

Aviation Merit Badge

February 2

2008

The following workbook was designed for Scouts working on the Aviation Merit Badge at the 2008 Tuscarora Merit Badge College in Clinton, NC; thus, it includes only those requirements covered by that program. New requirements for the Aviation MB became effective on January 1, 2007. For current information about this badge, including alternative requirements, check <http://www.meritbadge.org>. The information and images in this workbook were compiled from a variety of sources for educational purposes only; many thanks to those who contributed.

**Tuscarora
Merit Badge
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Contents

Table of Contents.....	i
Requirement 2a: Flight.....	1
Necessary Permission Forms for Flight:.....	1
Flight Log	1
Requirement 2b: Preflight	2
Preflight Inspection – Cessna 172 Checklist	2
Requirement 2f: Instrumentation.....	4
Requirement 3b: Model FPG-9	7
Requirement 4a: Airport Visit	10
Requirement 5: Aviation Careers	11



2a: Flight

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.

Necessary Permission Forms for Flight:

- BSA Consent Form
- Council Release Form
- Young Eagles Flight Release

These forms can be downloaded from: www4.ncsu.edu/~bkheld

Flight Log

Date	Airport	Duration of Flight	Comments:
e.g. 06/13/2007	KRDU – Raleigh Durham International	1.4 (hours)	<ul style="list-style-type: none">• Practiced maneuvers: Figure Eights, Chandelles, Power-on Stalls• Clear skies; winds @ 3000' were from 015°, 15-20nm/hr



2b: Preflight

Under supervision, perform a preflight inspection of a light airplane.

Preflight Inspection Checklist – Cessna 172

CABIN

- Certificates/DocumentsIN AIRCRAFT
- Parking BrakeSET
- Control WheelREMOVE
- Ignition SwitchOFF
- Master SwitchON
- Fuel Quantity IndicatorsCHECK QUANTITY
- FlapsDOWN FOR INSPECTION
- **For Night Operation: LightsCHECK
- Master SwitchOFF
- Fuel SelectorBOTH
- Baggage DoorCHECK

LEFT WING

- Main Wheel TireCHECK (Inflation/Condition)
- Fuel Tank Sump Quick-Drain ValveDRAIN
- Flap TracksCHECK
- AileronCHECK FREEDOM & SECURE
- Nav. LightUNBROKEN
- Pitot Tube/CoverCHECK / REMOVE
- Fuel Tank Vent OpeningCHECK
- Stall Warning Opening.....CHECK
- Wing Tie-downREMOVE
- Fuel QuantityCHECK VISUALLY
- Fuel Filler CapSECURE

FUSELAGE

- Static Source OpeningCHECK
- WindshieldCHECK CLEAN
- Wheel ChocksREMOVE
- Nose Wheel Strut & TireCHECK
- Air FilterCHECK
- Landing LightCHECK
- Propeller & SpinnerCHECK
- Engine Oil Dipstick(6-8 qt.) CHECK
- Fuel Strainer Drain KnobPULL OUT (4 sec.)

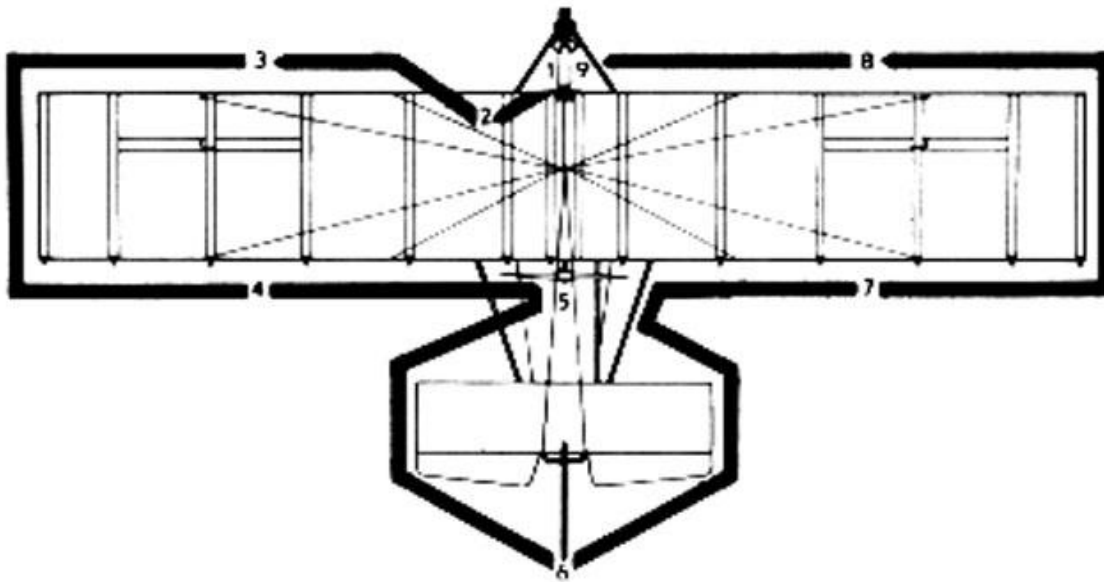


RIGHT WING


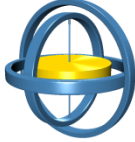



- Fuel QuantityCHECK VISUALLY
- Fuel Filler CapSECURE
- Wing Tie-downREMOVE
- Nav. LightUNBROKEN
- AileronCHECK FREEDOM & SECURE
- Flap TracksCHECK
- Main Wheel TireCHECK
- Fuel Tank Sump Quick-Drain ValveDRAIN

EMPENNAGE

- Tail Tie-DownREMOVE
- Elevator & RudderCHECK FREEDOM & SECURE
- Nav. LightsUNBROKEN



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.

	Instrument	Purpose	Function
A.	Attitude Indicator 	<p>The AI, a.k.a Artificial Horizon, is used to inform the pilot of an aircraft's orientation relative to the earth. Indicates pitch and roll. Often considered the most important instrument for flight in instrument meteorological conditions.</p>	<p>These instruments work off of an inertial platform established by a rapidly spinning gyroscope.</p> 
B.	Heading Indicator 		
C.	Altimeter 		
D.	Airspeed Indicator 		



E.

Turn & Bank Coordinator



F.

Vertical Speed Indicator



G.

Compass



H.

Navigation



(GPS ↓ and VOR ↑)



I.

Communication Radios





J.

Tachometer



K.

Oil Pressure Gauge



L.

Oil Temperature Gauge



Cockpit, Cessna 182



Unfortunately, time constraints dictate that scouts complete requirement 3b rather than 3a; however, there will be several engine-powered models on site along with their builder to explain the art and craft of model building.

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.

*Courtesy of Jack Reynolds, Volunteer, National Model Aviation Museum



FPG-9
Styrofoam® Plate Glider

Objective: This simple design requires only a foam plate, a little ambition, and even less time. The FPG-9 plane is a basic illustration of how flight works.

Description: The FPG-9 is constructed from a 9” foam plate. Just two pieces are traced from a pattern, cut out and assembled.

Materials: The materials and tools necessary are:

- FPG-9 pattern
- 9” foam plate
- Scissors
- Clear tape
- Ink pen
- Penny



How to build the FPG-9:

Note – Since a paper pattern is hard to trace around, you may want to use a foam plate master template to trace around.

1. Cut out the paper FPG-9 pattern. Do not cut along the dotted line on the paper pattern. Only cut along the bolded lines.
2. Place the paper pattern in the center of the foam plate ensuring that the tail of the pattern stays inside of the curved portion of the plate bottom. (*The tail must remain on the plate's flat bottom.*) It's fine if the tab on the front of the pattern is on the curved portion. The ends of the wings should spill over the curved edge of the plate.



3. Trace around the pattern with an ink pen. Don't forget to mark the scissor slits A and B.
4. Cut the foam template out by following the pen lines you just drew.



5. Once you have the master foam template, you may use the template to create FPG-9 planes.



6. Trace around the foam template in the center of the plate and trace around the template making sure to mark all of the lines.
7. When tracing slits A and B, you only need to make one line. These lines will create the elevons and rudder.
8. Cut out the FPG-9 you just traced by following the pen lines.

Important Note – *At this time cut along the dotted line to separate the tail from the wing of the FPG-9. It works better if you make all of your cuts from the outside of the plate towards the center of the plate. Do not try to turn your scissors to cut sharp corners. When cutting out the slots, make them only as wide as the thickness of the foam plate. If the slots are cut too wide the pieces of the plane will not fit together snugly.*

9. The wing and the tail each have slits drawn on them. Make a cut along each of these lines as drawn.
10. To attach the tail to the wing, slide **Slot 1** into **Slot 2**. Use two small (2”) pieces of tape to secure the bottom of the tail to the bottom of the wing. Ensure the tail is perpendicular to the wing before adding the tape.
11. In order to make the plane fly successfully, attach a penny on top of the wing right behind the square tab. Fold the tab back over the penny and tape it down to secure the coin.
12. Bend the elevons on the wing upward. This will provide for a flatter glide. If the students want the plane to turn they can adjust the rudder on the vertical fin.
13. Your FPG-9 is complete and ready to fly. *Gently* toss the plane directly in front of you. Once it flies reasonably straight ahead and glides well, try throwing it hard with the nose of the glider pointed 30° above the horizon. The FPG-9 should perform a big loop and have enough speed for a glide of 20 – 25 feet after the loop.



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."

Airport Name	Identifier	Runways	Facilities
		How are these determined?	How these used?

Communications Frequencies

		Purpose
CTAF:	___ • ___ mHz	-----
Unicom:	___ • ___ mHz	-----
AWOS/ATIS:	___ • ___ mHz	-----

How is "active" status determined?



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

Career Opportunities in Aviation

- 1.
- 2.
- 3.

Elaborate on one of the careers listed above: _____

a. Educational Requirements -

b. Training Requirements -

c. Experience Needed -

NOTE: for more information on careers in aviation, check out the Young Eagles career database at <http://www.youngeagles.org/careers/>.

