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## Aircraft and Avionics Equipment Mechanics and Service Technicians

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### Significant Points

- Most workers learn their jobs in 1 of about 170 schools certified by the Federal Aviation Administration (FAA).
- Job opportunities should be favorable for persons who have completed an aircraft mechanic training program, but keen competition is likely for jobs at major airlines, which offer the best pay and benefits.
- Job opportunities are likely to continue to be best at small commuter and regional airlines, at FAA repair stations, and in general aviation.

### Nature of the Work

To keep aircraft in peak operating condition, aircraft and avionics equipment mechanics and service technicians perform scheduled maintenance, make repairs, and complete inspections required by the Federal Aviation Administration (FAA).

Many aircraft mechanics, also called airframe mechanics, power plant mechanics, and avionics technicians, specialize in preventive maintenance. They inspect aircraft engines, landing gear, instruments, pressurized sections, accessories—brakes, valves, pumps, and air-conditioning systems, for example—and other parts of the aircraft, and do the necessary maintenance and replacement of parts. They also keep records related to the maintenance performed on the aircraft. Mechanics and technicians conduct inspections following a schedule based on the number of hours the aircraft has flown, calendar days since the last inspection, cycles of operation, or a combination of these factors. In large, sophisticated planes equipped with aircraft monitoring systems, mechanics can gather valuable diagnostic information from electronic boxes and consoles that monitor the aircraft's basic operations. In planes of all sorts, aircraft mechanics examine engines by working through specially designed openings while standing on ladders or scaffolds or by using hoists or lifts to remove the entire engine from the craft. After taking an engine apart, mechanics use precision instruments to measure parts for wear and use x-ray and magnetic inspection equipment to check for invisible cracks. They repair or replace worn or defective parts. Mechanics also may repair sheet metal or composite surfaces; measure the tension of control cables; and check for corrosion, distortion, and cracks in the fuselage, wings, and tail. After completing all repairs, they must test the equipment to ensure that it works properly.

Other mechanics specialize in repair work rather than inspection. They find and fix problems that pilot's describe. For example, during a preflight check, a pilot may discover that the aircraft's fuel gauge does not work. To solve the problem, mechanics may troubleshoot the electrical system, using electrical test equipment to make sure that no wires are broken or shorted out, and replace any defective electrical or electronic components. Mechanics work as fast as safety permits so that the aircraft can be put back into service quickly.

Some mechanics work on one or many different types of aircraft, such as jets, propeller-driven airplanes, and helicopters. Others specialize in one section of a particular type of aircraft, such as the engine, hydraulics, or electrical system. *Airframe mechanics* are authorized to work on any part of the aircraft except the instruments, power plants, and propellers. Powerplant mechanics are authorized to work on engines and do limited work on propellers. *Combination airframe-and-powerplant mechanics*—called A&P mechanics—work on all parts of the plane except the instruments. Most mechanics working on civilian aircraft today are A&P mechanics. In small, independent repair shops, mechanics usually inspect and repair many different types of aircraft.

Avionics systems—components used for aircraft navigation and radio communications, weather radar systems, and other instruments and computers that control flight, engine, and other primary functions—are now an integral part of aircraft design and have vastly increased aircraft capability. *Avionics technicians* repair and maintain these systems. Their duties may require additional licenses, such as a radiotelephone license issued by the U.S. Federal Communications Commission (FCC). Because of the increasing use of technology, more time is spent repairing electronic systems, such as computerized controls. Technicians also may be required to analyze and develop solutions to complex electronic problems.

**Work environment.** Mechanics usually work in hangars or in other indoor areas. When hangars are full or when repairs must be made quickly, they may work outdoors, sometimes in unpleasant weather. Mechanics often work under time pressure to maintain flight schedules or, in general aviation, to keep from inconveniencing customers. At the same time, mechanics have a tremendous responsibility to maintain safety standards, and this can cause the job to be stressful.

Frequently, mechanics must lift or pull objects weighing more than 70 pounds. They often stand, lie, or kneel in awkward positions and occasionally must work in precarious positions, such as on scaffolds or ladders. Noise and vibration are common when engines are being tested, so ear protection is necessary.

Aircraft mechanics usually work 40 hours a week on 8-hour shifts around the clock. Overtime and weekend work is frequent.



*Avionics technicians repair and maintain components used for aircraft navigation, radio communications, and weather radar systems, as well as instruments and computers that control flight, engine, and other functions.*

**Projections data from the National Employment Matrix**

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-16	
				Number	Percent
Aircraft and avionics equipment mechanics and service technicians.....	—	138,000	152,000	14,000	10
Avionics technicians .....	49-2091	16,000	17,000	1,300	8
Aircraft mechanics and service technicians.....	49-3011	122,000	135,000	13,000	11

NOTE: Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

**Training, Other Qualifications, and Advancement**

Most workers learn their jobs in 1 of about 170 trade schools certified by the FAA. Most mechanics who work on civilian aircraft are certified by the FAA as an “airframe mechanic” or a “powerplant mechanic.”

**Education and training.** Although a few people become mechanics through on-the-job training, most learn their jobs in 1 of about the 170 schools certified by the FAA. About one-third of these schools award 2-year and 4-year degrees in avionics, aviation technology, or aviation maintenance management.

FAA standards established by law require that certified mechanic schools offer students a minimum of 1,900 class hours. Coursework in schools normally lasts from 18 to 24 months and provides training with the tools and equipment used on the job. Aircraft trade schools are placing more emphasis on technologies such as turbine engines, composite materials—including graphite, fiberglass, and boron—and aviation electronics, which are increasingly being used in the construction of new aircraft.

Courses in mathematics, physics, chemistry, electronics, computer science, and mechanical drawing are helpful because they demonstrate many of the principles involved in the operation of aircraft, and knowledge of these principles is often necessary to make repairs. Recent technological advances in aircraft maintenance require mechanics to have an especially strong background in electronics to get or keep jobs in this field.

Courses that develop writing skills also are important because mechanics are often required to submit reports. Mechanics must be able to read, write, and understand English.

A few mechanics are trained on the job by experienced mechanics. They must be supervised by certified mechanics until they have FAA certificates.

**Licensure.** The FAA requires at least 18 months of work experience for an airframe or powerplant certificate, although completion of a program at an FAA-certified mechanic school can be substituted for the work experience requirement. Mechanics and technicians also must pass an exam for certification and take at least 16 hours of training every 24 months to keep their certificate current. Many mechanics take training courses offered by manufacturers or employers, usually through outside contractors.

The FAA also offers a combined certificate that allows for certification as both an airframe and a powerplant mechanic, the A&P certificate. For a combined A&P certificate, mechanics must acquire at least 30 months of experience working with both engines and airframes, or experience combined with

the completion of an FAA-certified mechanic school program. FAA regulations also require current work experience to keep the A&P certificate valid. Applicants must have at least 1,000 hours of work experience in the previous 24 months or take a refresher course. Most airlines require that mechanics have a high school diploma and an A&P certificate. Applicants for all certificates must pass written and oral tests and demonstrate that they can do the work authorized by the certificate.

Avionics technicians need an FAA mechanics’ certificate. They also must be trained and qualified and have the proper tools to work on avionics equipment. Many have avionics repair experience from the military or from working for avionics manufacturers.

**Other qualifications.** Applicants must be at least 18 years of age. Some aircraft mechanics in the Armed Forces acquire enough general experience to satisfy the work experience requirements for the FAA certificate. With additional study, they may pass the certifying exam. In general, however, jobs in the military services are too specialized to provide the broad experience required by the FAA. Most Armed Forces mechanics have to complete the entire FAA training program, although a few receive some credit for the material they learned in the service. In any case, military experience is a great advantage when seeking employment; employers consider applicants with formal training to be the most desirable applicants.

Aircraft mechanics must do careful and thorough work that requires a high degree of mechanical aptitude. Employers seek applicants who are self-motivated, hard working, enthusiastic, and able to diagnose and solve complex mechanical problems. Additionally, employers prefer mechanics who can perform a variety of tasks. Agility is important for the reaching and climbing necessary to do the job. Because they may work on the tops of wings and fuselages on large jet planes, aircraft mechanics must not be afraid of heights.

Advances in computer technology, aircraft systems, and the materials used to manufacture airplanes have made mechanics’ jobs more highly technical. Aircraft mechanics must possess the skills necessary to troubleshoot and diagnose complex aircraft systems. They also must continually update their skills with and knowledge of new technology and advances in aircraft technology

**Advancement.** As aircraft mechanics gain experience, they may advance to lead mechanic (or crew chief), inspector, lead inspector, or shop supervisor positions. Opportunities are best for those who have an aircraft inspector’s authorization. To obtain an inspector’s authorization, a mechanic must have held an A&P certificate for at least 3 years, with 24 months of hands-on experience.

In the airlines, where promotion often is determined by examination, supervisors sometimes advance to executive positions. Those with broad experience in maintenance and overhaul might become inspectors with the FAA. With additional business and management training, some open their own aircraft maintenance facilities. Mechanics with the necessary pilot licenses and flying experience may take the FAA examination for the position of flight engineer, with opportunities to become pilots.

Mechanics and technicians learn many different skills in their training that can be applied to other jobs, and some transfer to other skilled repairer occupations or electronics technician jobs. For example, some avionics technicians continue their education and become aviation engineers, electrical engineers (specializing in circuit design and testing), or communication engineers. Others become repair consultants, in-house electronics designers, or join research groups that test and develop products.

### Employment

Aircraft and avionics equipment mechanics and service technicians held about 138,000 jobs in 2006; about 5 in 6 of these workers was an aircraft mechanic and service technician.

Employment of aircraft and avionics equipment mechanics and service technicians primarily is concentrated in a small number of industries. More than half of aircraft and avionics equipment mechanics and service technicians worked in air transportation and support activities for air transportation. Around 18 percent worked in aerospace product and parts manufacturing and about 16 percent worked for the Federal Government. Most of the rest worked for companies that operate their own planes to transport executives and cargo.

Most airline mechanics and service technicians work at major airports near large cities. Civilian mechanics employed by the U.S. Armed Forces work at military installations. Mechanics who work for aerospace manufacturing firms typically are located in California or in Washington State. Others work for the FAA, many at the facilities in Oklahoma City, Atlantic City, Wichita, or Washington, DC. Mechanics for independent repair shops work at airports in every part of the country.

### Job Outlook

Job growth for these mechanics and technicians is expected to be about as fast as the average for all occupations. Job opportunities should be favorable for people who have completed an aircraft mechanic training program, but keen competition is likely for jobs at major airlines.

**Employment change.** Employment is expected to increase by 10 percent during the 2006-16 period, about as fast as the average for all occupations. Passenger traffic is expected to increase as the result of an expanding economy and a growing population, and the need for aircraft mechanics and service technicians will grow accordingly.

**Job prospects.** Most job openings for aircraft mechanics through the year 2016 will stem from the need to replace the many mechanics expected to retire over the next decade. In addition, some mechanics will leave to work in related fields, such as automobile repair, as their skills are largely transferable to other maintenance and repair occupations.

Also contributing to favorable future job opportunities for mechanics is the long-term trend toward fewer students entering technical schools to learn skilled maintenance and repair trades. Many of the students who have the ability and aptitude to work on planes are choosing to go to college, work in computer-related fields, or go into other repair and maintenance occupations with better working conditions. If this trend continues, the supply of trained aviation mechanics may not keep up with the needs of the air transportation industry.

Job opportunities will continue to be the best at small commuter and regional airlines, at FAA repair stations, and in general aviation. Commuter and regional airlines is the fastest growing segment of the air transportation industry, but wages in these airlines tend to be lower than those in the major airlines, so they attract fewer job applicants. Also, some jobs will become available as experienced mechanics leave for higher paying jobs with the major airlines or transfer to other occupations. At the same time, general aviation aircraft are becoming increasingly sophisticated, boosting the demand for qualified mechanics. Mechanics will face more competition for jobs with large airlines because the high wages and travel benefits that these jobs offer generally attract more qualified applicants than there are openings. Also, there is an increasing trend for large airlines to outsource aircraft and avionics equipment mechanic jobs overseas; however, most airline companies prefer that aircraft maintenance be performed in the U.S. because overseas contractors may not comply with more stringent U.S. safety regulations.

In spite of these factors, job opportunities with the airlines are expected to be better than they have been in the past. But, in general, prospects will be best for applicants with experience. Mechanics who keep abreast of technological advances in electronics, composite materials, and other areas will be in greatest demand. Also, mechanics who are mobile and willing to relocate to smaller rural areas will have better job opportunities. The number of job openings for aircraft mechanics in the Federal Government should decline as the Government increasingly contracts out service and repair functions to private repair companies.

Avionics technicians who do not have FAA certification, but who are prepared to master the intricacies of the aircraft while working with certified A&P mechanics, should have good opportunities. However, certified technicians who are trained to work with complex aircraft systems, performing some duties normally performed by certified A&P mechanics, should have the best job prospects. Additionally, technicians with licensing that enables them to work on the airplane, either removing or reinstalling equipment, are expected to be in especially high demand.

### Earnings

Median hourly earnings of aircraft mechanics and service technicians were about \$22.95 in May 2006. The middle 50 percent earned between \$18.96 and \$28.12. The lowest 10 percent earned less than \$14.94, and the highest 10 percent earned more than \$34.51. Median hourly earnings in the industries employing the largest numbers of aircraft mechanics and service technicians in May 2006 were:

Scheduled air transportation .....	\$27.46
Nonscheduled air transportation .....	23.33
Federal Government.....	23.19
Aerospace product and parts manufacturing.....	21.58
Support activities for air transportation .....	19.57

Median hourly earnings of avionics technicians were about \$22.57 in May 2006. The middle 50 percent earned between \$19.02 and \$26.65. The lowest 10 percent earned less than \$15.65, and the highest 10 percent earned more than \$30.33.

Mechanics who work on jets for the major airlines generally earn more than those working on other aircraft. Those who graduate from an aviation maintenance technician school often earn higher starting salaries than individuals who receive training in the Armed Forces or on the job. Airline mechanics and their immediate families receive reduced-fare transportation on their own and most other airlines.

About 3 in 10 aircraft and avionics equipment mechanics and service technicians are members of unions or covered by union agreements. The principal unions are the International Association of Machinists and Aerospace Workers, and the Transport Workers Union of America. Some mechanics are represented by the International Brotherhood of Teamsters.

### Related Occupations

Workers in some other occupations that involve similar mechanical and electrical work are electricians, electrical and

electronics installers and repairers, and elevator installers and repairers.

### Sources of Additional Information

Information about jobs with a particular airline can be obtained by writing to the personnel manager of the company.

For general information about aircraft and avionics equipment mechanics and service technicians, contact:

► Professional Aviation Maintenance Association, 400 Commonwealth Dr., Warrendale, PA 15096.

Internet: <http://www.pama.org>

For information on jobs in a particular area, contact employers at local airports or local offices of the State employment service.

Information on obtaining positions as aircraft and avionics equipment mechanics and service technicians with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at <http://www.usajobs.opm.gov> or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result.