

ACS Cheat Sheet: Task I, G. Operations of Systems

Ground Lesson 1

- a. **Primary flight controls** – Ailerons, Elevator, Rudder
- b. **Secondary flight controls** – Flaps, Trim tabs
- c. **Powerplant and propeller** – Most trainers are powered by a 4 cylinder, air-cooled, horizontally opposed 4-stroke piston engine with a fixed pitch propeller
- d. **Landing gear** – Most trainers have fixed, non-retractable landing gear
- e. **Fuel, oil, and hydraulic fluid**
 - 1. Fuel – Most airplanes take 100LL AVGAS (Blue)
 - 2. Oil – Oil is dark brown/black and serves to lubricate moving parts and remove heat
 - 3. Hydraulic Fluid – Hydraulic Fluid is usually red and is used for brakes (check around wheels on pre-flight) and retractable landing gear
- f. **Electrical** – Most trainers use either 14- or 28-volt DC electrical systems with 60-amp alternators and a 12- or 24-volt battery. The alternator voltage is higher than the battery voltage to keep it charged.
- g. **Avionics** – Avionics vary greatly between aircraft, know the nuances of yours.
- h. **Pitot-static, vacuum/pressure, and associated flight instruments**
 - 1. **Pitot-Static System** – Uses a combination of the pitot tube and the static port to supply information to the:
 - i. Airspeed indicator = pitot ram speed minus static pressure
 - ii. Altimeter = static pressure
 - iii. Vertical speed indicator = internal wafer pressure minus static pressure with a calibrated leak
 - 2. **Vacuum System** – Vacuum driven by the engine that creates a suction to spin the gyros and power the following instruments:
 - i. Attitude Indicator – Makes use of the gyroscopic principle, RIGIDITY IN SPACE
 - ii. Heading indicator – Makes use of the gyroscopic principle, RIGIDITY IN SPACE
 - iii. Turn Coordinator – Makes use of the gyroscopic principle, PRECESSION
 - I. Many turn coordinators are actually driven by an electric, not vacuum gyro, check your POH
- i. **Environmental** – This includes items like onboard RADAR, uncommon in trainers
- j. Deicing and anti-icing – Common anti-icing systems include Pitot Heat or Carb Heat; anti-icing systems like boots are rare on trainers
- k. **Water rudders (ASES, AMES)** – This website/guide is geared towards Private Pilot ASEL
- l. **Oxygen system** – This includes things like cabin pressurization and oxygen masks, uncommon in trainers
- m. **Indications of and procedures for managing system abnormalities or failures** – Know your airplane and what failures look like (whether that's annunciator lights on the panel or large red X's in AHRS-equipped aircraft)

The Four Left Turning Tendencies

1. **Torque** – The propeller is spinning clockwise from the pilot's perspective and there is an equal and opposite reaction for the plane to spin the opposite direction, to the left.
2. **Spiraling Slipstream** – The propeller spinning clockwise creates a flow of air that spirals over the airframe and eventually strikes the vertical stabilizer on the left side.
3. **Gyroscopic Precession** – When the propeller's plane of rotation is disturbed, a force is felt 90° ahead of the force, lifting the tail creates a left turning tendency.
4. **P-Factor** – At high angles of attack, the load of the downward propeller (on the right side) is greater due to that blade taking a larger "bite" out of the air, this makes the aircraft want to turn left.