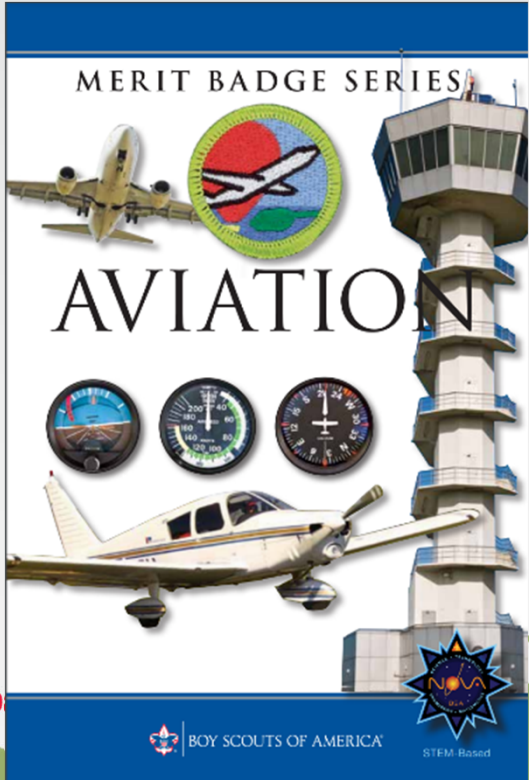




Aviation Merit Badge: PART ONE

Marc Cutright, CSR Troop 1028/9, Feb/March 2024





Aviation Merit Badge

February- March 2024



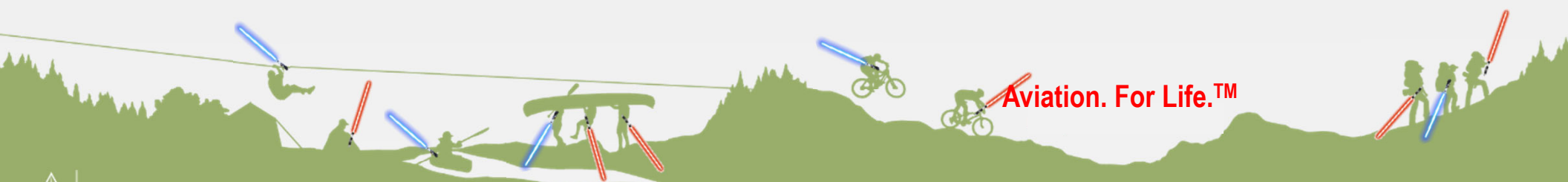
Feb 26: Part 1 – Overview of Requirements

- Requirement 1
- Requirement 5 Introduction (Homework!)

March 4: Part 2 –

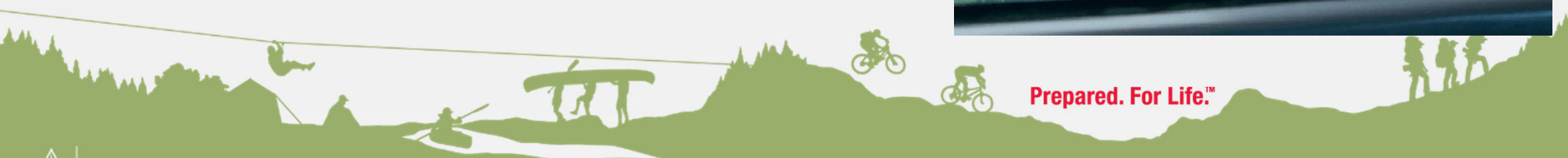
- Requirement 3b - Model airplane building and racing

Airport Visit – Saturday March 16 (More details to come, Requirements 2 and 4)



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Aviation MB Requirements – 1/4



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



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Requirement 1a



Define “aircraft.” Describe some kinds and uses of aircraft today. Explain the operation of piston, turboprop, and jet engines.



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Requirement 1a



Aircraft - a vehicle designed to fly through the air.

What are some kinds?



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Requirement 1a



Aircrafts Uses – Transportation of passengers and cargo, military purposes, recreation, search and rescue, surveying, crop-dusting, sport flying, etc.

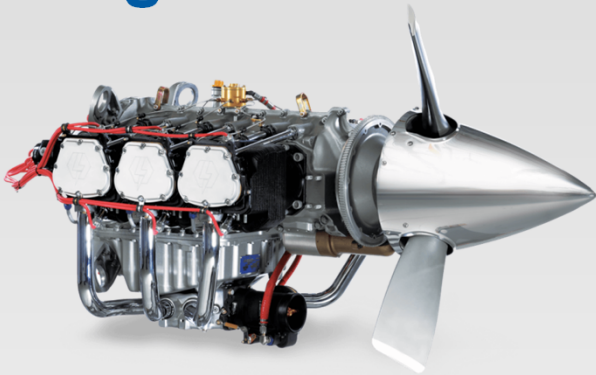




Requirement 1a



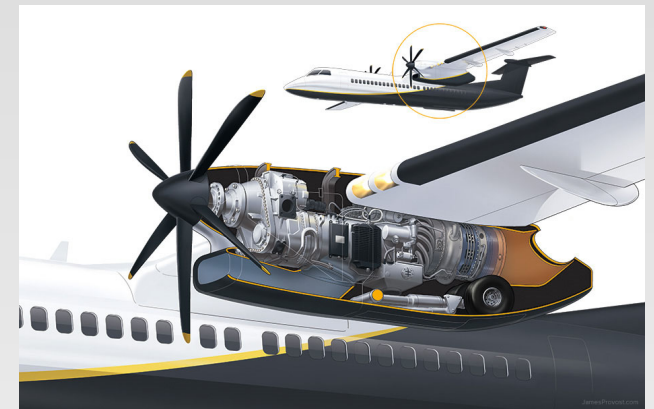
Explain the operation of piston, turboprop, and jet engines.



Piston: Convert fuel to mechanical energy through controlled explosions. Fuel and air intake, compression, power, exhaust.



Jet: Air is drawn in, compressed, mixed with fuel, ignited, expelled at high velocity to produce thrust



Turboprop:
Combination of the two. Gas turbine core drives the propeller

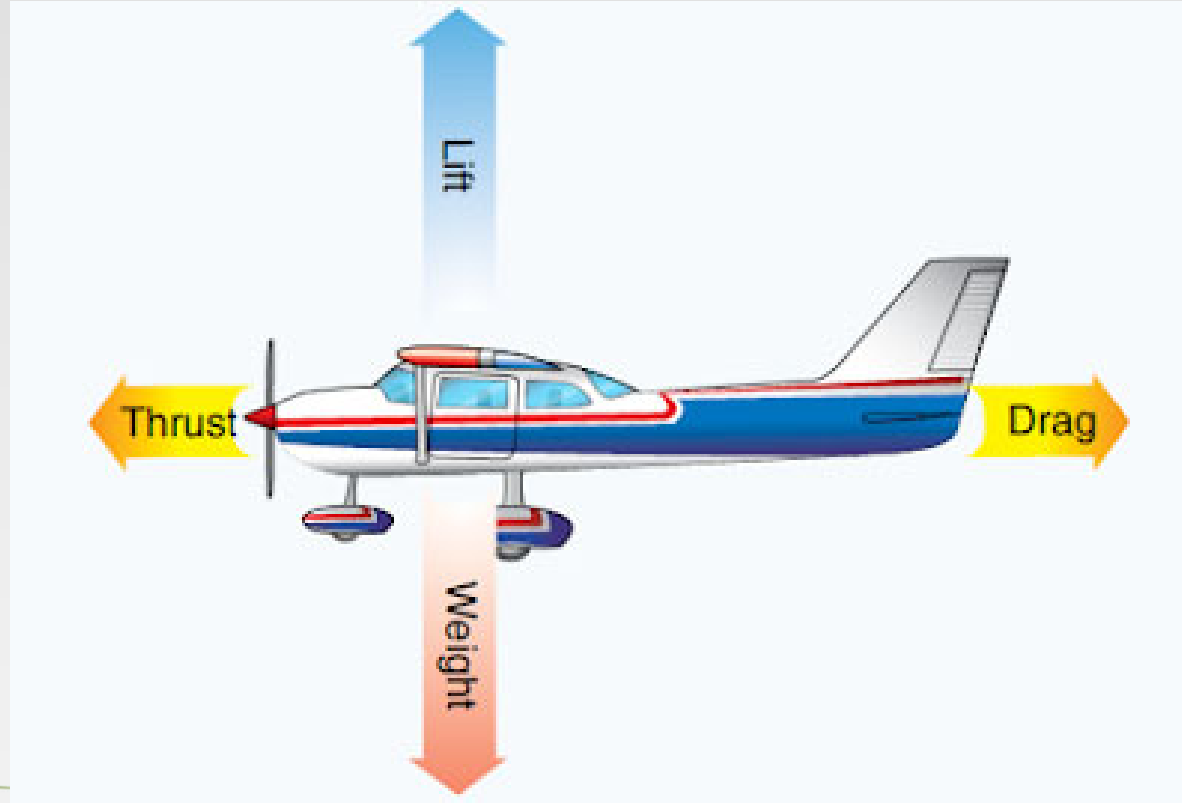




Requirement 1b



Point out on a model airplane the forces that act on an airplane in flight.



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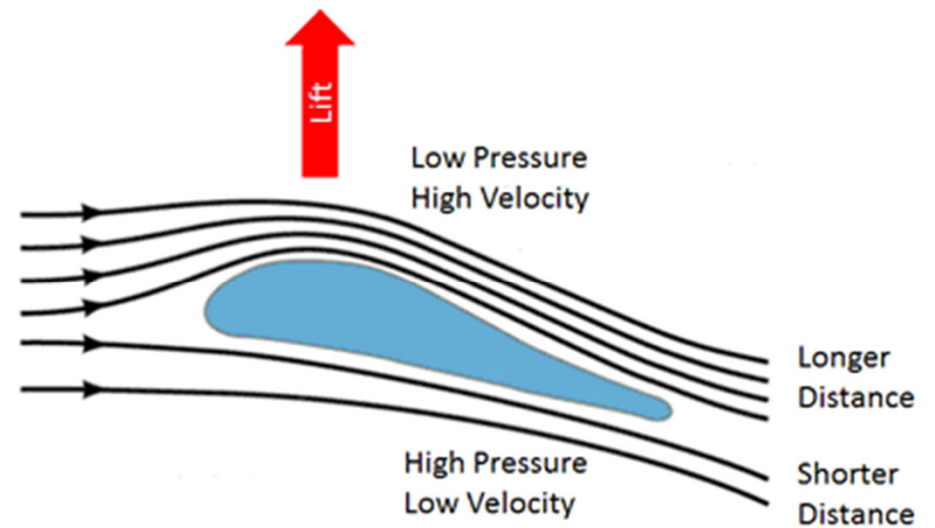
Requirement 1c



Explain how an airfoil generates lift.



Aerodynamic Lift – Explained by Bernoulli's Conservation of Energy Law



Also known as the "Longer Path" or "Equal Transit" Theory

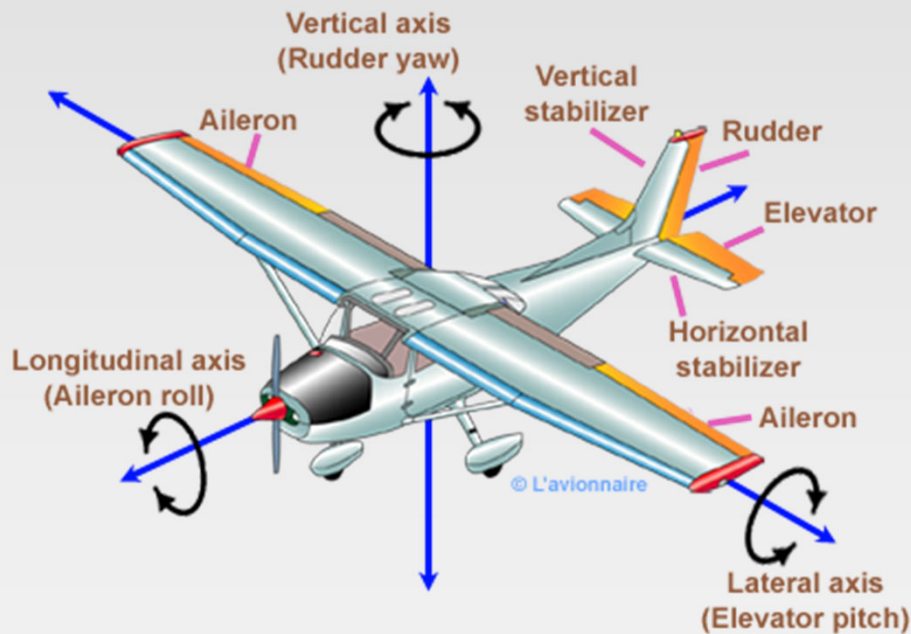




Requirement 1c



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





Requirement 1c



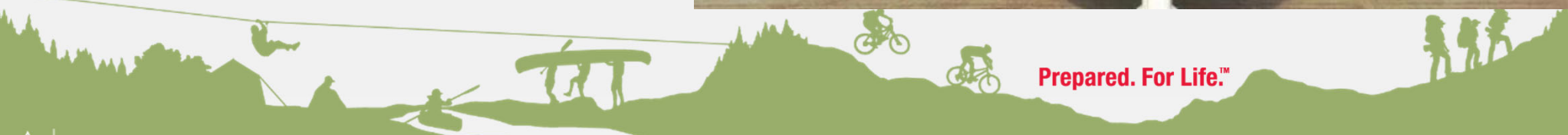
How a propeller produces thrust.

Newton's Third Law?

Every reaction has an equal and opposite reaction.

The propeller produces thrust by rotating and accelerating air backwards. By pushing air backwards, it has an equal force moving the plane forwards.

How do shape, angle, and number of blades influence thrust?



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Requirement 1d



Demonstrate how the control surfaces of an airplane are used for takeoff, straight climb, level turn, climbing turn, descending turn, straight descent, and landing.



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Requirement 1e



Explain the following: the sport pilot, the recreational pilot, and the private pilot certificates; the instrument rating.

Sport: Entry-level, small and simple aircraft, only fly during the day, no ATC, requires fewer training hours and medical requirements

Recreational: Entry-level, between sport and private, stay within 50 miles of home airport, one passenger, day hours and good weather conditions

Private: Most commonly sought-after, may fly passengers but not for hire, more diverse weather and airspace, cross-country, night flying, emergency procedures training

Instrument: Earned after private, fly under only reference to the instruments in the cockpit (no outside!), wide range of weather, very complex training





For Fun! Phonetic Alphabet



A = Alpha	H = Hotel	O = Oscar	V = Victor
B = Bravo	I = India	P = Papa	W = Whiskey
C = Charlie	J = Juliet	Q = Quebec	X = X-Ray
D = Delta	K = Kilo	R = Romeo	Y = Yankee
E = Echo	L = Lima	S = Sierra	Z = Zulu
F = Foxtrot	M = Mike	T = Tango	
G = Golf	N = November	U = Uniform	

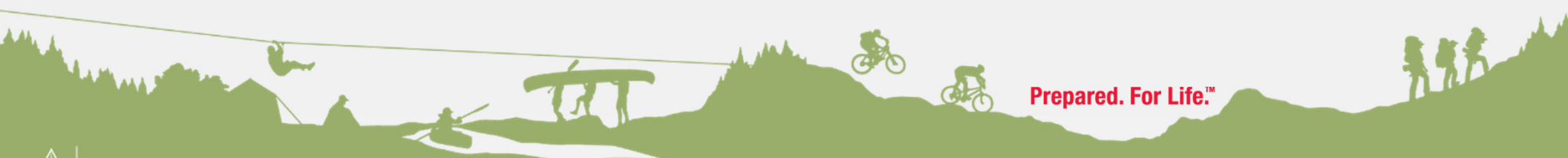
N172ME

N7575G

NSCOUT

NT10289

NAPK18



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Aviation MB Requirements – 2/4



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.

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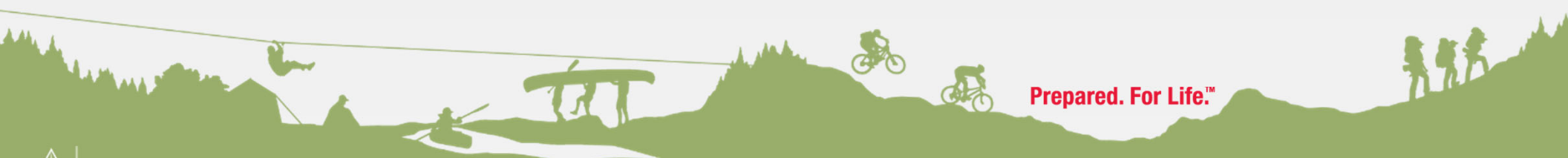
Aviation MB Requirements – 3/4



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.



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Aviation MB Requirements – 4/4



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. 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

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