



# OCCUPATIONAL OUTLOOK HANDBOOK

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## Aerospace Engineers

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Summary

### Summary

Quick Facts: Aerospace Engineers	
<b>2019 Median Pay</b>	\$116,500 per year \$56.01 per hour
<b>Typical Entry-Level Education</b>	Bachelor's degree
<b>Work Experience in a Related Occupation</b>	None
<b>On-the-job Training</b>	None
<b>Number of Jobs, 2019</b>	66,400
<b>Job Outlook, 2019-29</b>	3% (As fast as average)
<b>Employment Change, 2019-29</b>	1,900



#### [What Aerospace Engineers Do](#)

Aerospace engineers design primarily aircraft, spacecraft, satellites, and missiles.

#### [Work Environment](#)

Aerospace engineers are employed in industries whose workers design or build aircraft, missiles, systems for national defense, or spacecraft. Aerospace engineers are employed primarily in manufacturing, analysis and design, research and development, and the federal government.

#### [How to Become an Aerospace Engineer](#)

Aerospace engineers must have a bachelor's degree in aerospace engineering or another field of engineering or science related to aerospace systems. Aerospace engineers who work on projects that are related to national defense may need a security clearance.

#### [Pay](#)

The median annual wage for aerospace engineers was \$116,500 in May 2019.

#### [Job Outlook](#)

Employment of aerospace engineers is projected to grow 3 percent from 2019 to 2029, about as fast as the average for all occupations.

#### [State & Area Data](#)

Explore resources for employment and wages by state and area for aerospace engineers.

#### [Similar Occupations](#)

Compare the job duties, education, job growth, and pay of aerospace engineers with similar occupations.

#### [More Information, Including Links to O\\*NET](#)

Learn more about aerospace engineers by visiting additional resources, including O\*NET, a source on key characteristics of workers and occupations.

[What They Do ->](#)

What They Do

### What Aerospace Engineers Do

About this section

Aerospace engineers design primarily aircraft, spacecraft, satellites, and missiles. In addition, they create and test prototypes to make sure that they function according to design.

#### Duties

Aerospace engineers typically do the following:

- Direct and coordinate the design, manufacture, and testing of aircraft and aerospace products

- Assess proposals for projects to determine if they are technically and financially feasible
- Determine if proposed projects will result in safe operations that meet the defined goals
- Evaluate designs to see that the products meet engineering principles, customer requirements, and environmental regulations
- Develop acceptance criteria for design methods, quality standards, sustainment after delivery, and completion dates
- Ensure that projects meet quality standards
- Inspect malfunctioning or damaged products to identify sources of problems and possible solutions



Aerospace engineers evaluate designs to see that the products meet engineering principles.

Aerospace engineers may develop new technologies for use in aviation, defense systems, and spacecraft. They often specialize in areas such as aerodynamic fluid flow; structural design; guidance, navigation, and control; instrumentation and communication; robotics; and propulsion and combustion.

Aerospace engineers can specialize in designing different types of aerospace products, such as commercial and military airplanes and helicopters; remotely piloted aircraft and rotorcraft; spacecraft, including launch vehicles and satellites; and military missiles and rockets.

Aerospace engineers often become experts in one or more related fields: aerodynamics, thermodynamics, materials, celestial mechanics, flight mechanics, propulsion, acoustics, and guidance and control systems.

Aerospace engineers typically specialize in one of two types of engineering: aeronautical or astronautical.

**Aeronautical engineers** work with aircraft. They are involved primarily in designing aircraft and propulsion systems and in studying the aerodynamic performance of aircraft and construction materials. They work with the theory, technology, and practice of flight within the Earth's atmosphere.

**Astronautical engineers** work with the science and technology of spacecraft and how they perform inside and outside the Earth's atmosphere. This includes work on small satellites such as cubesats, and traditional large satellites.

Aeronautical and astronautical engineers face different environmental and operational issues in designing aircraft and spacecraft. However, the two fields overlap a great deal because they both depend on the basic principles of physics.

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Work Environment

[Work Environment →](#)

## Work Environment

About this section

Aerospace engineers held about 66,400 jobs in 2019. The largest employers of aerospace engineers were as follows:

Aerospace product and parts manufacturing	36%
Federal government, excluding postal service	16
Engineering services	15
Navigational, measuring, electromedical, and control instruments manufacturing	10
Research and development in the physical, engineering, and life sciences	8



Aerospace engineers work in industries that build aircraft and often help oversee construction.

Aerospace engineers are employed in industries in which workers design or build aircraft, missiles, systems for national defense, or spacecraft. They work primarily for firms that engage in manufacturing, analysis and design, research and development, and for the federal government.

Aerospace engineers now spend more of their time in an office environment than they have in the past, because modern aircraft design requires the use of sophisticated computer equipment and software design tools, modeling, and simulations for tests, evaluation, and training.

Aerospace engineers work with other professionals involved in designing and building aircraft, spacecraft, and their components. Therefore, they must be able to communicate well, divide work into manageable tasks, and work with others toward a common goal.

### Work Schedules

Aerospace engineers typically work full time. Engineers who direct projects must often work extra hours to monitor progress, to ensure that designs meet requirements, to determine how to measure aircraft performance, to see that production meets design standards, to participate in test flights and first flights, and to ensure that deadlines are met.

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How to Become One

[How to Become One →](#)

## How to Become an Aerospace Engineer

About this section

Aerospace engineers must have a bachelor's degree in aerospace engineering or another field of engineering or science related to aerospace systems.

Aerospace engineers who work on projects that are related to national defense may need a security clearance. U.S. citizenship may be required for certain types and levels of clearances.

## Education

Entry-level aerospace engineers usually need a bachelor's degree. High school students interested in studying aerospace engineering should take courses in chemistry, physics, advanced math, and computer programming and computer languages.

Bachelor's degree programs include classroom, laboratory, and field studies in subjects such as general engineering principles, propulsion, stability and control, structures, mechanics, and aerodynamics, which is the study of how air interacts with moving objects.

Some colleges and universities offer cooperative programs in partnership with regional businesses, which give students practical experience while they complete their education. Cooperative programs and internships enable students to gain valuable experience and to finance part of their education.

At some universities, a student can enroll in a 5-year program that leads to both a bachelor's degree and a master's degree upon completion. A graduate degree will allow an engineer to work as an instructor at a university or to do research and development. Programs in aerospace engineering are accredited by [ABET](#).

## Important Qualities

**Analytical skills.** Aerospace engineers must be able to identify design elements that may not meet requirements and then must formulate alternatives to improve the performance of those elements.

**Business skills.** Much of the work done by aerospace engineers involves meeting federal government standards. Meeting these standards often requires knowledge of standard business practices, as well as knowledge of commercial law. Additionally, project management or systems engineering skills can be useful.

**Critical-thinking skills.** Aerospace engineers must be able to produce designs that meet governmental standards, and to figure out why a particular design does not work. They must be able to ask the right question, then find an acceptable answer.

**Math skills.** Aerospace engineers use the principles of calculus, trigonometry, and other advanced topics in math for analysis, design, and troubleshooting in their work.

**Problem-solving skills.** Aerospace engineers use their education and experience to upgrade designs and troubleshoot problems when meeting new demands for aircraft, such as increased fuel efficiency or improved safety.

**Writing skills.** Aerospace engineers must be able both to write papers that explain their designs clearly and to create documentation for future reference.

## Licenses, Certifications, and Registrations

Licensure for aerospace engineers is not as common as it is for other engineering occupations, nor it is required for entry-level positions. A Professional Engineering (PE) license, which allows for higher levels of leadership and independence, can be acquired later in one's career. Licensed engineers are called professional engineers (PEs). A PE can oversee the work of other engineers, sign off on projects, and provide services directly to the public. State licensure generally requires

- A degree from an ABET-accredited engineering program
- A passing score on the Fundamentals of Engineering (FE) exam
- Relevant work experience, typically at least 4 years
- A passing score on the Professional Engineering (PE) exam.

The initial FE exam can be taken after earning a bachelor's degree. Engineers who pass this exam are commonly called engineers in training (EITs) or engineer interns (EIs). After meeting work experience requirements, EITs and EIs can take the second exam, called the Principles and Practice of Engineering.

Each state issues its own licenses. Most states recognize licensure from other states, as long as the licensing state's requirements meet or exceed their own licensure requirements. Several states require continuing education for engineers to keep their licenses.

## Other Experience

During high school, students can attend [engineering summer camps](#) to see what these and other engineers do. Attending these camps can help students plan their coursework for the remainder of their time in high school.

## Advancement

Eventually, aerospace engineers may advance to become technical specialists or to supervise a team of engineers and technicians. Some may even become [engineering managers](#) or move into executive positions, such as program managers.



Aerospace engineers use the principles of calculus, trigonometry, and other advanced topics in mathematics for analysis, design, and troubleshooting in their work.

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Pay

[Pay →](#)

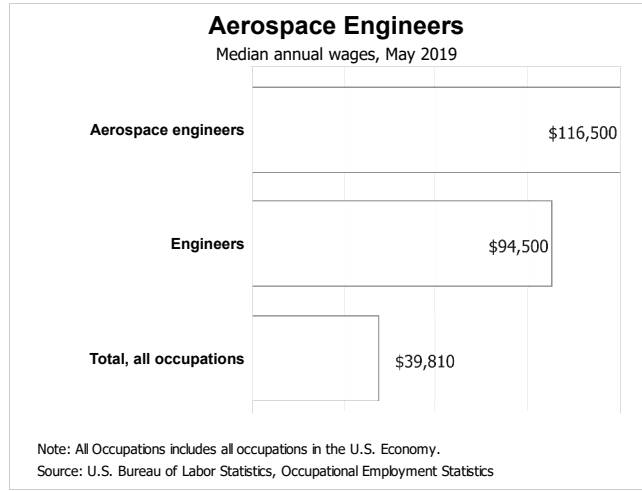
## Pay

About this section

The median annual wage for aerospace engineers was \$116,500 in May 2019. The median wage is the wage at which half the workers in an occupation earned more than that amount and half earned less. The lowest 10 percent earned less than \$72,450, and the highest 10 percent earned more than \$166,620.

In May 2019, the median annual wages for aerospace engineers in the top industries in which they worked were as follows:

Research and development in the physical, engineering, and life sciences	\$123,600
Navigational, measuring, electromedical, and control instruments manufacturing	121,750
Federal government, excluding postal service	118,050
Aerospace product and parts manufacturing	116,620
Engineering services	114,030



Aerospace engineers typically work full time. Engineers who direct projects must often work extra hours to monitor progress, to ensure that designs meet requirements, to determine how to measure aircraft performance, to see that production meets design standards, and to ensure that deadlines are met.

[<- How to Become One](#)

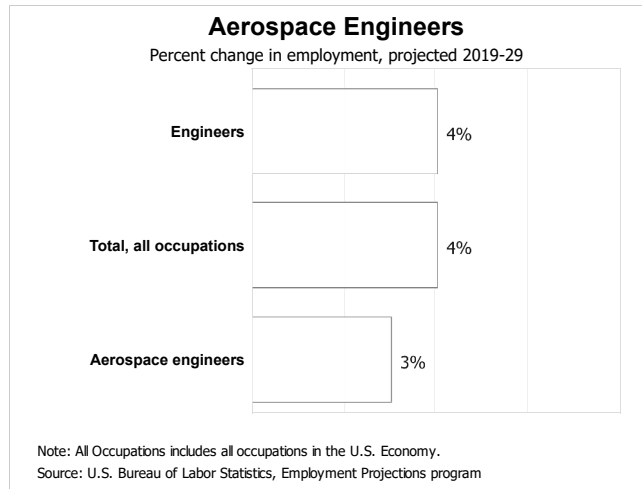
[Job Outlook ->](#)

Job Outlook

## Job Outlook

About this section

Employment of aerospace engineers is projected to grow 3 percent from 2019 to 2029, about as fast as the average for all occupations. Aircraft are being redesigned to cause less noise pollution and have better fuel efficiency, which will help sustain demand for research and development. Also, new developments in small satellites have greater commercial viability. Growing interest in unmanned aerial systems will also help drive growth of the occupation.



### Job Prospects

Employment opportunities should be favorable for those trained in software, such as C++, or with education and experience in stress and structural engineering.

### Employment projections data for aerospace engineers, 2019-29

Occupational Title	SOC Code	Employment, 2019	Projected Employment, 2029	Change, 2019-29		Employment by Industry
				Percent	Numeric	
Aerospace engineers	17-2011	66,400	68,200	3	1,900	<a href="#">Get data</a>

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

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State & Area Data

## State & Area Data

About this section

### Occupational Employment Statistics (OES)

The [Occupational Employment Statistics](#) (OES) program produces employment and wage estimates annually for over 800 occupations. These estimates are available for the nation as a whole, for individual states, and for metropolitan and nonmetropolitan areas. The link(s) below go to OES data maps for employment and wages by state and area.

- [Aerospace engineers](#)

### Projections Central

Occupational employment projections are developed for all states by Labor Market Information (LMI) or individual state Employment Projections offices. All state projections data are available at [www.projectionscentral.com](http://www.projectionscentral.com). Information on this site allows projected employment growth for an occupation to be compared among states or to be compared within one state. In addition, states may produce projections for areas; there are links to each state's websites where these data may be retrieved.

CareerOneStop

CareerOneStop includes hundreds of [occupational profiles](#) with data available by state and metro area. There are links in the left-hand side menu to compare occupational employment by state and occupational wages by local area or metro area. There is also a [salary info tool](#) to search for wages by zip code.

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[Similar Occupations ->](#)

Similar Occupations

## Similar Occupations

[About this section](#)

This table shows a list of occupations with job duties that are similar to those of aerospace engineers.

	OCCUPATION	JOB DUTIES	ENTRY-LEVEL EDUCATION	2019 MEDIAN PAY
	<a href="#">Aerospace Engineering and Operations Technicians</a>	Aerospace engineering and operations technicians operate and maintain equipment used in developing, testing, producing, and sustaining new aircraft and spacecraft.	Associate's degree	\$66,020
	<a href="#">Architectural and Engineering Managers</a>	Architectural and engineering managers plan, direct, and coordinate activities in architectural and engineering companies.	Bachelor's degree	\$144,830
	<a href="#">Computer Hardware Engineers</a>	Computer hardware engineers research, design, develop, and test computer systems and components.	Bachelor's degree	\$117,220
	<a href="#">Electrical and Electronics Engineering Technicians</a>	Electrical and electronics engineering technicians help engineers design and develop electrical and electronic equipment.	Associate's degree	\$65,260
	<a href="#">Electrical and Electronics Engineers</a>	Electrical engineers design, develop, test, and supervise the manufacture of electrical equipment.	Bachelor's degree	\$101,250
	<a href="#">Industrial Engineers</a>	Industrial engineers devise efficient systems that integrate workers, machines, materials, information, and energy to make a product or provide a service.	Bachelor's degree	\$88,020
	<a href="#">Materials Engineers</a>	Materials engineers develop, process, and test materials used to create a wide range of products.	Bachelor's degree	\$93,360
	<a href="#">Mechanical Engineers</a>	Mechanical engineers design, develop, build, and test mechanical and thermal sensors and devices.	Bachelor's degree	\$88,430

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More Info

## Contacts for More Information

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For more information about general engineering education and career resources, visit

[American Society for Engineering Education](#)

[Technology Student Association](#)

For more information about licensure as an aerospace engineer, visit

[National Council of Examiners for Engineering and Surveying](#)

[National Society of Professional Engineers](#)

For more information about accredited engineering programs, visit

[ABET](#)

For more information about current developments in aeronautics, visit

[The American Institute of Aeronautics and Astronautics](#)

For more information about engineering summer camps, visit

[Engineering Education Service Center](#)

CareerOneStop

For a career video on aerospace engineers, visit

[Aerospace Engineers](#)

O\*NET

[Aerospace Engineers](#)

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**SUGGESTED CITATION:**

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