



Aviation

Scouts BSA · STEM

Name

Started

Completed

Aviation is the science and adventure of flight. This badge explains how airplanes stay in the air, lets you build and fly a model, and takes you behind the scenes at an airport or museum. It might be the first step toward a pilot's seat.

Requirements

Every official requirement, in plain language. Check the official wording when you sign off (scouting.org/merit-badges/aviation/). Tips and examples are ideas, not extra requirements.

1 Aviation basics and how flight works

Tips for this section: Hold your hand out a car window, with a parent's okay, and tilt it to feel lift and drag. Then sketch the four forces on a plane.

Example for this section: Explain the four forces with a story: on takeoff, thrust from the engine pulls the plane forward, the wings create lift once there's enough airflow, and lift beats weight while thrust beats drag. Add a sketch, and one moment in flight history like the Wright brothers' 1903 flight.

- ☐ **1a** Define what an aircraft is, and describe 3 kinds of aircraft used today and what each is usually used for

- ☐ **1b** Give a short overview of how flight has developed and discuss 3 important moments in aviation history

- ☐ **1c** Explain how fixed-wing and rotary-wing aircraft differ and the advantages of each

- ☐ **1d** Explain how piston, turbine, and jet engines work

- ☐ **1e** Use a model aircraft to describe the 4 forces acting on an aircraft in flight

- ☐ **1f** Explain how an airfoil creates lift, including Bernoulli's principle

- ☐ **1g** Name and describe the control surfaces on an aircraft you choose, and explain how they control its attitude and direction

- ☐ **1h** Explain what each instrument in a typical single-engine plane does: attitude, heading, altimeter, airspeed, turn and bank, vertical speed, compass, navigation, communication, and engine indicators

2 Principles of flight: Choose 1 of 3

Tips for this section: Start with a simple glider or rubber-band model. Adjust the wings and tail and test how it changes the flight.

Example for this section: Build a rubber-band-powered balsa airplane and test it in a gym or open field, aiming for a straight 25-foot flight and a smooth landing. If it noses up and stalls, add a little weight to the nose; if it dives, bend the back edge of the tail up slightly. Keep notes on each adjustment and how it flew.

- ☐ **2a** Build an FPG-9 model, have other Scouts in your troop or patrol build one too, and hold a contest judging how accurately each flies and lands

- ☐ **2b** Build a balsa wood airplane powered by a rubber band and fly it straight for 25 feet, landing smoothly

- ☐ **2c** Build or get a fuel or battery-powered model aircraft or drone, earn The Recreational UAS Safety Test (TRUST) certificate, and fly it with a good takeoff and landing

3 Flight operations: Choose 2 of 5

Tips for this section: Try a flight simulator, or ask a pilot to show you an aviation chart and explain what the symbols mean.

Example for this section: On a sectional chart, plan a short imaginary flight between two nearby airports: draw the line, measure the true course with a plotter, then correct for wind drift, magnetic variation, and compass deviation to get your heading. Note any controlled airspace or tall towers along the route.

- ☐ **3a** On flight simulator software, set a course and fly your planned headings, including a successful takeoff and landing

- ☐ **3b** With supervision, do a preflight inspection of an aircraft

Example: With a pilot or mechanic supervising, follow a preflight walk-around at a general aviation airport, checking fuel, oil, control surfaces, and tires. Ask what they're looking for at each stop.

- ☐ **3c** Watch or help with aircraft maintenance, and describe what maintenance an aircraft of your choice needs and how often

- ☐ **3d** Get an aeronautical chart and learn to read it; measure a true course, then correct for wind drift, magnetic variation, and compass deviation to find a heading

- ☐ **3e** With permission from a parent or guardian, go on a discovery flight; log the date, place, aircraft type, and flight time, and report your impressions

4 **Airport operations: Choose 1 of 4**

Tips for this section: Many airports and aviation museums offer tours. Call ahead with a parent and bring questions.

Example for this section: At the airport, find out how runways get their numbers (one pointing about 270° magnetic is Runway 27), why pilots take off and land into the wind, and how that decides the active runway. Ask what the hangars, fuel trucks, and terminal are used for.

- ☐ **4a** Visit an airport, then report on how its facilities are used, how runways get their numbers, and how the active runway is chosen

- ☐ **4b** Visit an FAA facility (ATCT, TRACON, ARTCC, or FSDO) and report on how it operates and your impressions

- ☐ **4c** Visit a military aviation facility, learn how it supports defense or civilian activities, and report on how it operates and your impressions

- ☐ **4d** Visit an aviation museum or go to an air show, and report your impressions and what you learned

5 Personal and professional aviation opportunities

Tips for this section: Ask a pilot what training they needed and what other jobs exist, like air traffic controller, mechanic, or engineer.

Example for this section: Explain a pilot pathway: student pilot certificate, then private pilot, then instrument rating and commercial certificate for paid flying. Then name three non-pilot jobs, like air traffic controller, aircraft mechanic, and airport manager.

- ☐ **5a** Explain the student pilot, recreational pilot, remote pilot, and private pilot certificates

- ☐ **5b** Describe what an instrument rating lets a pilot do and why it's useful

Aviation worksheet (continued)

- ☐ **5c** Explain the commercial pilot and airline transport pilot certificates and what a certified flight instructor (CFI) is

- ☐ **5d** Find an Aviation Exploring post or Civil Air Patrol unit near you and learn what they do and how to join

- ☐ **5e** Name 3 aviation careers; research one's training, education, certification, experience, costs, job outlook, starting pay, and advancement, and discuss with your counselor whether it interests you