

MERIT BADGE SERIES



# AVIATION



BOY SCOUTS OF AMERICA®

STEM-Based

BOY SCOUTS OF AMERICA  
MERIT BADGE SERIES

# AVIATION



*"Enhancing our youths' competitive edge through merit badges"*



BOY SCOUTS OF AMERICA®

# Requirements

1. Do the following:
  - a. Define “aircraft.” Describe some kinds and uses of aircraft today. Explain the operation of piston, turboprop, and jet engines.
  - b. Point out on a model airplane the forces that act on an airplane in flight.
  - c. Explain how an airfoil generates lift, how the primary control surfaces (ailerons, elevators, and rudder) affect the airplane’s attitude, and how a propeller produces thrust.
  - d. Demonstrate how the control surfaces of an airplane are used for takeoff, straight climb, level turn, climbing turn, descending turn, straight descent, and landing.
  - e. Explain the following: the sport pilot, the recreational pilot, and the private pilot certificates; the instrument rating.
2. Do TWO of the following:
  - a. Take a flight in an aircraft, with your parent’s permission. Record the date, place, type of aircraft, and duration of flight, and report on your impressions of the flight.
  - b. Under supervision, perform a preflight inspection of a light airplane.
  - c. Obtain and learn how to read an aeronautical chart. Measure a true course on the chart. Correct it for magnetic variation, compass deviation, and wind drift to determine a compass heading.

- d. Using one of many flight simulator software packages available for computers, “fly” the course and heading you established in requirement 2c or another course you have plotted.
  - e. Explain the purposes and functions of the various instruments found in a typical single-engine aircraft: attitude indicator, heading indicator, altimeter, airspeed indicator, turn and bank indicator, vertical speed indicator, compass, navigation (GPS and VOR) and communication radios, tachometer, oil pressure gauge, and oil temperature gauge.
  - f. Create an original poster of an aircraft instrument panel. Include and identify the instruments and radios discussed in requirement 2e.
3. Do ONE of the following:
- a. Build and fly a fuel-driven or battery-powered electric model airplane. Describe safety rules for building and flying model airplanes. Tell safety rules for use of glue, paint, dope, plastics, fuel, and battery pack.



- b. Build a model FPG-9. Get others in your troop or patrol to make their own model, then organize a competition to test the precision of flight and landing of the models.
4. Do ONE of the following:
  - a. Visit an airport. After the visit, report on how the facilities are used, how runways are numbered, and how runways are determined to be “active.”
  - b. Visit a Federal Aviation Administration facility—a control tower, terminal radar control facility, air route traffic control center, or Flight Standards District Office. (Phone directory listings are under U.S. Government Offices, Transportation Department, Federal Aviation Administration. Call in advance.) Report on the operation and your impressions of the facility.
  - c. Visit an aviation museum or attend an air show. Report on your impressions of the museum or show.
5. Find out about three career opportunities in aviation. Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor, and explain why this profession might interest you.



# Aviation Resources

## Scouting Literature

*Auto Mechanics, Electronics, Engineering, Model Design and Building, Orienteering, and Space Exploration* merit badge pamphlets

For more information about Scouting-related resources, visit the BSA's online retail catalog (with your parent's permission) at [www.scoutstuff.org](http://www.scoutstuff.org).

## Books

Bell, Dana. *In the Cockpit: Inside 50 History-Making Aircraft*. Harper Design, 2007.

———. *Smithsonian Atlas of World Aviation*. Smithsonian, 2008.

Echaore-McDavid, Susan. *Career Opportunities in Aviation and the Aerospace Industry: A Guide to 80 Careers in Aviation and the Aerospace Industry*. Checkmark Books, 2004.

Eichenberger, Jerry A. *Your Pilot's License*, 8th ed. McGraw Hill, 2011.

Grant, R.G. *Flight: The Complete History*. DK Publishing, 2007.

Nahum, Andrew. *Flight: DK Eyewitness Book*. DK Children, 2011.

Whiteman, Phillip. *Aircraft: The Definitive Visual History*. DK Adult, 2013.

## Periodicals

### **Flying**

Telephone: 407-628-4802

Website: [www.flyingmag.com](http://www.flyingmag.com)

### **Model Airplane News**

Air Age Media

Toll-free telephone: 800-827-0323

Website: [www.modelairplanenews.com](http://www.modelairplanenews.com)

### **Plane & Pilot**

Werner Publishing Corp.

Telephone: 310-820-1500

Website: [www.planeandpilotmag.com](http://www.planeandpilotmag.com)

## Organizations and Websites

### **Academy of Model Aeronautics**

5161 East Memorial Drive

Muncie, IN 47302

Toll-free telephone: 800-435-9262

Website: [www.modelaircraft.org](http://www.modelaircraft.org)

### **Aircraft Owners and Pilots Association**

421 Aviation Way

Frederick, MD 21701

Toll-free telephone: 800-872-2672

Website: [www.aopa.org](http://www.aopa.org)

### **ALLSTAR Network**

Aeronautics Learning Laboratory for

Science, Technology, and Research

Website: [www.allstar.fiu.edu](http://www.allstar.fiu.edu)

### **The Aviation History Online Museum**

Website: [www.aviation-history.com](http://www.aviation-history.com)

### **Chasing the Sun**

The History of Commercial Aviation Seen Through the Eyes of Its Innovators  
 Website: [www.pbs.org/kcet/chasingthesun](http://www.pbs.org/kcet/chasingthesun)

### **Federal Aviation Administration**

800 Independence Ave. SW  
 Washington, DC 20591  
 Toll-free telephone: 866-835-5322  
 Website: [www.faa.gov](http://www.faa.gov)

### **National Aeronautics and Space Administration**

Suite 1M32  
 Washington, DC 20546-0001  
 Telephone: 202-358-0001  
 Website: [www.nasa.gov](http://www.nasa.gov)

### **National Oceanic and Atmospheric Administration**

1401 Constitution Ave., NW, Room 5128  
 Washington, DC 20230  
 Telephone: 202-482-6090  
 Website: [www.noaa.gov](http://www.noaa.gov)

### **Sporty's Pilot Shop**

Website: [www.sportys.com](http://www.sportys.com)  
 Toll-free telephone: 800-776-7897

### **University Aviation Association**

2415 Moore's Mill Road, Suite 265-216  
 Auburn, AL 36830  
 Telephone: 334-528-0300  
 Website: [www.imis100us1.com/uaa](http://www.imis100us1.com/uaa)

### **DVDs**

*Be a Sport Pilot: Learn to Fly a Fixed-Wing Light-Sport Aircraft.* DVD, 75 min.

*Sporty's Learn to Fly Course.* DVD, 23 hours.

*Sporty's Introduction to Flying—A Non-Pilot's Guide.* DVD, 56 min.

*Sporty's So You Want to Fly Helicopters.* DVD, 2 hrs.

*Start Flying! Understand What's Involved With Learning to Fly and Earning a Pilot's License.* DVD, 34 min.

### **Acknowledgments**

The Boy Scouts of America gives special thanks to Sporty's Pilot Shop for making this major revision of the *Aviation* merit badge pamphlet possible. In particular, thanks to Mark Wiesenhahn for his assistance.

Thanks to Robert Lamb Jr. and to Ed Mitchell and his colleagues in Phantom Works at Boeing Aircraft Company for their assistance with past updates to this pamphlet.

The BSA is grateful to Rear Adm. J. Dan McCarthy, U.S. Pacific Fleet, U.S. Navy, for facilitating the use of U.S. Navy photographs in the production of this book.

Thanks also to staff members at the Academy of Model Aeronautics for their time and expertise in reviewing the text, and for providing some of the photos used in this pamphlet.

The Boy Scouts of America is grateful to the men and women serving on the Merit Badge Maintenance Task Force for the improvements made in updating this pamphlet.