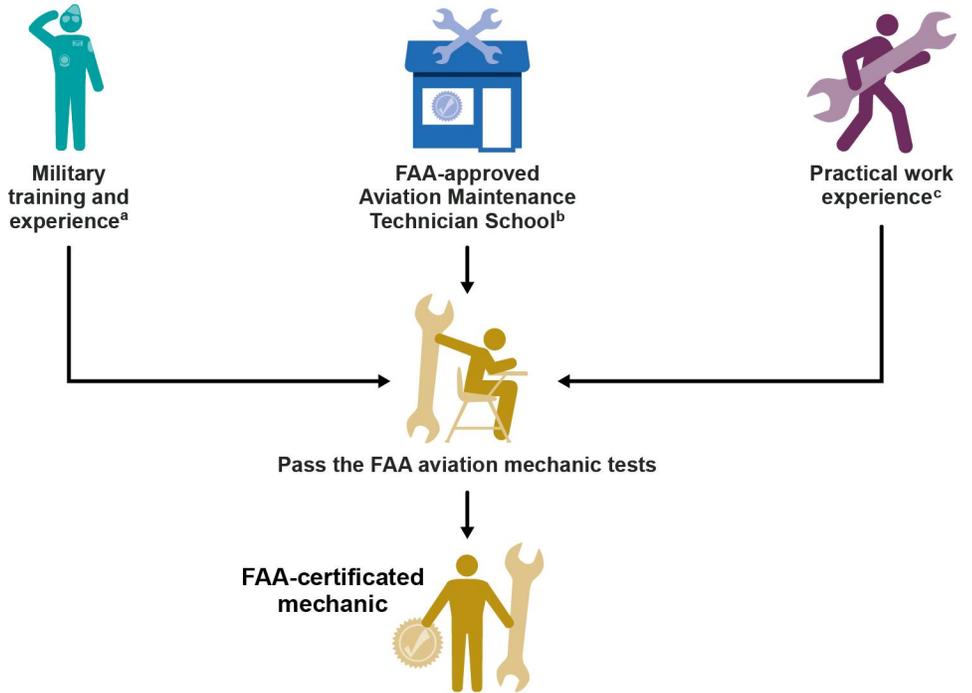
<sup>7</sup>14 C.F.R. § 65.103(a). Certificated repairmen must meet FAA practical experience or formal training requirements. 14 C.F.R. § 65.101(a)(5).

<sup>8</sup>FAA's mechanic application refers to these three pathways as "military experience," "graduate of approved course," and "civil experience." In this report, we use the term "practical work experience" to refer to civil experience.

<sup>9</sup>14 C.F.R. § 65.79.

There are three tests—written, oral, and practical.<sup>10</sup> FAA publishes testing standards for the oral and practical skills tests.

**Figure 1: Pathways to Federal Aviation Administration (FAA) Certification for Mechanics**



Source: GAO analysis of FAA regulations and other agency documents. | GAO-20-206

<sup>10</sup>The written knowledge test includes topics such as the construction and maintenance of aircraft, relevant FAA regulations, and basic maintenance principles. The oral and practical tests cover all of the technical and regulatory subject areas and test individuals on their technical skills.

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<sup>a</sup>Individuals with specific military occupational specialty codes are eligible to enroll in the military airframe and powerplant program.

<sup>b</sup>The length of these programs varies between 1 and 2 years. Combined airframe and powerplant curriculum consists of 1,900 curriculum hours of training: 750 hours in airframe subjects, 750 hours in powerplant subjects, and 400 hours in general education subjects.

<sup>c</sup>FAA requires at least 18 months of practical aircraft maintenance experience for either the airframe or powerplant rating, and at least 30 months for both ratings.

**Military training and experience.** The Community College of the Air Force administers an FAA-approved A&P training program which consists of on-the-job training and various courses for military service members with certain experience. When service members successfully complete the program, the Joint Services Aviation Maintenance Technician Certification Council issues them a certificate of eligibility to take the FAA mechanic tests (see side bar).

**Joint Services Aviation Maintenance Technician Certification Council**

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. 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.

Source: GAO. | GAO-20-206

**Aviation Maintenance Technician School.** Individuals may also attend an FAA-approved AMT School to become eligible to take the FAA mechanic tests. FAA approves and oversees AMT Schools and it maintains enrollment and mechanic test pass-rate data for each school. The minimum curriculum requirements for these schools are currently prescribed in regulation.<sup>11</sup> The regulation includes the subjects the curriculum must cover and the number of training hours students must complete to become eligible to take the FAA mechanic tests.<sup>12</sup> Given that AMT School curriculum requirements are in regulation, FAA has in the past attempted to amend the requirements through the federal rulemaking process.

**Practical work experience.** People can also become eligible to take the FAA mechanic tests by demonstrating practical, or civil work experience. Individuals may work under the supervision of a certificated mechanic for 18 months for either an airframe or powerplant certificate, or 30 months for an A&P certificate. Practical work experience includes apprenticeships, which combine on-the-job training with classroom instruction.

For certificated repairmen, there is no prescribed test, though repairmen must demonstrate their practical experience or have completed formal training to be certificated. Avionics technicians also have no prescribed test, but may seek certain related certifications.

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## Occupational Data

The Standard Occupational Classification (SOC) system is a federal statistical standard used to classify workers into occupational categories for purposes of collecting, calculating, or disseminating data such as employment levels and pay. The SOC structure forms the basis for the occupational coding system used by BLS' Occupational Employment Statistics survey and Current Population Survey. Aviation maintenance workers generally fall into the avionics technicians or the aircraft mechanics and service technicians occupational group (see fig. 2). Both

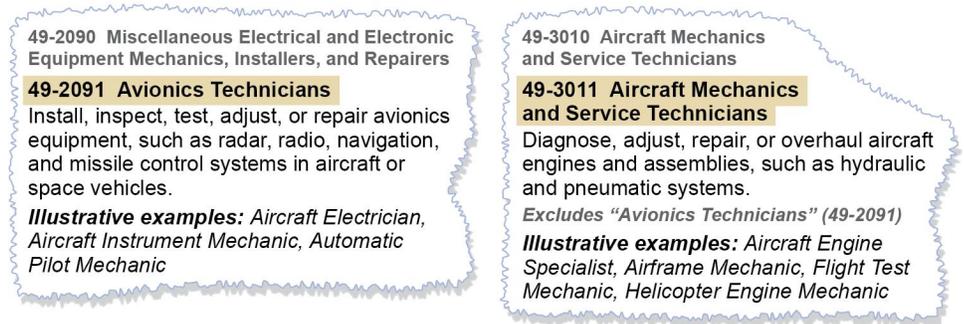
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<sup>11</sup>14 C.F.R. part 147, app. A.

<sup>12</sup>14 C.F.R. part 147, apps. B - D.

occupational groups include certificated and non-certificated individuals.<sup>13</sup> The most recent revision to the SOC was for 2018.<sup>14</sup>

**Figure 2: Bureau of Labor Statistics Standard Occupational Classification (SOC) Codes and Descriptions for Avionics Technicians and Aircraft Mechanics and Service Technicians**



Source: The 2018 SOC system. | GAO-20-206

## Selected Federal Agencies and the Aviation Maintenance Workforce

In addition to the Department of Transportation (DOT) and FAA, several other federal agencies play a role in developing and maintaining a qualified aviation professional workforce. For example, we previously reported on related efforts administered by DOD, DOL, VA, and Education.<sup>15</sup> These agencies provide either financial assistance for education or training in aviation maintenance related fields or administer programs that support career pathways to becoming an FAA-certificated mechanic or repairman.

<sup>13</sup>Avionics technicians may hold an FAA-issued A&P or repairman certificate or other type of certification. In this report, we primarily focus on the aircraft mechanics and service technicians occupation because of its size relative to the avionics technicians occupation.

<sup>14</sup>The 2018 revision included adding, deleting, and combining certain detailed occupations and revising certain definitions, among other changes. The Standard Occupational Classification Policy Committee did not recommend any changes to the classification of aircraft mechanics and service technicians or avionics technicians for the 2018 revision. There is no set schedule for updating the SOC; however, in more recent years, it has been updated about every 10 years. Since its inception in 1980, the SOC has been revised in 2000, 2010, and 2018. The Office of Management and Budget has not officially announced when the next revision to the SOC will occur, but BLS officials indicated the next revision may be for the year 2028.

<sup>15</sup>[GAO-14-237](#).

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**Letter**

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## Existing Data Provide Limited Information about the Current Workforce and Potential Future Demand

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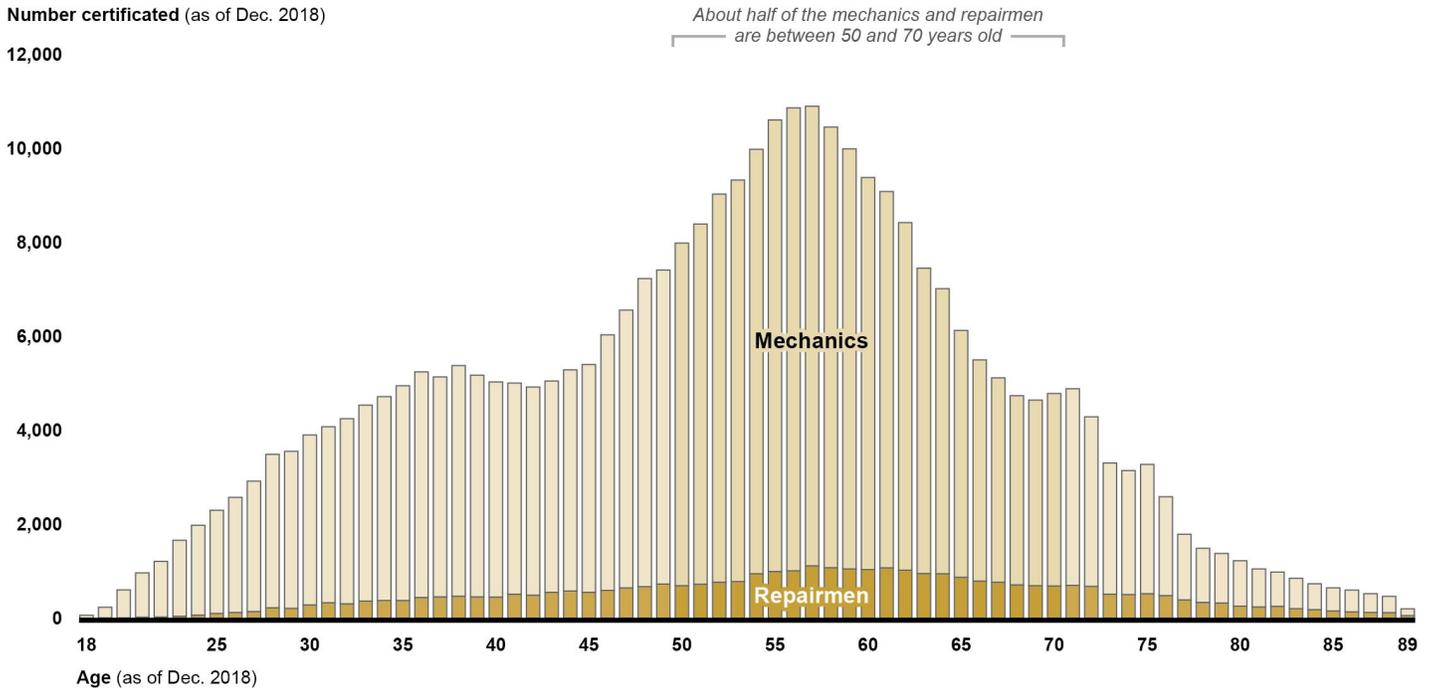
### Federal Data Provide Information on the Number of Certificated Mechanics and Repairmen but Likely Overestimate How Many Are Available to Fill Projected Openings

As of December 2018, about 295,000 individuals held a mechanic certificate and about 35,000 held a repairman certificate. The median age of FAA-certificated mechanics and repairmen was 54 years old, according to our analysis of the FAA data.<sup>16</sup> Specifically, 52 percent were between the ages of 50 and 70 years old; 19 percent were between 39 and 49; and 19 percent were between 18 and 38. The remaining 10 percent were between the ages of 71 and 89 years old (see fig. 3). In comparison, about 23 percent of the overall workforce was age 55 or over according to BLS data as of 2018.

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<sup>16</sup>BLS reported the median age of the overall workforce in 2018 was 42 years old.

**Figure 3: Age Distribution of Federal Aviation Administration (FAA) Certificated Mechanics and Repairmen as of December 2018**



Source: GAO analysis of FAA data. | GAO-20-206

Our analysis of FAA data also found that 3 percent of all aviation maintenance certificate holders were women as of December 2018. This percentage has not changed since we last reported on this workforce in 2014. In comparison, BLS data as of 2018 show that women made-up 47 percent of the total workforce. We were not able to analyze other demographic characteristics for these certificate holders, such as race or ethnicity, because neither FAA nor BLS collects these data.<sup>17</sup>

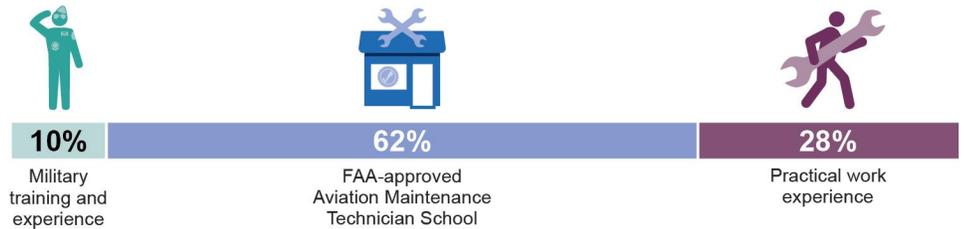
FAA data for 2015 through 2018 also provide some information on the education and work experience of certificated mechanics.<sup>18</sup> These data show that attending AMT School was the most common pathway

<sup>17</sup>BLS publishes employment data by race and ethnicity for the aircraft mechanics and service technicians occupation, which includes both certificated and non-certificated aviation maintenance workers.

<sup>18</sup>FAA officials told us they began collecting data on the military pathway in 2015 at the request of DOD.

certificated individuals used to qualify for the FAA tests to become mechanics (see fig. 4).

**Figure 4: Career Pathways for Federal Aviation Administration (FAA) Certificated Mechanics, 2015 through 2018**



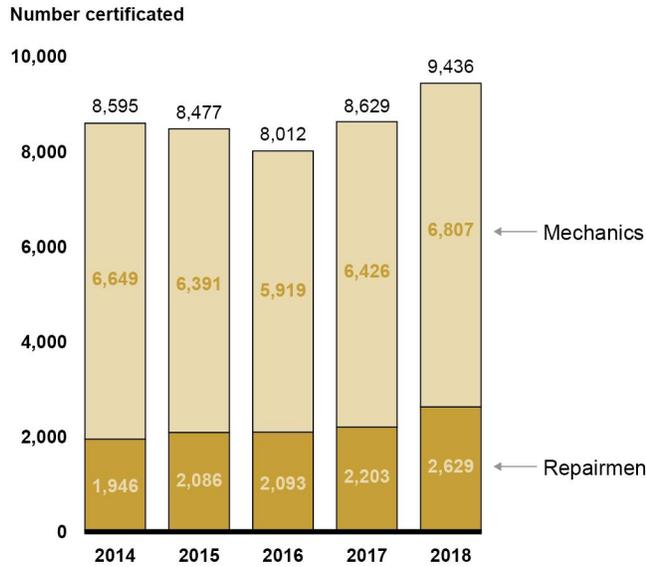
Source: GAO analysis of FAA data. | GAO-20-206

Note: FAA certificated 25,543 mechanics from 2015 through 2018.

In addition, FAA data provide information on the number of newly certificated individuals and indicate that FAA certificated about 8,600 mechanics and repairmen on average each year for 2014 through 2018 (see fig. 5). BLS data project an annual average of 11,800 job openings in the United States from 2018-2028 for the aircraft mechanics and service technicians occupation due to growth and replacement, which include job openings for both certificated and non-certificated workers.<sup>19</sup>

<sup>19</sup>For avionics technicians, BLS data project an annual average of 1,500 job openings from 2018-2028.

**Figure 5: Number of Mechanics and Repairmen Newly Certificated by the Federal Aviation Administration (FAA) Each Year, 2014-2018**



Source: GAO analysis of FAA data. | GAO-20-206

The supply of workers to fill any open or projected job openings in the aviation industry, however, not only depends on the number of people qualified to do the work, but also their availability and willingness to work at a certain wage and under particular working conditions. While FAA data provide information on the number of mechanic and repairman certificate holders who are qualified to perform certain work, less is known about the number of them who are available and willing to work in the aviation industry. FAA data show there were approximately 330,000 certificated mechanics and repairmen as of December 2018, but FAA officials said this number likely overestimates the number of individuals working in the aviation industry. BLS data indicate 136,900 were employed in the aircraft mechanics and service technicians occupation in 2018, but it is not clear how many of those jobs were filled by FAA-certificated workers.<sup>20</sup> In addition, it is unknown how many of the approximately 330,000 certificate holders are retired, deceased, or

<sup>20</sup>BLS data also indicate 20,600 were employed in the avionics technicians occupation in 2018. See <https://www.bls.gov/emp/tables/occupational-projections-and-characteristics.htm> (accessed December 13, 2019).

working in other industries.<sup>21</sup> Individuals who obtain a mechanic certificate from FAA may never work in the aviation industry, or may begin their career in the aviation industry and leave for a job in another industry. Several stakeholders we interviewed said FAA-certificated mechanics possess certain skills that are transferrable to other industries and leave the aviation industry to work for other employers, such as amusement parks. Furthermore, officials explained that once certificated, there is no certification renewal requirement for mechanics.<sup>22</sup>

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### Federal Data Provide Some Information on Current Pay and Demand for Aviation Maintenance Workers, but Do Not Distinguish Between Certificated and Non-Certificated Workers

BLS publishes some data on pay for aircraft mechanics and service technicians, such as average hourly and annual wages. However, the occupational classification system BLS and other federal statistical agencies use for aircraft mechanics and service technicians does not distinguish between FAA-certificated and non-certificated workers.<sup>23</sup> This is in part because workers are classified by the work they perform and not necessarily by certification or education, according to SOC classification system principles. As a result, it is difficult to determine employment characteristics such as pay for certificated workers, specifically.

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<sup>21</sup>The database that stores certificate holder information maintains records on individuals unless FAA is informed of their death. As previously noted, we limited the scope of our analysis to those individuals less than 90 years old who were issued a plastic certificate by FAA, which is required for certificated workers to exercise their privileges after March 31, 2013. See 14 C.F.R. §§ 63.15(d) and 65.15(d). FAA began issuing plastic certificates in July 2003.

<sup>22</sup>While FAA officials said there is no certification renewal requirement for mechanics, several of the employers we interviewed said they provide training to their employees. In addition, certificate holders with inspection authority are subject to certain renewal requirements. 14 C.F.R. §§ 65.91 - 65.95.

<sup>23</sup>Certain industry groups petitioned the Standard Occupational Classification Policy Committee (SOCPC) to change the SOC framework as part of the 2018 update to differentiate between certificated and non-certificated workers. The SOCPC did not recommend any changes to the classification of aircraft mechanics and service technicians or avionics technicians. In its response to comments, the SOCPC stated that workers are classified based on work performed, and that it must be able to collect and report data for a detailed occupation for it to be included.

BLS data as of May 2018 show that annual wages for aircraft mechanics and service technicians ranged from about \$37,000 to about \$98,000. According to BLS officials, it is not uncommon for there to be a wide salary range across an occupation, as wages may vary depending on factors such as experience, education, and skills. A DOD official we interviewed also said that employers have told him that they pay certificated aviation maintenance workers more than non-certificated workers. BLS officials said they collected wage and employment data for certificated workers separate from non-certificated workers in employer surveys conducted between 2000 and 2012.<sup>24</sup> However, officials said they stopped collecting these data in part because employers inconsistently reported them.

Data limitations at the federal and state levels also make it difficult to determine the demand for certificated aviation maintenance workers.

- **BLS occupational data.** On the federal level, BLS occupational outlook data provide some information on potential future demand nationwide for aviation maintenance workers, but the data do not distinguish between certificated and non-certificated workers. As a result, the data provide limited detail about the demand for certificated workers, specifically. According to BLS data, total employment for the aircraft mechanics and service technicians occupation is projected to grow about 3 percent over the 2018 to 2028 time frame, which is slower than the average for all occupations. As previously mentioned, these data project an annual average of 11,800 job openings for this occupation from 2018 to 2028 due to job growth and replacement.<sup>25</sup>
- **DOL certification data.** On its public website for career planning and job search, CareerOneStop, DOL provides information on certifications that are frequently mentioned in online job postings and considered to be in-demand. DOL also indicates in its online resources which certifications may draw on training and experience gained in the military. However, DOL does not track or publish data on the demand for occupational

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<sup>24</sup>See *An Examination of the Employment and Wages of FAA-certified and FAA-noncertified Aircraft Mechanics and Service Technicians, 2001*. This study found that FAA-certified aircraft mechanics and service technicians earned more than noncertified workers, and that about 80 percent of aircraft mechanics and service technicians employed by private industry were FAA-certified.

<sup>25</sup>Department of Labor, Bureau of Labor Statistics, <https://www.bls.gov/emp/tables/occupational-separations-and-openings.htm> (accessed December 13, 2019).

licenses, including federal licenses such as FAA's A&P certification.<sup>26</sup> DOL officials said currently there are no plans to expand the agency's data collection to include information on the demand for occupational licenses. DOL officials added that for certain jobs that require licenses, the demand for the required licenses mirrors occupational demand for those jobs so collecting those data may not be as meaningful.

- **Workforce Innovation and Opportunity Act plans.** On the state level, Workforce Innovation and Opportunity Act plans, intended in part to outline states' use of federal funds to help workers meet employers' needs, provide some geographically-specific information on the demand for workers in the aviation industry.<sup>27</sup> Our review of states' most recent Workforce Innovation and Opportunity Act plans found that 19 states identified the aerospace and aviation industry as a targeted sector for development. However, only certain plans specifically mention the need for certificated mechanics; others refer to the aviation industry more broadly.

Employers we interviewed had differing perspectives on potential growth in demand for aviation maintenance workers; some said they were experiencing difficulty finding enough workers to meet their needs, while others said they were not experiencing difficulty.<sup>28</sup> While some stakeholders voiced concerns about the potential for a labor shortage, the selected labor market indicators we reviewed for aircraft mechanics and service technicians (unemployment, wages, and employment) from 2013 through 2018 were not all consistent with the existence of hiring difficulties. See appendix I for our analysis.

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<sup>26</sup>While FAA uses the term "certificated" and the terms "certification" and "license" are often used interchangeably, DOL's website states that "they are two different types of occupational regulation." DOL classifies FAA's A&P certification as an occupational license, not a certification. See <https://www.careeronestop.org/Toolkit/Training/find-certifications-help.aspx> for the certification finder and <https://www.careeronestop.org/toolkit/Training/find-licenses-help.aspx> for the license finder (accessed October 30, 2019).

<sup>27</sup>The Workforce Innovation and Opportunity Act authorizes grants for adult employment, among other things. 29 U.S.C. § 3172(a), (b)(1). These grants may be used to carry out certain statewide employment and training activities (29 U.S.C. § 3174(a)(3)(A)), including customized training which could include training to develop aviation maintenance workers' skills.

<sup>28</sup>Several other stakeholders we interviewed, including unions and industry associations, cited an industry study by Boeing, a major airplane manufacturing company, which projects increased demand for aviation maintenance workers. For more information, see the Boeing Pilot & Technician Outlook, 2019-2038.

Officials we interviewed from a regional airline said the majority of the airline's certificated mechanics come to them directly after completing AMT School and that the airline was having a difficult time finding enough mechanics to fill 60 open full-time positions. On the other hand, officials we interviewed from a major airline said the airline rarely hires certificated mechanics right out of AMT School and that their employees typically come to them with a number of years of experience. The officials from the major airline said that they were not experiencing difficulty recruiting and retaining aviation maintenance workers, but noted that regional airlines may experience hiring difficulties first if there is a shortage of these workers because certificated mechanics often start their careers at regional airlines to gain practical experience before moving on to work at a major airline.

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## Government and Industry Programs Support the Workforce, but FAA Lacks Information that Could Advance Its Workforce Development Efforts

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### Government, Industry, and AMT Schools Administer Programs and Coordinate to Some Extent to Support the Development of Aviation Maintenance Workers' Skills and Career Pathways

Several federal agencies administer grants or programs that support individuals pursuing aviation maintenance careers or facilitate coordination among different stakeholders to support them. Specifically:

- **DOD's Military Services' Credentialing Opportunities On-Line (COOL) program.** This program provides funding for service members to obtain professional credentials related to their military training and helps them translate their military experience into civilian occupations. The Air Force, which employs the largest number of aircraft mechanics in the military along with the Navy, requires that COOL program courses be accredited and that credentials be recognized by the industry in which service members are seeking certification. Each military service COOL program collaborates with other federal agencies such as VA, DOL, and FAA to obtain information on relevant certifications and licensures for service members, such as FAA's A&P certification. According to DOD

### Registered Apprenticeship Program Serving Underrepresented Populations

The Department of Labor awarded the Connecticut Department of Labor Office of Apprenticeship Training a \$1,550,000 grant to fund the Connecticut Apprenticeship Expansion Rx project, which targets the aviation industry, among others. The project aims to serve over 1,600 apprentices and provide underrepresented populations, including women, dislocated, and under-employed individuals an opportunity to acquire industry required credentials. Key partners include industry, educational institutions, and labor unions.

Source: Department of Labor documents. | GAO-20-206

### Registered Apprenticeship Program for Airframe and Powerplant Mechanics

As part of the State Apprenticeship Expansion grant, the Alaska Department of Labor and Workforce Development (DOLWD) is implementing registered apprenticeships in aviation, a relatively new industry in using the apprenticeship model. With the help of the U.S. Department of Labor Office of Apprenticeship in Alaska, two aviation occupations have been approved: Airframe & Powerplant Mechanic and Air Transport Pilot. The Alaska state Apprenticeship Coordinator is working closely with the U.S. Department of Labor Office of Apprenticeship and individual air carriers across Alaska to develop and implement registered apprenticeships for these occupations. Alaska DOLWD has approximately 12 mechanic apprentices and 2 air transport pilot apprentices with various air carrier employers.

Source: Alaska's Fiscal Year 2018 Workforce Innovation and Opportunity Act Plan. | GAO-20-206

officials, the COOL program provided more than \$5 million toward aviation maintenance-related credentials from 2015-2018 for over 2,500 Air Force and Navy service members.

**DOL's Registered Apprenticeship Program.** DOL awards grants to support Registered Apprenticeship Programs— employer-driven training opportunities that combine on-the-job learning with related classroom instruction. The program facilitates coordination among different stakeholders such as industry, states, and educational institutions to support apprenticeships and employment opportunities. DOL awarded almost \$3.8 million in grants and contracts from 2014 through 2018 to promote these apprenticeships for aviation maintenance workers. For example, one grantee is aiming to serve underrepresented populations in the aviation industry, including women, and another is coordinating with industry to develop a registered apprenticeship program for certificated mechanics (see side bars). In addition, the United Services Military Apprenticeship Program, a DOL registered program, provides service members an opportunity to improve skills and qualify for employment in a recognized civilian trade, including as an A&P mechanic, upon completion of military service.

**VA's Post-9/11 GI Bill Program.** The Post-9/11 Veterans Educational Assistance Act of 2008 (Post-9/11 GI Bill) provides funding for veterans to pursue an approved program of education, including undergraduate and graduate degrees, non-college degree programs, apprenticeships, and on-the-job training.<sup>29</sup> VA data show approximately \$42 million in Post-9/11 GI Bill funds were awarded in fiscal year 2018 to 4,200 veterans enrolled in aviation maintenance post-secondary programs, which include programs at FAA-approved AMT Schools.<sup>30</sup>

**Education's financial assistance.** Education provides billions of dollars in federal assistance to support students pursuing higher education, which may include training in aviation-related fields. We previously reported that in academic year 2011-2012, Education disbursed \$918 million in federal grants to 142,708 recipients and \$1.3 billion in federal

<sup>29</sup>38 U.S.C. § 3313.

<sup>30</sup>The Post-9/11 GI Bill provides veterans with tuition and fee assistance for all public school in-state students and reimbursement for private institutions of higher learning for up to \$24,476 per academic year. See 38 U.S.C. § 3313(c)(1)(A). In addition, degree-granting educational institutions may choose to participate in the Yellow Ribbon Program, which covers tuition and fees beyond those covered by the Post-9/11 GI Bill, and enter into an agreement with VA to make these funds available. VA data show that Yellow Ribbon Program payments to veterans enrolled in aviation maintenance post-secondary programs totaled over \$600,000 in fiscal year 2018.

loans to 114,564 recipients pursuing aircraft mechanic and avionics programs.<sup>31</sup>

- **DOT's workforce development grant program.** DOT is also developing a process for administering a workforce development grant program for aviation maintenance workers. Specifically, the FAA Reauthorization Act of 2018 included a provision for DOT to establish an aviation maintenance workforce development grant program.<sup>32</sup> Once established, eligible entities such as aircraft repair stations, unions, educational institutions, and state or local governments may apply for grants. The program may provide grants for projects such as establishing new educational programs or scholarships for individuals seeking employment in the aviation maintenance industry and supporting service members transitioning into aviation maintenance related careers.<sup>33</sup>

In addition, FAA has taken steps to engage other key stakeholders on aviation workforce development initiatives. In September 2018, FAA sponsored an Aviation Workforce Symposium that included participants from industry, AMT Schools, and federal agencies such as Education and DOL. Discussion topics included building the pipeline of workers, maximizing efficiency in training, and promoting productive partnerships. Subsequent to the 2018 symposium, FAA established an Aviation Workforce Steering Committee in February 2019, in part to coordinate efforts across FAA to address various workforce related provisions included in the FAA Reauthorization Act of 2018.

The steering committee finalized its charter in April 2019, and the charter states FAA's intentions of developing productive partnerships with industry, government, and educational institutions to expand the pipeline of aviation safety professionals. As of October 2019, FAA was finalizing a working group structure to carry out the steering committee's work that

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<sup>31</sup>See [GAO-14-237](#) for the details on this analysis and its limitations, such as the inclusion of related programs like vehicle maintenance and repair. Education disbursed approximately \$34 billion in federal grants and \$107 billion in federal loans in total in fiscal year 2012. In fiscal year 2018, Education disbursed approximately \$29 billion in federal grants and \$92 billion in federal loans in total.

<sup>32</sup>Pub. L. No. 115-254, § 625(a)(2), 132 Stat. 3186, 3406.

<sup>33</sup>The Act authorized \$5 million per year for fiscal years 2019 through 2023 and prescribed that not more than \$500,000 shall be available for any one grant per year. Pub. L. No. 115-254, § 625(b), 132 Stat. 3186, 3406. Congress did not appropriate money specifically for this grant program in fiscal year 2019. The agency's appropriation for fiscal year 2020 had not been finalized as of November 2019.

will focus on: (1) marketing/communications, (2) educational outreach, (3) training, and (4) partnerships. FAA officials also told us they plan to collaborate with other federal agencies moving forward, including Education, DOL, and DOD.<sup>34</sup> For example, FAA and DOD officials said they are currently discussing options for streamlining pathways for service members with aviation maintenance backgrounds to move into civilian careers in aviation maintenance. According to a DOD official, streamlining pathways could increase the number of service members who become FAA-certificated mechanics and leverage the skills of the over 250,000 current service members with aviation maintenance backgrounds.<sup>35</sup>

Additional examples of states, industry employers, and AMT Schools coordinating or partnering to support the aviation maintenance workforce include:

- **Career grants.** One state we visited developed a career grant to align students' programs of study with in-demand occupations in the state. The grant provides tuition assistance to in-state residents working toward selected certificates or degrees at eligible in-state colleges or universities, including aviation maintenance programs.
- **Military pathway program.** Officials from a regional airline we interviewed said the airline developed a military transition program to assist service members in preparing for the FAA mechanic tests. The airline funds 100 percent of the program cost, which according to officials is about \$11,000 per person. As part of the program, airline officials told us they provide about \$5,000 worth of tools to each participant.
- **Training equipment and funding.** Officials we interviewed from one school said they strategically opened their AMT program next to a major cargo airline so that students could benefit from employment opportunities there. The officials said the airline also benefits from the close proximity of the school in that it is able to leverage local talent, and the airline provides AMT School students with scholarships, technical support, and surplus equipment to use for training. In another example,

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<sup>34</sup>DOT had a formal memorandum of understanding with Education and DOL on aerospace workforce development initiatives, but it expired in 2014.

<sup>35</sup>We previously reported that Air Force aviation maintenance workers are attractive to the commercial aviation industry because of their previous experience, work ethic, and discipline. We recommended that the Air Force develop a retention strategy for Air Force maintainers to meet and retain required staffing levels. See GAO, *Military Personnel: Strategy Needed to Improve Retention of Experienced Air Force Aircraft Maintainers*, [GAO-19-160](#) (Washington, D.C.: Feb. 5, 2019).

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officials from a major commercial airline told us the airline partners with over 40 AMT Schools and provides them with funding to improve operations and recruitment. Officials said the goal of the program is to ensure the airline has a pipeline of workers to fill any future job openings.<sup>36</sup>

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### FAA Does Not Use Existing Data to Strategically Target Its Resources and Workforce Development Efforts

Despite FAA's recent efforts to coordinate with other federal agencies on expanding and streamlining pathways for aviation maintenance careers, we found that FAA does not routinely analyze, collect, or coordinate with other stakeholders on certain related data. Such activities could assist FAA in measuring progress toward meeting its workforce related objectives and inform strategic decisions for promoting the development of this workforce. For example, FAA's strategic plan includes an objective on promoting the development of a robust aviation workforce.<sup>37</sup> In addition, FAA's Aviation Workforce Steering Committee charter emphasizes providing diverse populations, including youth, women, and minorities, with clear pathways into aviation careers to expand the talent pool from which both government and industry may recruit. However, neither the strategic plan nor the steering committee charter provides specific information on how FAA plans to select and measure any efforts it undertakes related to these objectives. Prior GAO work has emphasized that strategic workforce planning requires monitoring and evaluating progress toward goals, and federal internal control standards state that management should use quality information to achieve its objectives.<sup>38</sup> We identified several areas in which improved data analysis, collection, or coordination could assist FAA in measuring progress and understanding how to target its resources in support of its workforce related objectives.

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<sup>36</sup>For more information on high school and community college aviation programs, see National Academies of Sciences, Engineering, and Medicine. 2019. *Promoting Aviation Career Education in High Schools and Community Colleges*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25643>.

<sup>37</sup>FAA Strategic Plan, FY 2019-2022.

<sup>38</sup>GAO, *Human Capital: Key Principles for Effective Strategic Workforce Planning*, [GAO-04-39](#) (Washington, D.C.: Dec. 11, 2003); GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 10, 2014).

- **Demographic data.** FAA collects certain demographic data on its A&P certification application, such as the age and sex of individuals; however, FAA currently uses these data only to determine eligibility and issue certificates, according to FAA officials. These data could also be used to identify patterns or relationships, such as the trend in female certificate holders by pathway, which could be useful information as FAA aims to increase opportunities for women to pursue aviation maintenance careers.

In addition, FAA does not currently collect data on the race and ethnicity of certificated individuals. Such data could provide additional information on the demographics of certificated individuals and help FAA or other stakeholders monitor the progress of any efforts to diversify this workforce. FAA could also leverage BLS data on the race and ethnicity of certificated and non-certificated aircraft mechanics and service technicians more broadly as it begins to develop and implement any activities related to expanding and diversifying the talent pool for recruiting workers into aviation maintenance careers.<sup>39</sup>

- **Pathway data.** FAA also maintains mechanic pathway data, but these data do not provide a complete picture of certificated individuals' education, training, and work experience due to certain data limitations. For example, FAA does not require AMT Schools to report program completion data. As a result, it does not have information such as how many students who enter FAA-approved AMT Schools complete the program. Moreover, FAA does not analyze nationwide trends for AMT Schools using existing data on these schools (such as enrollment or mechanic test pass-rate data) or aggregate information across AMT Schools to better understand the AMT School pathway as a whole.

In addition, pathway data collected by FAA do not clearly differentiate between civil and military work experience. Specifically, FAA officials said practical, or civil, work experience pathway data may include information on individuals with both prior military and civil experience. Moreover, according to an FAA official, FAA's military experience pathway data may include individuals who completed DOD's FAA-approved A&P training program as well as individuals who met FAA's on-the-job training requirements through relevant military experience.

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<sup>39</sup>BLS data from 2018 indicate the aircraft mechanics and service technicians occupation was about 82 percent White, 9 percent Black or African American, 5 percent Asian, and 19 percent Hispanic or Latino, compared to about 78, 12, 6, and 17 percent of the entire labor force, respectively. Estimates for the above race groups (White, Black or African American, and Asian) do not add to 100 percent because data are not presented for all races. People whose ethnicity is identified as Hispanic or Latino may be of any race.

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Combined pathway data may limit FAA's and DOD's understanding of DOD's contributions to this workforce, including the number of individuals who completed DOD's FAA-approved A&P training program and subsequently obtained mechanic certification from FAA.

- **Supply and demand data.** Other federal agencies, such as BLS and DOD, maintain data that relate to this workforce more broadly that could be useful to FAA. For example, FAA could leverage BLS data on the projected employment of certificated and non-certificated aircraft mechanics and service technicians in conjunction with its data on newly certificated workers each year to better understand worker supply and demand. DOD also maintains information on separating service members with aviation maintenance backgrounds, who may be attractive to the commercial aviation industry. For example, according to a DOD official, in fiscal year 2018 over 22,000 service members with aviation maintenance backgrounds separated from the Air Force and Navy. Additional data analysis and coordination could potentially yield useful information on worker supply and demand and areas for promoting the development of this workforce.

Without routinely analyzing its existing data on certificated workers, collecting additional data, or leveraging existing workforce data maintained by other federal agencies, FAA will not have certain information it needs to measure progress and strategically target its resources toward its objective of promoting the development of a robust aviation workforce. A robust aviation workforce, including certificated mechanics and repairmen, is necessary for maintaining a safe aviation system. FAA's recently developed Aviation Workforce Steering Committee presents the agency with an opportunity to engage other federal agencies in discussions on how to leverage data to expand and diversify this workforce.

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## FAA Has Proposed Changing Its Decades Old Mechanic Curriculum Requirements and Its Testing Standards, and Revisions to Them Are Ongoing

Even as FAA's strategic plan states the agency's focus on promoting the development of a skilled aviation maintenance workforce to integrate new technologies, the agency has acknowledged that the current curriculum requirements for AMT Schools and mechanic testing standards are outdated. Efforts to revise the curriculum requirements for AMT Schools are ongoing through the rulemaking process, and FAA is also currently updating the testing standards for mechanics.

The curriculum requirements for AMT Schools have remained largely unchanged for several decades despite numerous attempts to update them as aviation technology has evolved. The minimum requirements are established in regulation and list the subjects that AMT Schools must include in their training curriculum for individuals to be eligible to take FAA's mechanic tests.<sup>40</sup> FAA officials, employers, and AMT School officials we interviewed said the current curriculum requirements do not emphasize commonly used modern aircraft technologies, such as avionics and composite materials. Because the curriculum requirements are established in federal regulation, FAA has attempted several times to revise them through the rulemaking process. Table 1 provides selected changes or actions relating to these requirements.

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<sup>40</sup>14 C.F.R. pt. 147, Apps. A – D.

**Table 1: Federal Aviation Administration (FAA) History and Attempts to Update Curriculum for Aviation Maintenance Technician (AMT) Schools**

Year	Description
1962	FAA develops the basic training curriculum
1970	FAA revises required core curriculum hours from 1,500 to 1,900 and further defines subject content and teaching guidelines
1992	FAA makes minor revisions to the curriculum requirements, including facilitating the use of computers, adding a subject area on composite materials, and adding unducted fans and auxiliary power units as subjects
2005	In response to a recommendation made by GAO to review airframe and powerplant curriculum, FAA issues a revised Advisory Circular that includes examples of courses AMT Schools have offered, though not required by regulation, to satisfy industry demands
2007	The Part 147 Aviation Maintenance Technician Schools Curriculum and Operating Requirements Working Group is established and is tasked with reviewing/recommending revisions to certain requirements for AMT Schools
2015	FAA issues a Notice of Proposed Rulemaking (NPRM) to modernize and reorganize required curriculum and remove outdated courses
2018	FAA Reauthorization Act of 2018 requires FAA to issue a final rule to modernize training programs at AMT Schools by April 2019, or to explain to the appropriate committees of Congress why it has not issued the rule by the deadline and provide a schedule for issuing it <sup>a</sup>
2019	FAA publishes a Supplemental NPRM to its 2015 proposed rule, which includes several flexibilities for AMT Schools, such as allowing competency-based training; comments were due on June 17, 2019

Source: GAO analysis of relevant federal regulations, FAA documents, and prior GAO reports. | GAO-20-206

<sup>a</sup>Pub. L. No. 115-254, § 624(a), 132 Stat. 3186, 3404. FAA officials have indicated that they informed the appropriate committees in Congress that the primary reason for the delay was the need to respond to public comments to the October 2015 Notice of Proposed Rulemaking (NPRM). As a result, FAA issued a Supplemental Notice of Proposed Rulemaking on April 16, 2019. 84 Fed. Reg. 15,533 (Apr. 16, 2019). FAA further indicated that they communicated with the appropriate committees in Congress that to address comments to the supplemental NPRM and draft the final rule, the proposed schedule for issuance of a final rule is October 2020.

FAA officials noted several challenges to updating the AMT School curriculum requirements, including competing demands at the department level, the extent of comments FAA has received from stakeholders in response to proposed changes, and the amount of time required to coordinate with internal stakeholders during the review process. We previously reported on factors that affect the amount of time needed to issue a rule for selected agencies, which included similar challenges such as the complexity of an issue, agency management priorities, and the amount of review required at different phases of the rulemaking process.<sup>41</sup>

<sup>41</sup>See GAO, *Federal Rulemaking: Improvements Needed to Monitoring and Evaluation of Rules Development as Well as to the Transparency of OMB Regulatory Reviews*, GAO-09-205 (Washington, D.C.: April 2009).

In October 2015, FAA published a notice of proposed rulemaking (NPRM) with the stated goal of updating the existing AMT School curriculum and providing an efficient means of changing specific course items by including them in each school's operations specifications (see fig. 6).<sup>42</sup> This would eliminate the need to go through the federal rulemaking process to update the curriculum. As part of its ongoing efforts to revise the curriculum requirements for AMT Schools through the rulemaking process, FAA issued a supplemental NPRM in the April 2019 Federal Register that expanded the scope of the NPRM it issued in October 2015 (see fig. 6).<sup>43</sup> Comments on the supplemental NPRM were due in June 2019. As of October 2019, FAA officials said they were in the process of reviewing the comments.

**Figure 6: Excerpts from the Federal Aviation Administration's (FAA) October 2015 Notice of Proposed Rulemaking (NPRM) and April 2019 Supplemental NPRM (SNPRM) related to the Part 147 Regulations for Aviation Maintenance Technician (AMT) Schools**

**Proposed changes in the 2015 NRPM**

This proposed rule would amend the regulations governing Aviation Maintenance Technician Schools (14 CFR part 147) to both update the existing curriculums and provide an efficient means of changing specific course items under each main subject heading, when needed, by including them in each school's operations specifications. The proposal sets forth both a description of operations specifications and a process for amending, suspending, or terminating them. In addition, the proposed amendments would clarify existing requirements, remove gender-specific references, and eliminate duplication found in some sections of the current rules.

*The amendments are needed because the **existing curriculums are outdated, do not meet current industry needs**, and can be changed only through notice and comment rulemaking. These amendments would ensure that aviation maintenance technician students receive up-to-date foundational training to meet the demanding and consistently changing needs of the aviation industry.*

[emphasis added]

**Proposed changes in the 2019 SNRPM**

In this SNPRM, The FAA proposes to allow AMTSS to deliver their approved curriculums using a CBT program. The FAA also proposes to allow satellite training locations for these schools, which could expand the capacity to recruit and educate future aircraft mechanics. Lastly, the FAA proposes to replace the current national passing norm requirements with a standard pass rate that would apply to all AMTSS. CBT and satellite training locations would be voluntary provisions.

AMTSS= Aviation Maintenance Technician Schools  
CBT= Competency-based training

Source: 80 Fed. Reg. 59,674-59,675; 84 Fed. Reg. 15,534. | GAO-20-206

<sup>42</sup>Aviation Maintenance Technician Schools, 80 Fed. Reg. 59,674, 59,675 (Oct. 2, 2015). An operations specifications document is issued by the FAA to a training center, in this case an FAA-approved AMT School, that specifies training program requirements, among other things.

<sup>43</sup>Aviation Maintenance Technician Schools, 84 Fed. Reg. 15,533 (April 16, 2019).

In a separate effort outside of the rulemaking process, FAA is currently updating the testing standards for mechanics.<sup>44</sup> The standards were last revised in 2015. FAA has acknowledged that current mechanic testing standards are also outdated.<sup>45</sup> As a result, aviation stakeholders have stated that the mechanic tests include outdated or irrelevant questions. For example, the practical test may include projects on wood airframes and fabric coverings, which are not common to modern commercial aircraft. FAA has stated that the revised testing standards will provide a comprehensive framework for the mechanic tests and serve as a guide for reviewing and revising the oral and written test questions and the practical projects.<sup>46</sup>

FAA officials said two offices within the agency are responsible for updating AMT School training curriculum requirements and mechanic testing standards and that these offices have been coordinating efforts to align the two.<sup>47</sup> FAA's efforts to modernize the curriculum requirements for AMT Schools and its efforts to update the mechanic testing standards started on slightly different paths, in part due to differences in when the working groups were formed and recommendations to address these issues were made (see fig. 7).<sup>48</sup>

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<sup>44</sup>Testing standards are not in regulation and therefore changes to them do not need to go through the rulemaking process. FAA's ongoing effort to update the mechanic testing standards began in 2015 and is part of a broader effort to update the testing standards for different types of FAA certifications. FAA has already updated the testing standards for several FAA certifications.

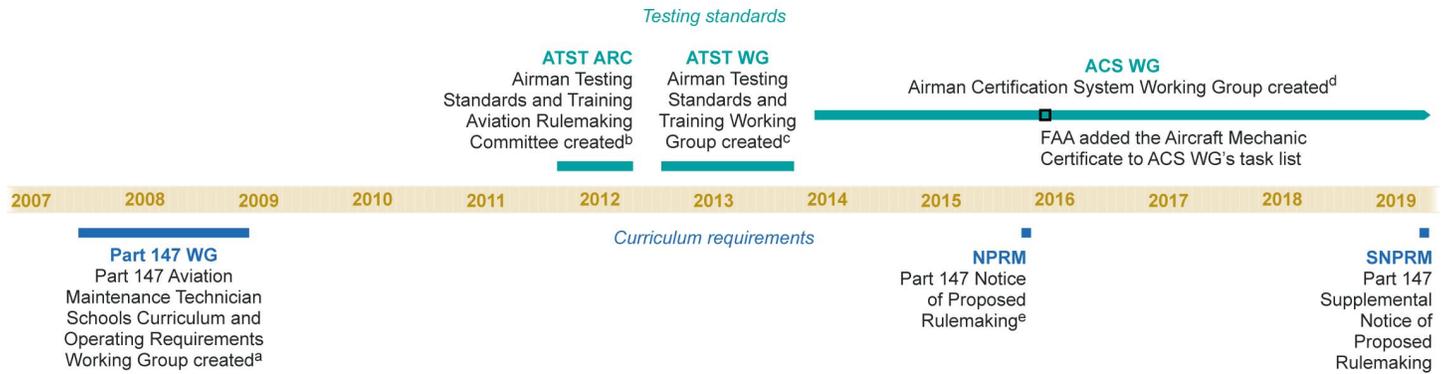
<sup>45</sup>The Practical Test Standards (PTS) are the current testing standards for mechanics and include information that may help individuals prepare for the practical and oral tests. Currently, there are no published knowledge test standards.

<sup>46</sup>FAA is switching from the PTS to the Airman Certification Standards (ACS). FAA has stated that the ACS is an enhanced version of the PTS and integrates into one comprehensive document all of the standards individuals need to know, consider, and perform to pass the tests for a certificate or rating. The draft ACS for mechanics includes task-specific knowledge and risk management elements for each subject.

<sup>47</sup>The General Aviation Branch (Flight Standards Service-350) is leading the effort to update curriculum requirements for AMT Schools, and the Regulatory Support Division (Flight Standards Service-600) is leading the effort to update mechanic testing standards.

<sup>48</sup>The different working groups were established by the Aviation Rulemaking Advisory Committee, which is tasked with providing FAA with advice and recommendations related to aviation-rulemaking activities.

**Figure 7: Timeline of Relevant Federal Aviation Administration (FAA) Working Groups and Activities Related to Updating Curriculum Requirements for Aviation Maintenance Technician Schools and Mechanic Testing Standards (2007-2019)**



Source: GAO analysis of selected Federal Register notices and Aviation Rulemaking Advisory Committee Working Group documents. | GAO-20-206

<sup>a</sup>This working group was established to review the training curriculum for Aviation Maintenance Technician Schools and provide recommendations.

<sup>b</sup>This committee was tasked with making recommendations to FAA on updating the testing standards for certain pilot and flight instructor certificates and the instrument rating.

<sup>c</sup>This working group developed the foundation for the revised airman certification testing system by creating a testing standard framework that could be applied to the majority of airman certificates and ratings.

<sup>d</sup>This working group was tasked with providing expert assistance and industry views on the development and modification of the updated testing standards for several airman certifications, including the aviation mechanic testing standards.

<sup>e</sup>The October 2015 NPRM addresses several of the recommendations made in 2008 by the Part 147 Working Group. 80 Fed. Reg. 59,676.

As of October 2019, FAA had not issued a final rule for modernizing AMT School curriculum requirements as required by the FAA Reauthorization Act of 2018, and it was still in the process of updating testing standards. FAA officials have indicated that they have informed the appropriate committees in Congress that the proposed schedule for issuance of a final rule is in October 2020 and said that the revised mechanic testing standards would likely be finalized after the publication of the final rule amending the curriculum requirements for AMT Schools. An FAA official noted that any delay in finalizing the rule would likely result in a corresponding delay to finalizing the testing standards. Delaying the release of the updated mechanic testing standards could result in the prolonged use of outdated or irrelevant questions on the mechanic tests. FAA officials said that once finalized and implemented, the updated

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curriculum requirements for AMT Schools and the mechanic testing standards for individuals should be mostly aligned.<sup>49</sup>

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## Conclusions

A sufficient supply of aviation maintenance workers is critical to maintaining a safe and robust aviation system and meeting the growing demand for air travel. Current training and skills requirements for these workers are also important because of changing flight technology. Both the federal government and other industries benefit from having a professional, trained, and qualified workforce, and addressing aviation workforce needs is a shared responsibility among these different stakeholders. As the federal agency responsible for certificating aircraft mechanics and repairmen, FAA maintains certain demographic information on these individuals that could shed light on the characteristics and employment of these personnel. However, without strategically using or analyzing the data it has along with data other stakeholders collect, FAA will not have certain information it needs to target its resources or measure and improve progress toward its aviation workforce goals. It may also miss the opportunity to provide other stakeholders with valuable information for supporting these workers. Other agencies and stakeholders may also assist FAA in understanding and promoting the development of the aviation maintenance workforce. FAA's recently developed Aviation Workforce Steering Committee presents the agency with an opportunity to engage other federal agencies to explore potential data sources and their usefulness and discuss ways to expand, diversify, and strengthen career pathways for the aviation maintenance workforce.

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## Recommendation for Executive Action

The Administrator of FAA should direct the Aviation Workforce Steering Committee, as part of its ongoing efforts, to take steps to use existing FAA data and coordinate with other federal agencies to identify and gather the information it needs to measure progress and target resources

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<sup>49</sup>FAA officials stated the anticipated effective date of the updated curriculum requirements for AMT Schools would be anywhere from 1 to 3 years after the publication of the final rule.

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toward its goal of promoting a robust, qualified, and diverse aviation maintenance workforce. For example, FAA could task a committee working group with developing and implementing ways to improve data sharing among federal agencies to inform decision-making on how to strengthen career pathways and better understand the supply and demand of certificated workers. (Recommendation 1)

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## Agency Comments

We provided a draft of this report to DOT, DOL, Education, DOD, and VA for review and comment. DOT provided written comments, which are reprinted in appendix II. DOT concurred with our recommendation. Specifically, DOT agreed that using existing data could potentially contribute to its efforts to develop the aviation maintenance workforce. DOT said it will ask the Aviation Workforce Steering Committee to consider using existing FAA data and to coordinate with other federal agencies regarding other potential data sources to support the FAA's aviation maintenance workforce goals. DOL provided technical comments, which we incorporated in the report as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of the Department of Transportation, the Secretary of the Department of Labor, the Secretary of the Department of Education, the Secretary of the Department of Defense, the Secretary of the Department of Veterans Affairs, and other interested parties. In addition, the report is available at no charge on the GAO website at <https://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-7215 or [gurkinc@gao.gov](mailto:gurkinc@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.



Chelsea Gurkin  
Director, International Affairs and Trade

# Appendix I: Labor Market Indicator Analysis

While no single metric can be used to determine whether a labor shortage exists, certain indicators in conjunction with views of stakeholders can provide insight on this issue. We previously found, based on our review of economic research, that an occupation experiencing a labor shortage would exhibit the following: (1) a low unemployment rate signaling limited availability of workers in that profession, (2) increases in wages offered to draw people into that profession, and (3) increases in employment due to increases in demand for that occupation.<sup>1</sup> Table 2 shows these specific indicators from 2013 through 2018 for the aircraft mechanics and service technicians occupation, measured using Bureau of Labor Statistics (BLS) Current Population Survey data.<sup>2</sup>

**Table 2: Selected Labor Market Indicators for Aircraft Mechanics and Service Technicians, 2013-2018**

Category	Average unemployment <sup>a</sup>	Annual percent change in median wages <sup>b</sup>	Annual percent change in employment <sup>c</sup>
Aircraft mechanics and service technicians	2.1	1.2	0.0
All occupations	5.3	1.2	2.1

Source: GAO analysis of Current Population Survey data. | GAO-20-206

<sup>a</sup>The unemployment rate is the percentage of persons aged 16 years or older that have no employment, but are 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” by summing the unemployment levels over the period divided by the sum of the labor force over the period.

<sup>b</sup>We 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 midpoint between the highest paid 50 percent and the lowest paid 50 percent in that occupation). The changes in median wages were adjusted for inflation using the Consumer Price Index for All Urban Consumers.

<sup>1</sup>See [GAO-19-160](#). Also see Carolyn Veneri, “Can Occupational Labor Shortages be Identified Using Available Data?,” *Monthly Labor Review* (March 1999): pp. 15-21; and Malcolm S. Cohen, *Labor Shortages: As America Approaches the Twenty-first Century* (Ann Arbor: University of Michigan Press, 1995).

<sup>2</sup>We did not analyze these same labor market indicators for avionics technicians because of the relatively small size of the occupational group.

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**Appendix I: Labor Market Indicator Analysis**

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<sup>a</sup>We calculated the “annual percent change in employment” as the annualized percent change in employment among full time workers in that occupation over the period.

According to our analysis of BLS data from 2013 through 2018, unemployment rate and change in median wage earnings for the aircraft mechanics and service technicians occupation, which includes both Federal Aviation Administration-certificated and non-certificated workers, were consistent with the existence of hiring difficulties, while the percent change in employment was not.

Data on two of the three indicators (unemployment rate and wage earnings) were consistent with difficulties in hiring aircraft mechanics and service technicians. However, because these data combine information for certificated and non-certificated workers, it is difficult to know the extent to which any hiring difficulties represent demand for certificated workers, specifically. In addition, the indicators should be viewed with appropriate caveats.<sup>3</sup> For example, while median wages increased for aircraft mechanics and service technicians in 2018 compared to 2013, they did not increase in every year—and they exhibited decreases of as much as 6.7 percent.<sup>4</sup>

The direction of change of the employment indicator was not consistent with hiring difficulties for this occupation. As shown in table 2, from 2013 through 2018, employment for aircraft mechanics and service technicians does not appear to have changed, while employment for all other occupations increased. However, employment for this occupation did not remain constant in every year over that time period and exhibited increases of as much as 12.5 percent and decreases of as much as 21.9 percent.<sup>5</sup>

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<sup>3</sup>We previously reported on important limitations to these indicators, as measured using Current Population Survey data, in [GAO-14-237](#). Those data are collected through a household survey and are subject to response and sampling error. Moreover, BLS collects information on workers at all stages in their career, so it may not be informative of changes in starting salaries.

<sup>4</sup>Given the fluctuations from year to year, we also estimated growth by averaging the year-to-year percentage changes. Looking at the average year-to-year changes, median wages for aircraft mechanics and service technicians increased by 1.4 percent on average compared to a 1.2 percent average increase for all occupations.

<sup>5</sup>Given the fluctuations from year to year, we also estimated growth by averaging the year-to-year percentage changes. Looking at the average year-to-year changes, employment for aircraft mechanics and service technicians increased by about 0.8 percent on average compared to a 2.1 percent average increase for all occupations.

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# Appendix II: Department of Transportation Agency Comments

**Appendix II: Department of Transportation  
Agency Comments**



**U.S. Department of  
Transportation**  
Office of the Secretary  
of Transportation

Assistant Secretary for Administration

1200 New Jersey Avenue SE  
Washington, DC 20590

**JAN 24 2020**

Chelsa Gurkin  
Director, International Affairs and Trade  
U.S. Government Accountability Office (GAO)  
441 G Street NW  
Washington, DC 20548

Dear Ms. Gurkin:

The Federal Aviation Administration (FAA) is committed to the promotion of a robust and diverse aviation maintenance workforce. Technological innovation and continued rapid growth in the aviation industry have heightened government and industry concerns regarding the adequacy of the current aviation maintenance workforce to meet future demands. The GAO draft report notes that the FAA is updating regulatory requirements for Aviation Maintenance Technician school curricula and testing standards to expand career opportunities. The FAA has established an Aviation Workforce Steering Committee to coordinate these efforts, and the agency has appointed an executive to focus exclusively on modernizing the curricula. The agency continues to work with partners across government, including the military, along with industry, and labor organizations to develop the pipeline of future aviation maintenance professionals.

While the FAA has historically utilized data collected during the application process in determining an applicant's eligibility for an FAA certificate, the agency agrees that using this data could potentially contribute to our efforts to develop the aviation maintenance workforce. We concur with the recommendation in the GAO draft report, and we will ask the Aviation Workforce Steering Committee to consider using existing FAA data and to coordinate with other Federal agencies regarding other potential data resources to support the FAA's aviation maintenance workforce goals. The Department will provide a detailed response to the recommendation within 180 days of the final report's issuance.

We appreciate the opportunity to respond to the GAO draft report. Please contact Madeline Chulumovich, Audit Relations and Program Improvement, at (202) 366-6512 to obtain additional information.

Sincerely,

A handwritten signature in black ink, appearing to read "Keith Washington".

Keith Washington  
Deputy Assistant Secretary for Administration

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# Appendix III: GAO Contact and Staff Acknowledgments

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## GAO Contact

Chelsa Kenney Gurkin at (202) 512-7215 or [Gurkinc@gao.gov](mailto:Gurkinc@gao.gov).

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## Staff Acknowledgments

In addition to the contact named above, Betty Ward-Zukerman (Assistant Director), Meredith Moore (Analyst-in-Charge), Ellie Klein, and Chris Woika made key contributions to this report. Additional assistance was provided by James Bennett, Lilia Chaidez, Holly Dye, Serena Lo, Sheila R. McCoy, John Mingus, Michael Naretta, James Rebbe, Almeta Spencer, and Andrew Von Ah.

# Appendix IV: Accessible Data

## Data Tables

**Accessible Data for Number of Mechanics and Repairmen Newly Certificated by FAA Each Year, 2014-2018**

Year	Repairmen	Mechanics	Total
2014	1946	6649	8,595
2015	2086	6391	8,477
2016	2093	5919	8,012
2017	2203	6426	8,629
2018	2629	6807	9,436

Source: GAO analysis of Federal Aviation Administration (FAA) data. | GAO-20-206

**Accessible Data for Figure 1: Pathways to Federal Aviation Administration (FAA) Certification for Mechanics**

1. Military training and experience<sup>a</sup>, FAA-approved Aviation Maintenance Technician School<sup>b</sup>, or Practical work experience<sup>c</sup>
2. Pass the FAA aviation mechanic tests
3. FAA-certificated mechanic

Source: GAO analysis of FAA regulations and other agency documents. | GAO-20-206

**Accessible Data for Figure 2: Bureau of Labor Statistics Standard Occupational Classification (SOC) Codes and Descriptions for Avionics Technicians and Aircraft Mechanics and Service Technicians**

Avionics Technicians	Aircraft Mechanics and Service Technicians
49-2090 Miscellaneous Electrical and Electronic Equipment Mechanics, Installers, and Repairers 49-2091 Avionics Technicians Install, inspect, test, adjust, or repair avionics equipment, such as radar, radio, navigation, and missile control systems in aircraft or space vehicles.	49-3010 Aircraft Mechanics and Service Technicians 49-3011 Aircraft Mechanics and Service Technicians Diagnose, adjust, repair, or overhaul aircraft engines and assemblies, such as hydraulic and pneumatic systems.

Appendix IV: Accessible Data

Avionics Technicians	Aircraft Mechanics and Service Technicians
Illustrative examples: Aircraft Electrician, Aircraft Instrument Mechanic, Automatic Pilot Mechanic	Excludes Avionics Technicians (49-2091)  Illustrative examples: Aircraft Engine Specialist, Airframe Mechanic, Flight Test Mechanic, Helicopter Engine Mechanic

Source: The 2018 SOC system. | GAO-20-206

**Accessible Data for Figure 3: Age Distribution of Federal Aviation Administration (FAA) Certificated Mechanics and Repairmen as of December 2018**

Age	Number of Repairmen certificated (as of Dec. 2018)	Number of Mechanics certificated (as of Dec. 2018)
19	1	60
20	3	231
21	5	597
22	17	947
23	21	1186
24	39	1620
25	63	1913
26	98	2196
27	117	2452
28	139	2777
29	219	3268
30	206	3342
31	281	3616
32	326	3746
33	304	3939
34	365	4168
35	377	4338
36	373	4571
37	438	4802
38	451	4681
39	465	4908
40	449	4720
41	448	4578
42	506	4497
43	489	4429
44	548	4498
45	578	4707
46	547	4852
47	592	5435
48	641	5912
49	668	6558

Appendix IV: Accessible Data

Age	Number of Repairmen certified (as of Dec. 2018)	Number of Mechanics certified (as of Dec. 2018)
50	727	6680
51	688	7293
52	720	7667
53	761	8263
54	778	8542
55	945	9030
56	991	9610
57	1006	9853
58	1112	9779
59	1070	9378
60	1049	8935
61	1034	8341
62	1066	8012
63	1020	7395
64	946	6502
65	944	6068
66	865	5256
67	785	4711
68	764	4348
69	704	4030
70	687	3952
71	684	4095
72	698	4182
73	676	3607
74	506	2796
75	502	2639
76	518	2754
77	476	2108
78	387	1398
79	333	1154
80	320	1056
81	256	965
82	237	809
83	249	730
84	201	648
85	178	553
86	153	492
87	131	468
88	122	398
89	115	350

Source: GAO analysis of FAA data. | GAO-20-206

**Accessible Data for Figure 4: Career Pathways for Federal Aviation Administration (FAA) Certificated Mechanics, 2015 through 2018**

Category	Percentage
Military training and experience	10
FAA-approved Aviation Maintenance Technician School	62
Practical work experience	28

**Accessible Data for Figure 5: Number of Mechanics and Repairmen Newly Certificated by the Federal Aviation Administration (FAA) Each Year, 2014-2018**

Year	Repairmen (number certified)	Mechanics (number certified)	Total (number certified)
2014	1946	6649	8,595
2015	2086	6391	8,477
2016	2093	5919	8,012
2017	2203	6426	8,629
2018	2629	6807	9,436

Source: GAO analysis of Federal Aviation Administration (FAA) data. | GAO-20-206

**Accessible Data for Figure 6: Excerpts from the Federal Aviation Administration’s (FAA) October 2015 Notice of Proposed Rulemaking (NPRM) and April 2019 Supplemental NPRM (SNPRM) related to the Part 147 Regulations for Aviation Maintenance Technician (AMT) Schools**

**Proposed changes in the 2015 NRPM**

This proposed rule would amend the regulations governing Aviation Maintenance Technician Schools (14 CFR part 147) to both update the existing curriculums and provide an efficient means of changing specific course items under each main subject heading, when needed, by including them in each school’s operations specifications. The proposal sets forth both a description of operations specifications and a process for amending, suspending, or terminating them. In addition, the proposed amendments would clarify existing requirements, remove gender- specific references, and eliminate duplication found in some sections of the current rules.

The amendments are needed because the existing curriculums are outdated, do not meet current industry needs, and can be changed only through notice and comment rulemaking. These amendments would ensure that aviation maintenance technician students receive up-to-date foundational training to meet the demanding and consistently changing needs of the aviation industry.

**Proposed changes in the 2019 SNRPM**

In this SNPRM, The FAA proposes to allow AMTSs to deliver their approved

curriculums using a CBT program. The FAA also proposes to allow satellite training locations for these schools, which could expand the capacity to recruit and educate future aircraft mechanics. Lastly, the FAA proposes to replace the current national passing norm requirements with a standard pass rate that would apply to all AMTSs. CBT and satellite training locations would be voluntary provisions.

AMTS= Aviation Maintenance Technician Schools

CBT= Competency-based training

Source: 80 Fed. Reg. 59,674-59,675; 84 Fed. Reg. 15,534. | GAO-20-206

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**Accessible Data for Figure 7: Timeline of Relevant Federal Aviation Administration (FAA) Working Groups and Activities Related to Updating Curriculum Requirements for Aviation Maintenance Technician Schools and Mechanic Testing Standards (2007-2019)**

Curriculum requirements

- June 2007 to Dec. 2008: Part 147 WG Part 147 Aviation Maintenance Technician Schools Curriculum and Operating Requirements Working Group createda
- Oct. 2015: NPRM Part 147 Notice of Proposed Rulemaking
- April 2019: SNPRM Part 147 Supplemental Notice of Proposed Rulemaking

Testing standards

- Sept. 2011 to April 2012: Airman Testing Standards and Training Aviation Rulemaking Committee createdb
- Aug. 2012 to Sept. 2013: ATST WG Airman Testing Standards and Training Working Group createdc
- Dec. 2013 and ongoing: ACS WG Airman Certification System Working Group createdd
- Dec. 2015: FAA added the Aircraft Mechanic Certificate to ACS WG's task list

Source: GAO analysis of selected Federal Register notices and Aviation Rulemaking Advisory Committee Working Group documents. | GAO-20-206

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## Agency Comment Letter

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### Accessible Text for Appendix II Department of Transportation Agency Comments

JAN 24 2020

Chelsa Gurkin

Director, International Affairs and Trade

U.S. Government Accountability Office (GAO)

441 G Street NW

Washington, DC 20548

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Sincerely,

Keith Washington

Deputy Assistant Secretary for Administration

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