

EAA BoyScout Merit Badge Model for Aviation Education

The following pages provide an updated version of the information, worksheets, and requirements for the Boy Scouts of America Aviation Merit Badge. The program illustrated is offered at the EAA in Oshkosh.

AVIATION

Requirements were REVISED with the release of a new merit badge pamphlet during 2006, effective January 1, 2007.

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 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. Arrive at 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. On a map, mark a route for an imaginary airline trip to at least three different locations. Start from the commercial airport nearest your home. From timetables (obtained from agents or online from a computer, with your parent's permission), decide when you will get to and leave from all connecting points. Create an aviation flight plan and itinerary for each destination.
- f. 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.
- g. Create an original poster of an aircraft instrument panel. Include and identify the instruments and radios discussed in requirement 2f.

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, and 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, flight service station, or Flight Standards District Office. (Phone directory listings are under U.S. Government Offices, Transportation Department, and 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.**

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



Merit Badge

Requirements

1) Do the following:

- A) Define "aircraft." Describe some kinds of aircraft in use today. Explain the operation of piston, turboprop, and jet engines.**
- B) Point out on a model plane 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 recreational pilot and the private pilot certificates; the instrument rating.**

2) Do TWO of the following:

- A) Take a flight in an aircraft. Record the date, place, type of aircraft, duration of flight, and 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. Arrive at a compass heading.**
- D) Using one of many flight simulator software packages available for computers, "fly" the course and heading you established in requirement 3e or another course you have plotted.**
- E) On a map, mark a route for an imaginary airline trip to at least three foreign countries. Start from the commercial airport nearest your home. From timetables (obtained from agents or online from a computer), decide when you will get to and leave from all connecting points.**
- 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 TWO of the following:

A) Build and fly a fuel-driven model airplane. Describe safety rules for building and flying model airplanes. Tell safety rules for use of glue, paint, dope, plastics, and fuel.

B) Build a model FPG-9. Get others in your troop or patrol to make their own model, and then organize a competition to test the precision of flight and landing of the models.

Worksheet Created by: Rob Greenland – robgreenland@juno.com

Requirement 1

Define *aircraft*:

Describe some kinds of aircraft in use today:

Type: _____

Description: _____

Type: _____

Description: _____

Type: _____

Description: _____

Type: _____

Description: _____

Explain the operation of piston engines:

Explain the operation of turboprop engines:

Explain the operation of jet engines:

Point out on a model airplane the forces that act upon an airplane in flight. Tell & explain what you pointed out:

Explain how an airfoil generates lift:

Explain how the primary control surfaces (ailerons, elevator, and rudder) affect the aircraft's attitude:

Explain how a propeller produces thrust:

How are the control surfaces of an airplane used for take off?

How are the control surfaces of an airplane used for a straight climb?

How are the control surfaces of an airplane used for a level turn?

How are the control surfaces of an airplane used for a climbing turn?

How are the control surfaces of an airplane used for a descending turn?

How are the control surfaces of an airplane used for a straight descent?

How are the control surfaces of an airplane used for landing?

Explain the recreational pilot certificate:

Explain private pilot certificate:

What is meant by “instrument rating” when talking about the recreational pilot and private pilot certificates?

List and describe some of the job opportunities in aviation:

Job Name: _____

Description: _____

Job Name: _____

Description: _____

Job Name: _____

Description: _____

Which job interests you most?

What are some of the qualifications for this job?

What are some of the working conditions of this job?

What does this particular job offer for reaching your goal in life?

Requirement 2

You have been given seven options for this requirement. Select and complete two of them.

If you selected **Option A**:

Take a flight in an aircraft. Record the date, place, type of aircraft, and duration of flight.

Date: _____ Place: _____ Type of aircraft: _____ Duration: _____

Report on your impressions of the flight:

If you selected **Option B**:

Visit an airport.

Describe how the facilities are used:

Describe how the runways are numbered:

Describe how runways are determined to be “active”:

If you selected *Option C*:

Visit a Federal Aviation Administration facility – a control tower, terminal radar control facility, air route traffic control center, flight service station, or Flight Standards District Office. (Phone directory listings are under U.S. Government Offices, Transportation Department, and Federal Aviation Administration. Call in advance.) Report on the operation and your impressions of the facility:

Altimeter

Purpose:

Function:

Airspeed Indicator

Purpose:

Function:

Turn & Bank Indicator

Purpose:

Function:

Vertical Speed Indicator

Purpose:

Function:

Compass

Purpose:

Function:

Navigation (GPS and VOR) and Communication Radios

Purpose:

Function:

Tachometer

Purpose:

Function:

Oil Pressure Gauge

Purpose:

Function:

Oil Temperature Gauge

Purpose:


Function:

If you selected **Option F**:

Visit an aircraft maintenance shop. Interview a technician and report on his/her ideas about aircraft maintenance:

If you selected *Option G*:

Create an original poster of an aircraft instrument panel. Include and identify the



instruments and radios discussed in requirement 2e. Use the rest of this page to draw a small sketch of your poster or use it to help you come up with ideas for your poster.

Requirement 3

You have been given nine options for this requirement. Select and complete two of them.

If you selected *Option A*:

Interview a professional or military pilot. Report on what you learned:

If you selected *Option B*:

Interview a flight attendant. Report on what you learned:

If you selected *Option C*:

Interview a certified flight instructor. Report on what you learned:

If you selected *Option D*:

Under supervision, perform a preflight inspection of a light plane. Attach your pre-flight inspection sheet or describe your inspection below:

If you selected **Option E**:

Learn how to read an aeronautical chart. What do some of the special symbols indicate on the aeronautical chart?

What kinds of information will you find on the back of an aeronautical chart?

Measure a true course on the aeronautical chart. Describe the course:

Correct your course for magnetic variation, compass deviation and wind drift. Describe the steps you took to make the corrections:

What is the compass heading that you arrived at?

If you selected **Option F**:

Using one of many flight simulator software packages available for computers, “fly” the course and heading you established in requirement 3e or another course you have plotted. Give a summary of your flight:

If you selected **Option G**:

On a map, mark a route for an imaginary airline trip to at least three foreign countries. Start from the commercial airport nearest your home. From timetables (obtained from agents or online from a computer), decide when you will get to and leave from all connecting points.

What is your starting point (nearest commercial airport to your home)?

From timetables, decide from when you will get to and leave from all connecting points. List your times below

Depart From: _____	Time: _____
Arrive At: _____	Time: _____
Depart From: _____	Time: _____
Arrive At: _____	Time: _____
Depart From: _____	Time: _____
Arrive At: _____	Time: _____
Depart From: _____	Time: _____
Arrive At: _____	Time: _____

Safety Rule for U-Control Models:

Safety Rule(s) for Radio-Control Models:

Tell safety rules for use of the following:

Glue:

Paint:

Dope:

Plastics:

Fuel:

If you selected *Option I*:

Assemble a poster (or album) of original photographs taken while accomplishing the requirements.

If you wish, paste some of your photos on this page and show them to your counselor.

Requirement 4

5. 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, flight service station, or Flight Standards District Office. (Phone directory listings are under U.S. Government Offices, Transportation Department, and 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.**

Requirement 5

1. 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

Merit Badge Workbook

This workbook is not required but is designed to help you with this merit badge. No one can add or subtract from the Boy Scout Requirements #33215. Use page backs & add pages as needed. Please send comments to: craig@craiglincoln.com. Requirements effective: January 1, 2007, Workbook updated: August 2006.

Scout's Name: _____ Unit: _____

Counselor's Name: _____ Counselor's Ph #: _____

1. Do the following:

a. Define "aircraft." _____

Describe some kinds and uses of aircraft today.

Kind:

Uses:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

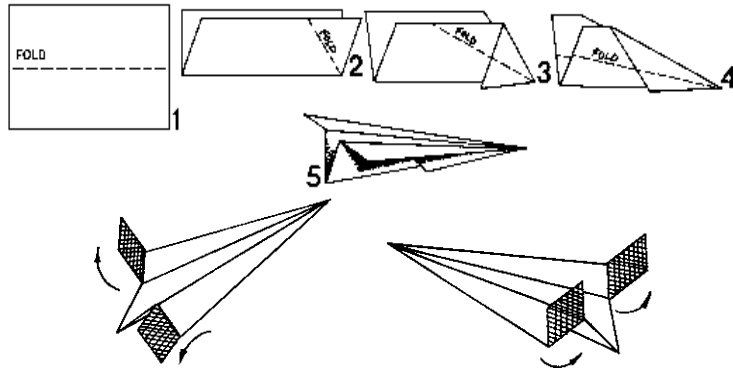
Explain the operation of piston, _____

Turboprop, _____

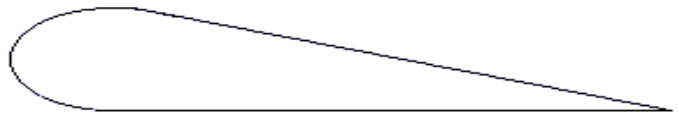
Jet engines. _____

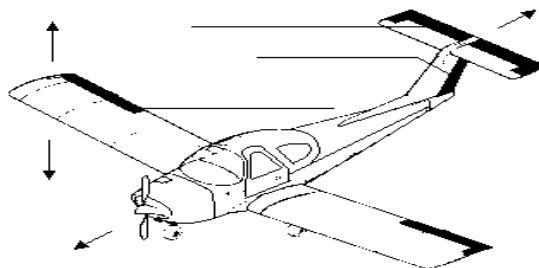
a. Define "aircraft." Describe some kinds of aircraft in use today.
 Explain the operation of piston, turboprop, and jet engines.

b. Point out on a model airplane the forces that act on an airplane in flight. *(Hint: To make a model airplane out of paper...)*



c. Explain how an airfoil generates lift,





How do the primary control surfaces (ailerons, elevators, and rudder) affect the airplane's attitude,

Ailerons: _____

Elevators: _____

Rudder: _____

How does a propeller produce thrust? _____

d. **Demonstrate** how the control surfaces of an airplane are used for

	<i>Ailerons</i>	<i>Elevators</i>	<i>Rudder</i>	<i>Flaps</i>
Takeoff,	_____	_____	_____	_____
Straight climb,	_____	_____	_____	_____
Level turn,	_____	_____	_____	_____
Climbing turn,	_____	_____	_____	_____
Descending turn,	_____	_____	_____	_____
Straight descent,	_____	_____	_____	_____
And landing •	_____	_____	_____	_____

e. Explain the following: 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. _____

Arrive at 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. On a map, mark a route for an imaginary airline trip to at least three different locations.



From timetables (obtained from agents or online from a computer, with your parent's permission), decide when you will get to and leave from all connecting points.

Create an aviation flight plan _____

And itinerary for each destination.

<i>Depart</i>	<i>Flight</i>	<i>Time</i>	<i>Arrive</i>	<i>Time</i>	<i>Depart</i>	<i>Flight</i>	<i>Time</i>	<i>Arrive</i>	<i>Time</i>
1	_____	_____	_____	_____	4	_____	_____	_____	_____
2	_____	_____	_____	_____	5	_____	_____	_____	_____
3	_____	_____	_____	_____	6	_____	_____	_____	_____

f. 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. _____

g. Create an original poster of an aircraft instrument panel. Include and identify the instruments and radios discussed in requirement 2f. _____

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, flight service station, or Flight Standards District Office.

(Phone directory listings are under U.S. Government Offices, Transportation Department, and 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. _____