

Private

Ground Lesson (GL) 2

Chapter 2 – Airplane Systems

GL 2 Objectives

- Applicable FARs for private pilot privileges, limitations and flight operations
 - Identify the inspections and logbook documentation that are required for Airworthiness
 - Identify the equipment required for flight under 91.205 and the procedures to fly with inoperative equipment (91.213)
- Principles of Aircraft Engines and Aircraft Systems
 - ID airplane components
 - Explain how aircraft engines and related systems operate
 - Describe Flight Instrument functions and operating characteristics, including errors and malfunctions

Inspections, Logbook Documentation and Airworthiness

- For an aircraft to be airworthy.....simplified
 - Owner/Operator must maintain the aircraft
 - PIC must inspect the aircraft and find it to be safe to operate..... and have the required documents onboard
- ARROW – Required Documents onboard
 - A – Airworthiness Certificate
 - R – Registration
 - R – Radio Station License
 - O – Operating Limitations (POH, ADs, Placards)
 - W – Weight and Balance

Inspections, Logbook Documentation and Airworthiness – AAVIATE – Required Inspections and duration

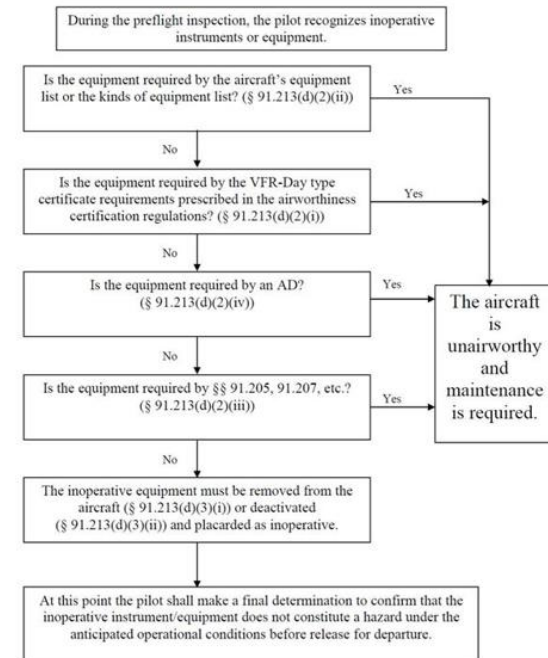
- A – Airworthiness Directives (As directed)
- A – Annual (12 calendar months)
- V – VOR – Every 30 days if using VOR for Instrument Flight
- 1 – 100 Hour (Tachometer) if for hire
- A – Altimeter (Static) – Instrument Flight in controlled airspace (24 Calendar months)
- T – Transponder – (24 Calendar Months)
- E – ELT Inspection (12 Calendar Months) and Battery (replaced/recharged 1 hour continuous use or ½ battery life/useful life of charge)

Equipment required for Day VFR Flight (91.205) – A TOMATO FLAMES

- A – Airspeed Indicator
- T – Tachometer
- O – Oil Pressure Gauge
- M - Manifold Pressure Gauge*
- A – Altimeter
- T – Temperature Gauge*
- O – Oil Temperature Gauge
- F – Fuel Gauge
- L – Landing Gear Pos Indicator*
- A – Anti-Collision Lights
- M – Magnetic Compass
- E – Emg Location Transmitter
- S – Safety Belts

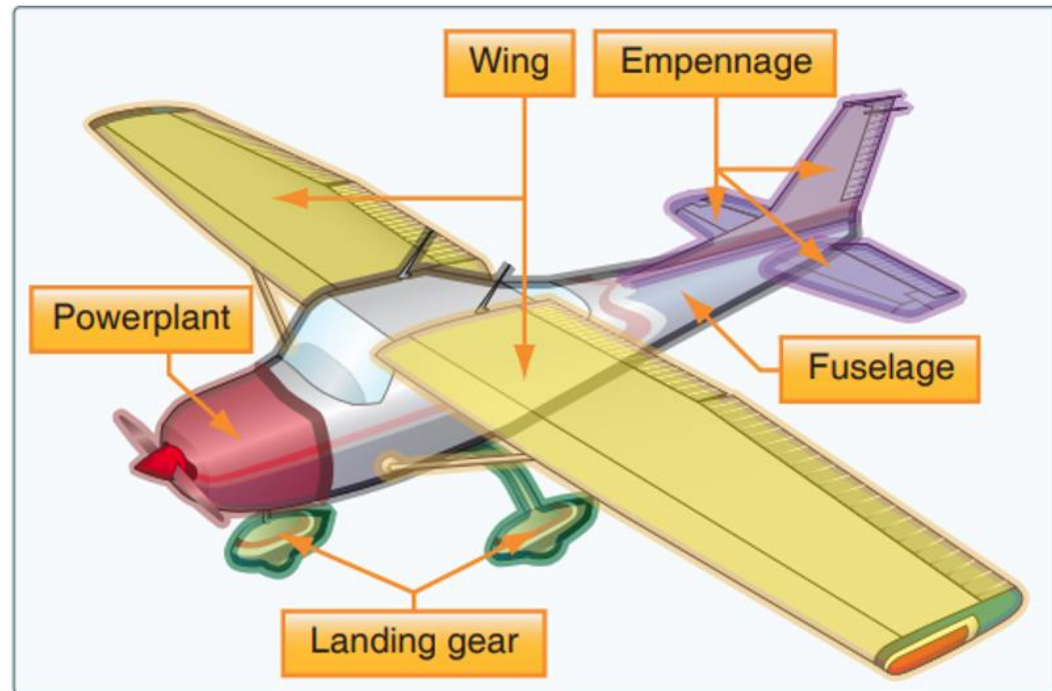
Inoperative Equipment – 91.213

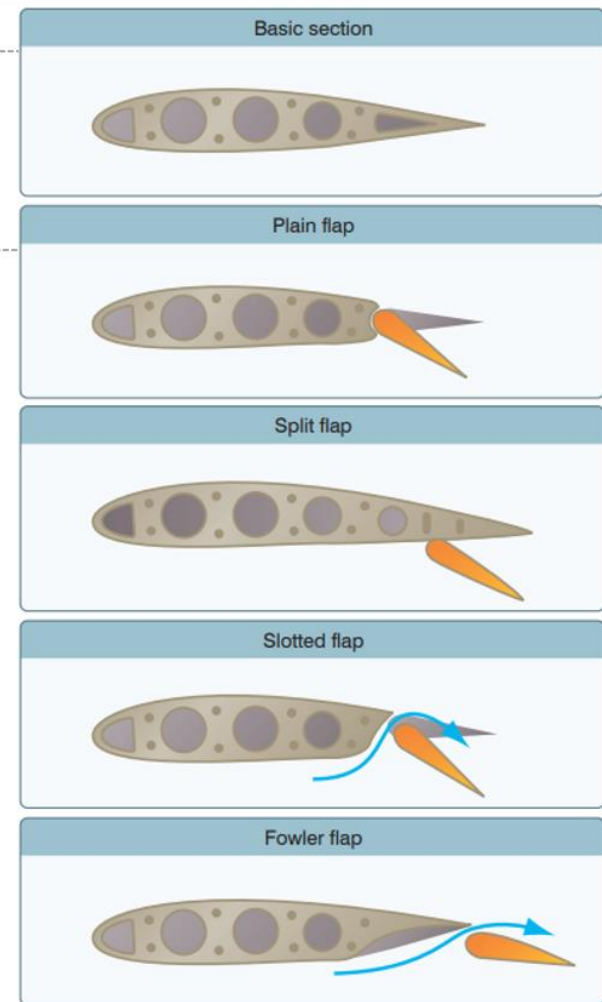
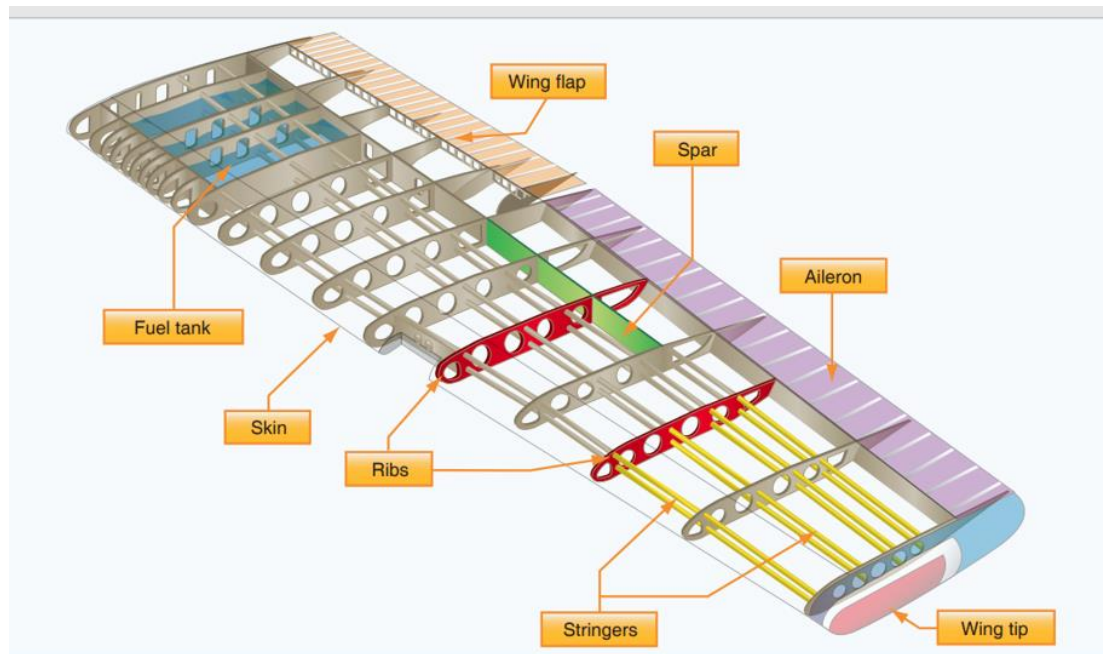
- Inoperative – Doesn't work
- Must deal with it, even if not required



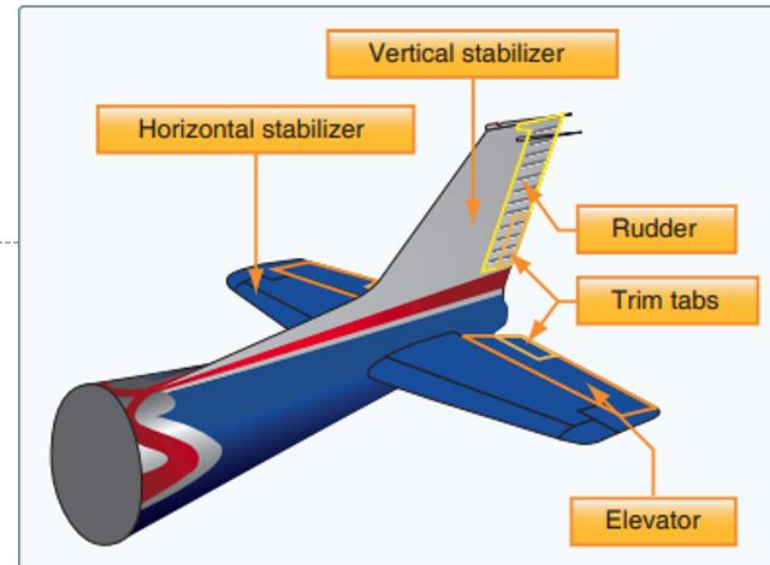
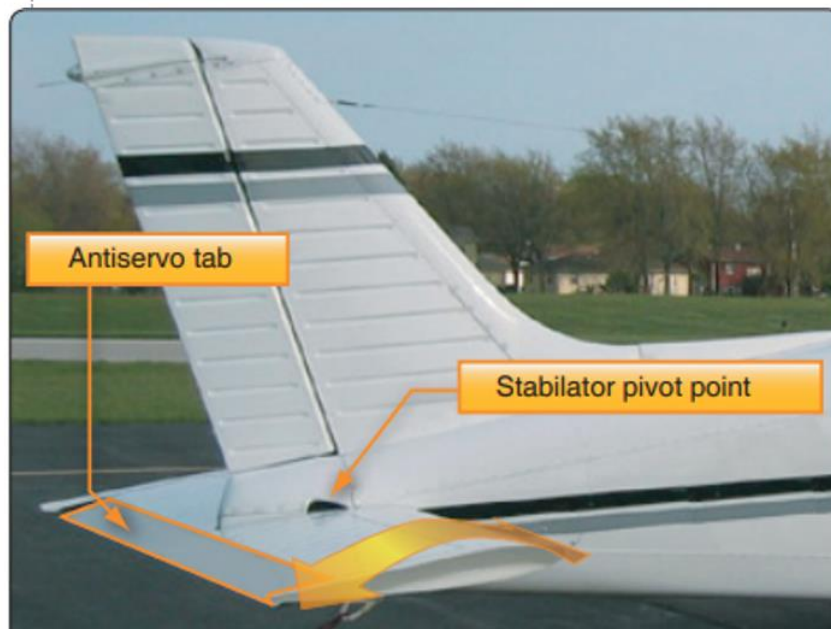
Airplane Major Parts

- Wing
 - Ailerons
 - Flaps
- Fuselage
- Empennage
 - Vertical Stabilizer
 - Horizontal Stabilizer
 - Rudder
- Landing Gear
- Powerplant
- Trim Devices





Empennage Components

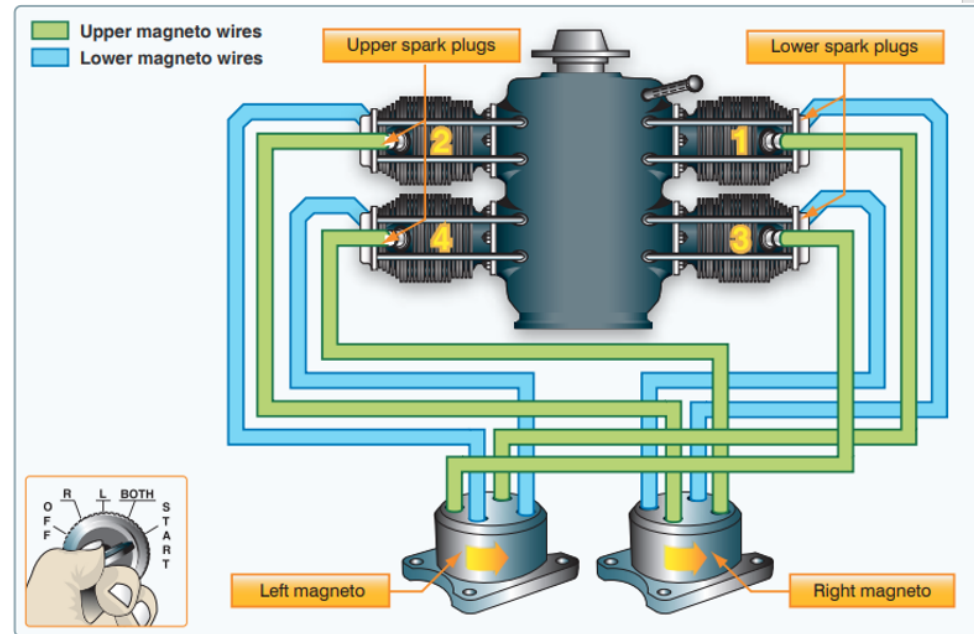


Landing Gear Types

- Floats
 - Skis
 - Wheels
-
- Conventional = Tailwheel
 - Tricycle = with Nose wheel

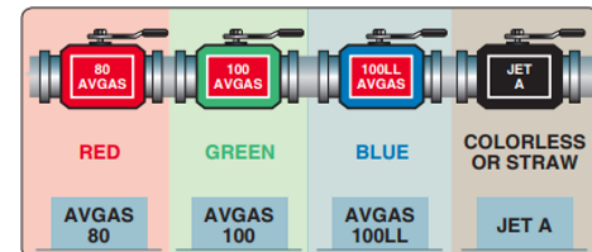
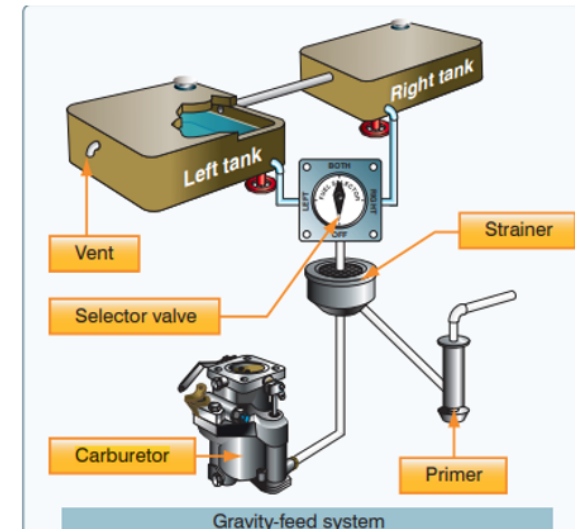
The Ignition System

- Spark Plugs – Two per Cylinder
- Magnetos – Produce electricity (spark) from motion
 - Connected directly to the Engine
 - 2 systems, left and right, each power 1 spark plug per cylinder
 - Connected to Ignition Switch
 - Off
 - Left
 - Right
 - Both



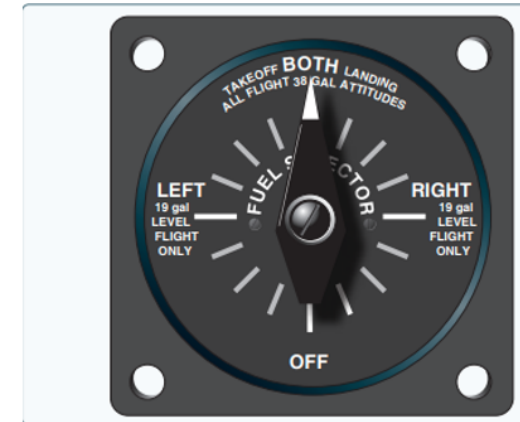
The Fuel System

- C172N – 43 gallons total, 40 gallons useable
- Two fuel tanks, left and right, in the Wings, with associated fuel gauges
- Supplies fuel to the Fuel Selector Valve
 - Left, Right, Both, Off
 - Limitations when using Left or Right to cruise/straight and level flight
- Fuel Selector Valve supplies fuel to Carburetor
- Primer – Small manual fuel pump that pumps fuel directly to the cylinder(s)
 - # of cylinders being primed varies by aircraft installation



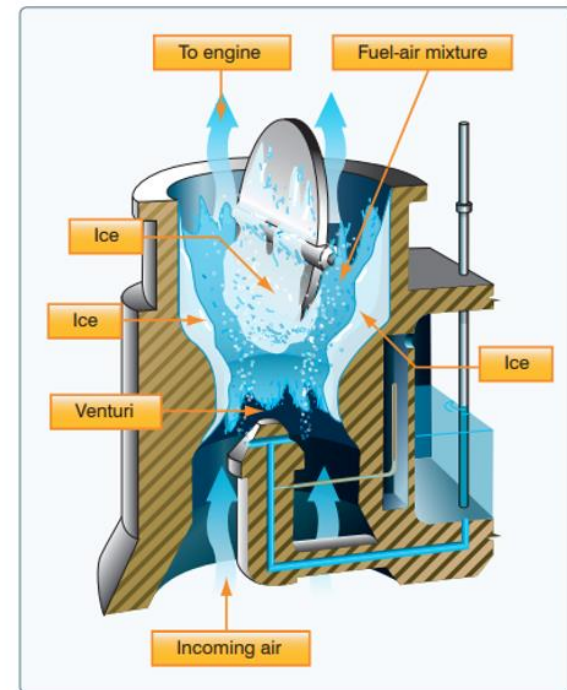
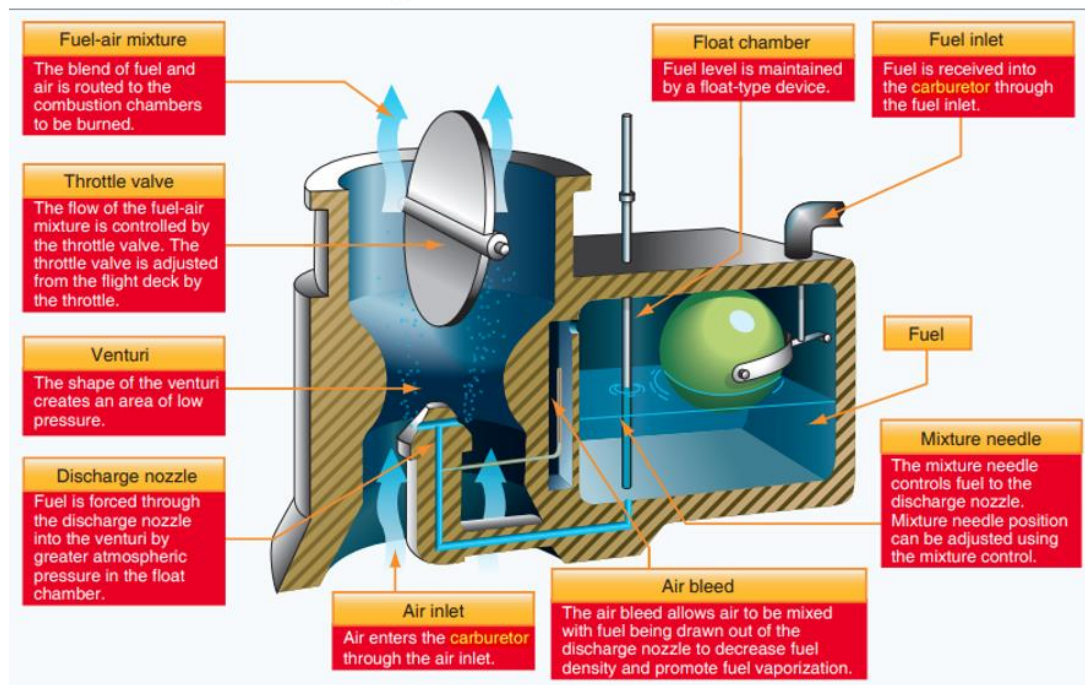
The Fuel System

- 3 Fuel sample locations
 - One on each wing, one strainer with outflow near the nose wheel (just behind)
 - Look for contamination (water, particles, anything not fuel)
- Refueling
 - Generally leave full at end of day
 - Refuel for next flight if less than.....
 - Don't fill completely if Weight and Balance a concern on the next flight
- Color of the fuel and fuel grade
 - Expect to use 100LL and it is light blue



Carburetor

- Mixes air with fuel and delivers to combustion chamber
- Prone to icing in certain conditions



Powerplant and Related Systems 3

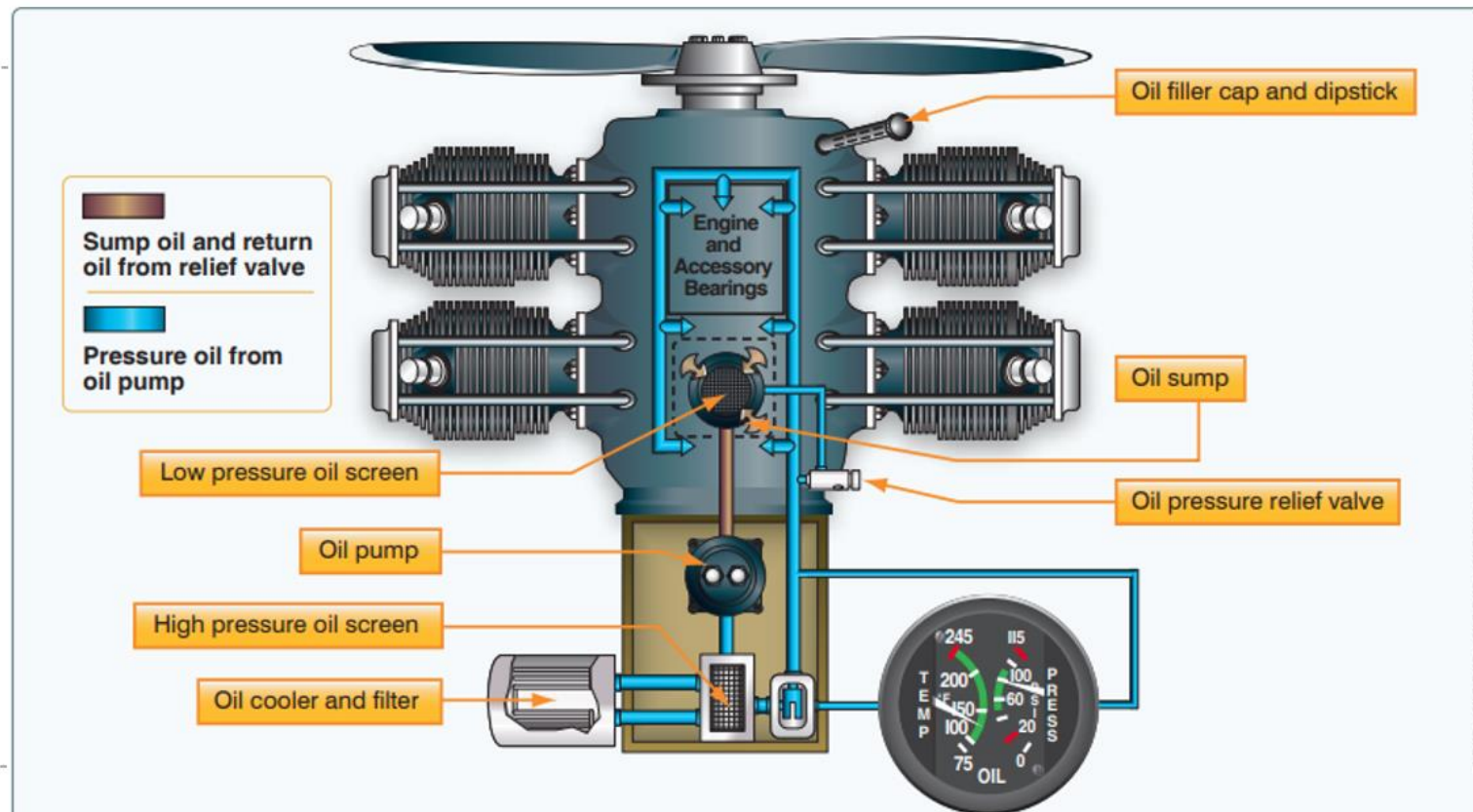
- Reciprocating Engine Operation
- Four Stroke Cycle
 - Intake
 - Compression
 - Power
 - Exhaust
- Tachometer (vs Hobbs Meter)



The Oil System

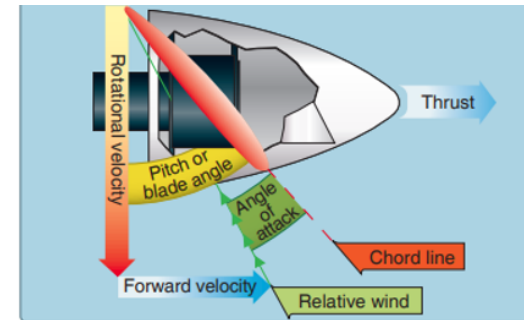
- Provides lubrication and some cooling
- Oil level checked as part of preflight
 - Hard to do accurately when engine has just been run
 - School policy, fill with 1 quart if 2 quarts below maximum
- Most of the 172Ns max is 8 quarts
 - N1294F (a 1980) max is 7 quarts
 - N53351, a C172P (1981 model) max is 7 quarts
- Max oil is the top line on the oil dipstick
- Follow the checklist and check engine oil pressure immediately after starting the engine – If not in the green on the gauge within 30 seconds, POH says to shut down the engine

Oil Systems

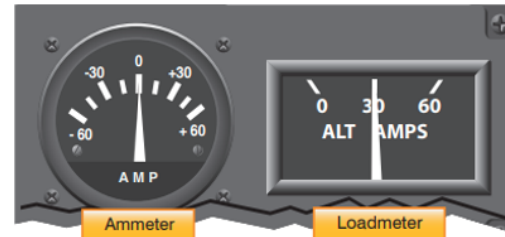


Propeller

- C172N has a fixed pitch prop, connected directly to the engine
- Preflight check for nicks and cracks
- Beware of the prop arc, that area the prop circles in, and stay out of it unless absolutely required
- Engine should not start when turning the prop by hand, however.....
 - Remember those Magnetos.....
 - Turn the prop “backwards”
 - Ignition Switch – Off only works if the grounding wire is connected
 - Be careful when turning on the Master Power Switch. A starter malfunction could cause the prop to turn



Electrical System



- Alternator – Produces electrical energy when turning and turns when the engine is turning. Connected by a belt.
- Battery – Small 24v battery – Don't waste your battery power in preflight
- Ammeter – Monitors Amps, electrical load
 - Negative Amps means you are discharging, using more electricity than alternator is producing
- Voltmeter – Shows the voltage of the system
 - 28 volts with alternator working, 24 volt battery
- Master Switch – Two Switches, Battery and Alternator
- Circuit Breakers – Protects the electrical systems from overload, possible fire
 - Reset once if a critical system

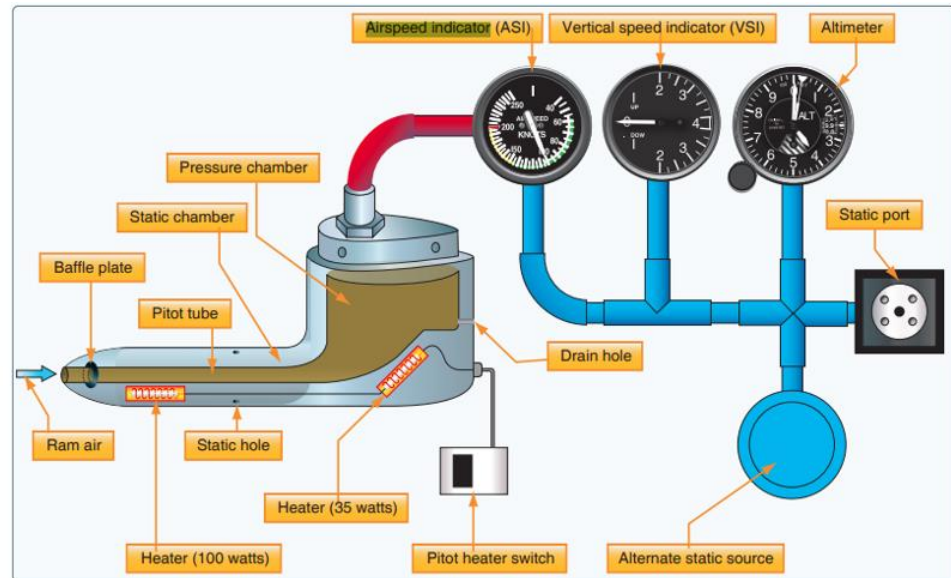


The “Six-Pack” aka The Flight Instruments

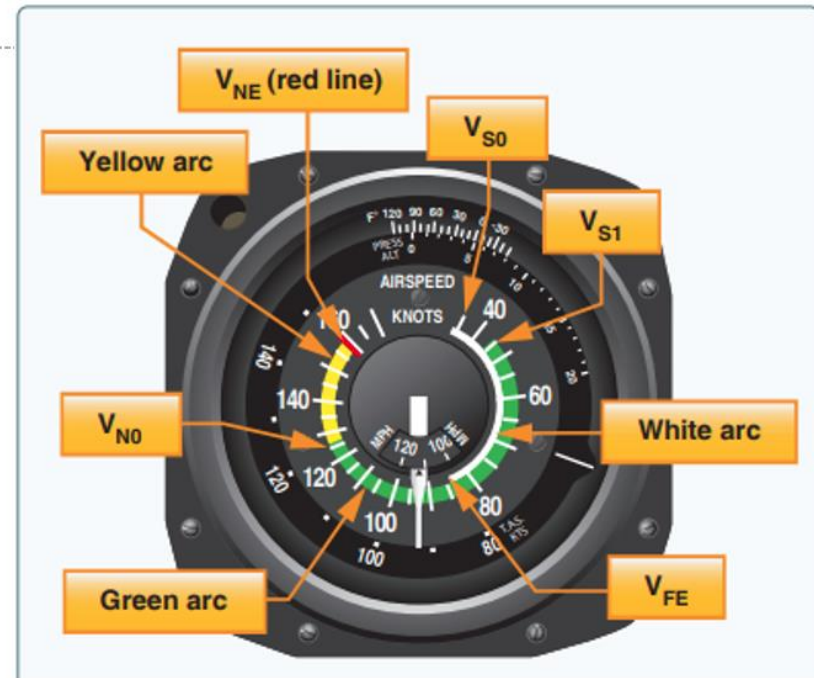
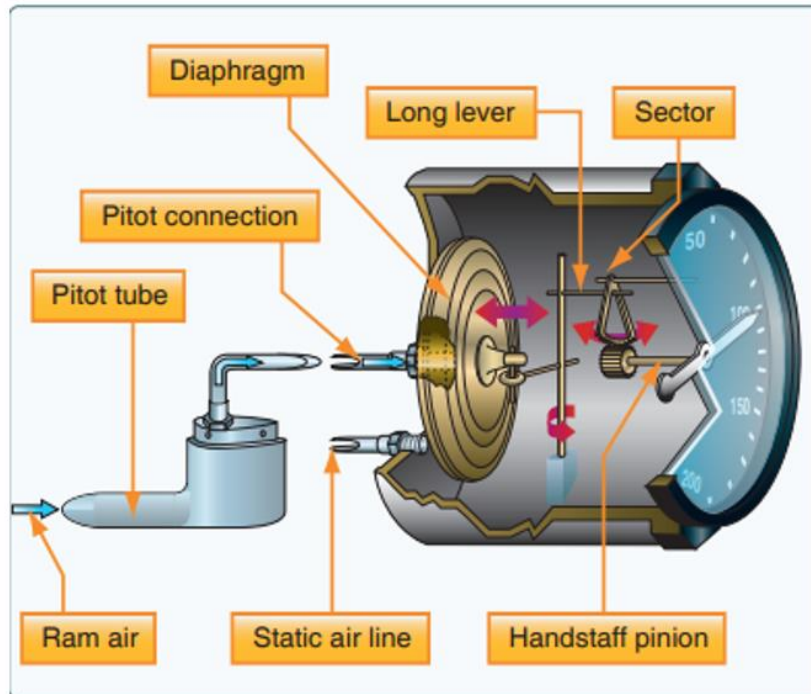


Flight Instruments

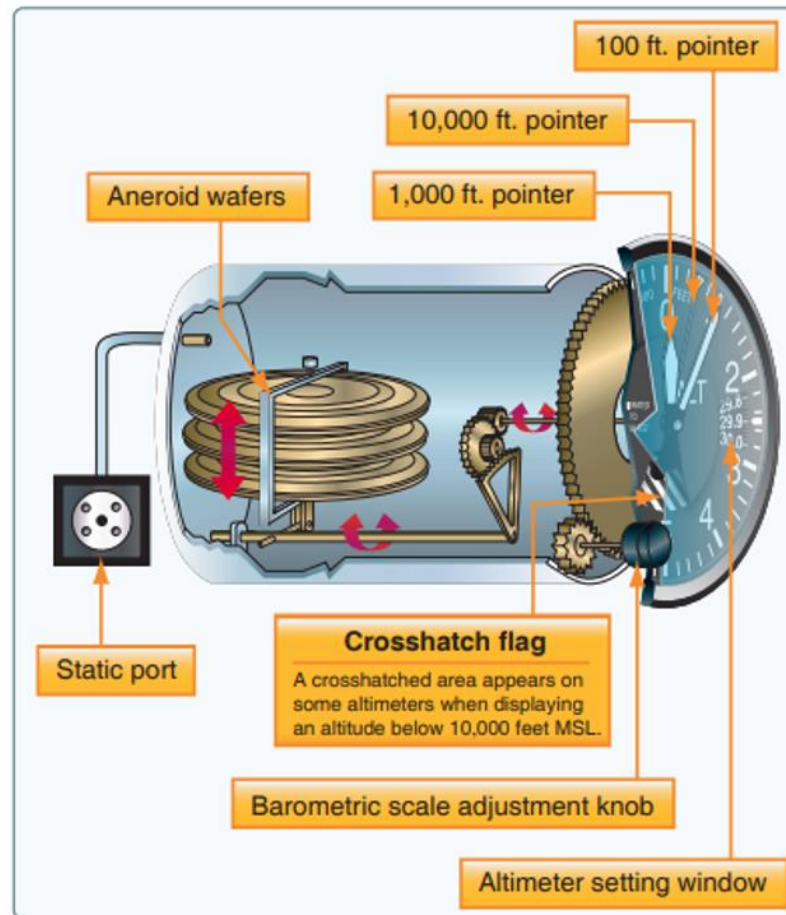
- Pitot-Static
 - Airspeed
 - Altimeter
 - Vertical Velocity Indicator
- Gyroscopic Instruments
 - Attitude Indicator – Vacuum Powered
 - Directional Gyro – Vacuum Powered
 - Turn Coordinator – Electrically Powered
 - Also includes the Slip/Skid Indicator, Ball
- Magnetic Compass



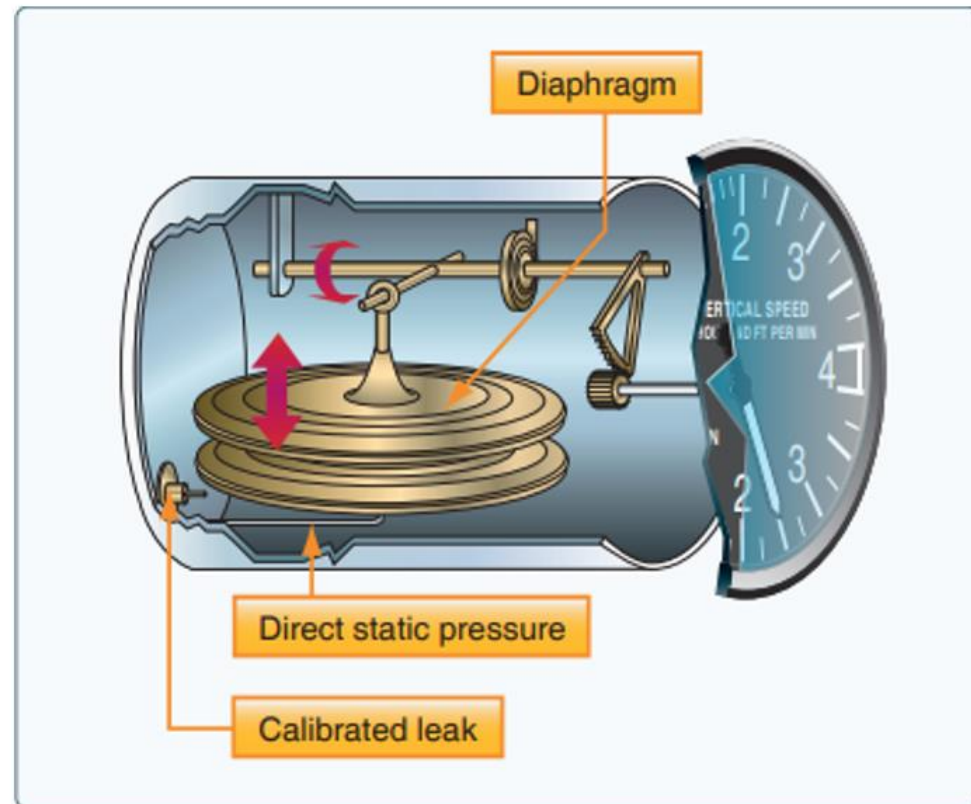
Airspeed Indicator



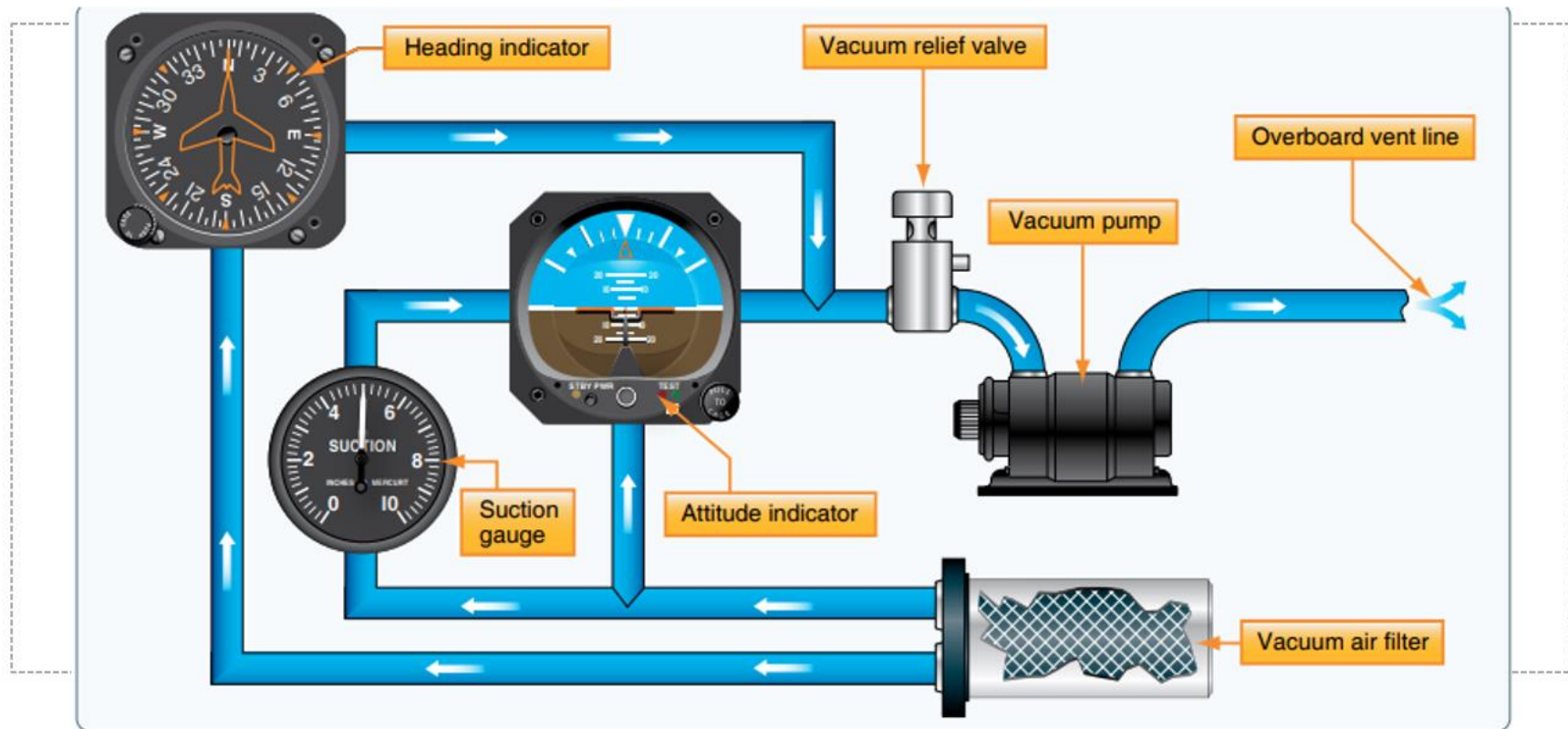
Altimeter



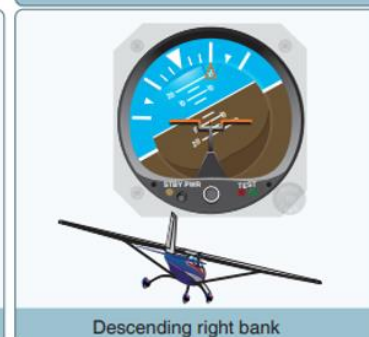
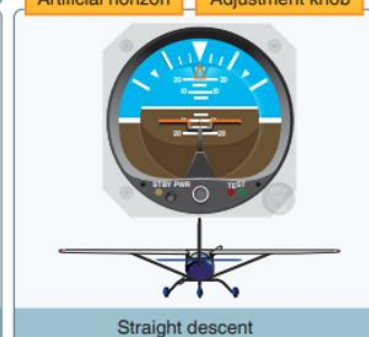
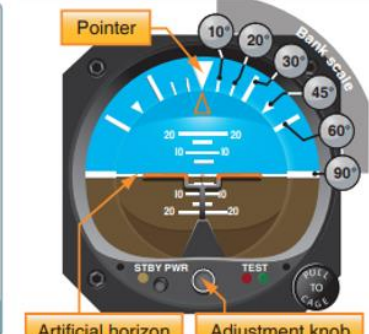
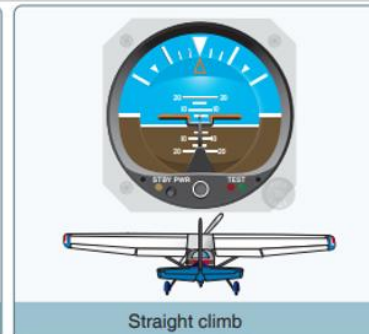
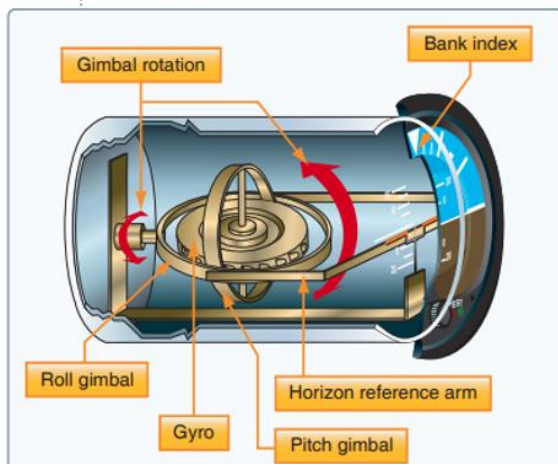
Vertical Speed Indicator



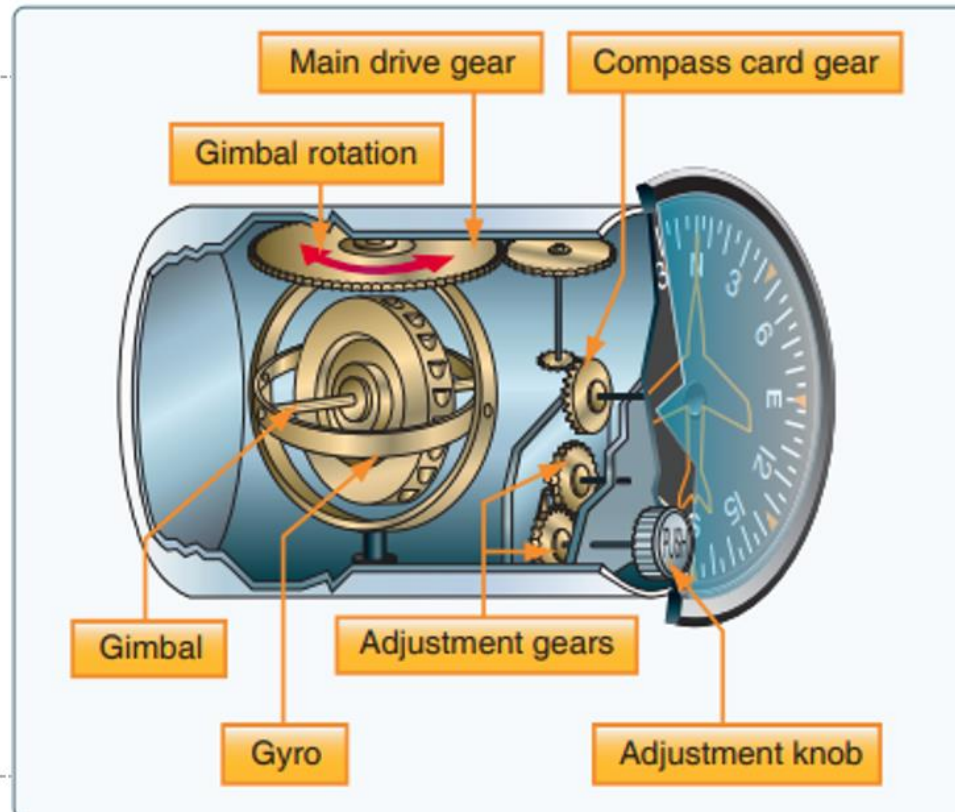
Vacuum System, Attitude Indicator and DG



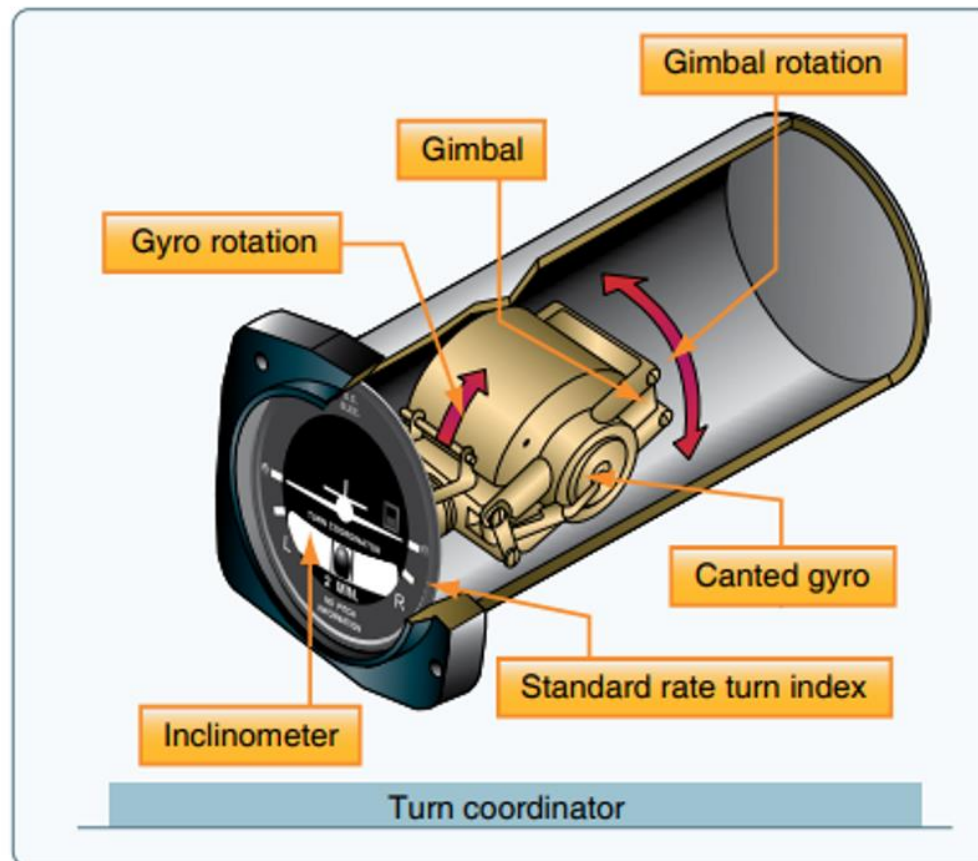
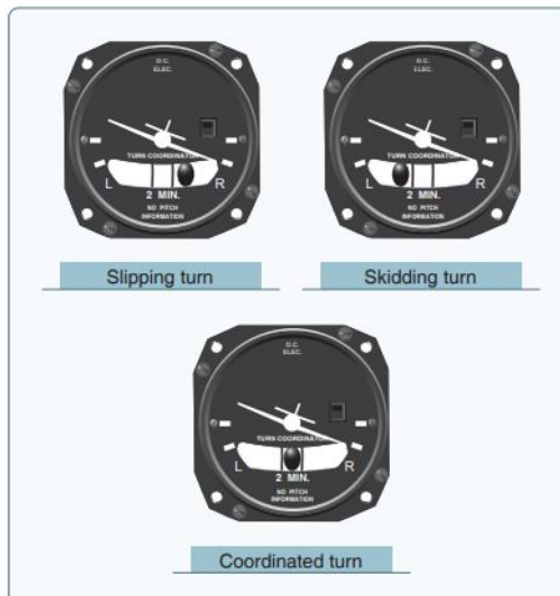
Attitude Indicator



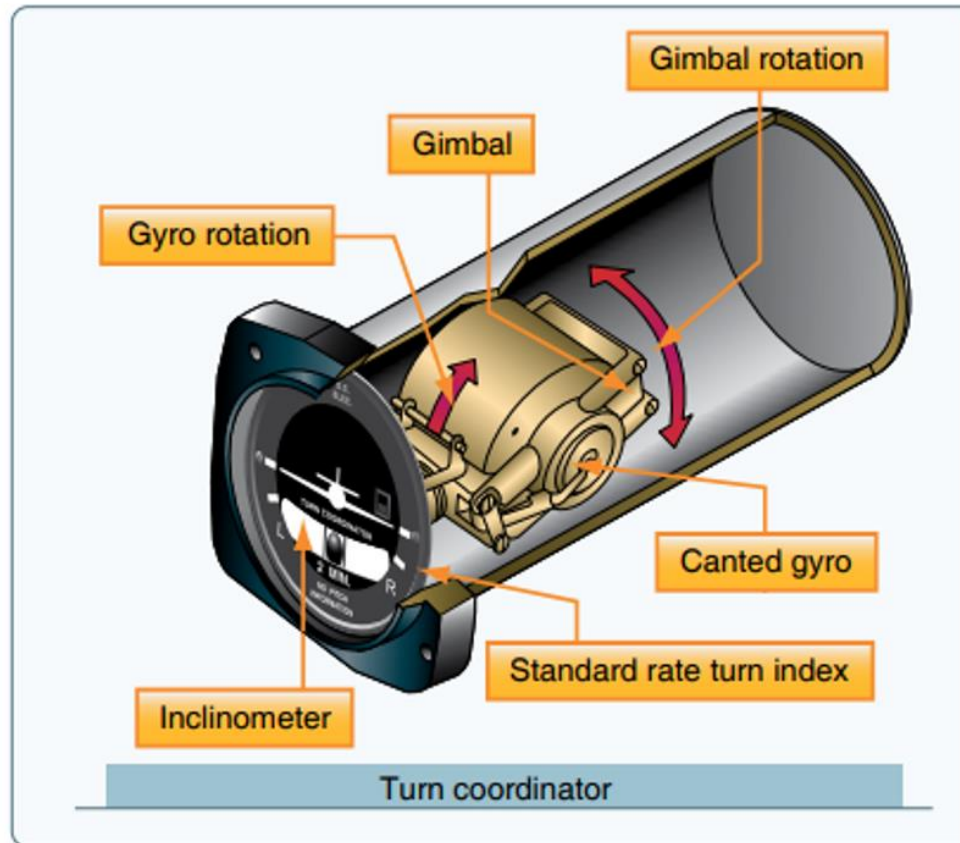
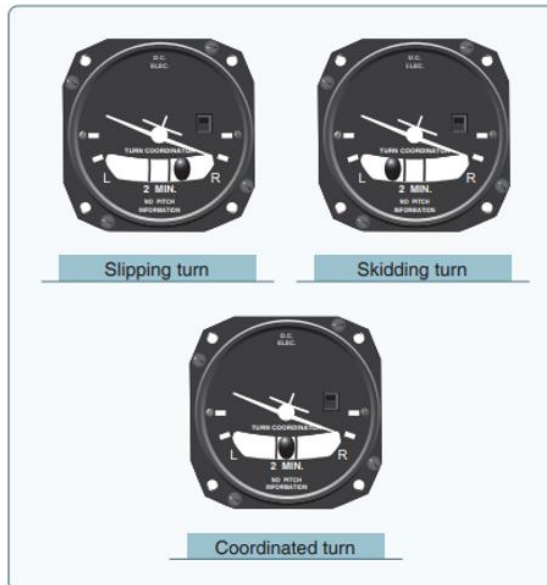
Directional Gyro (DG)



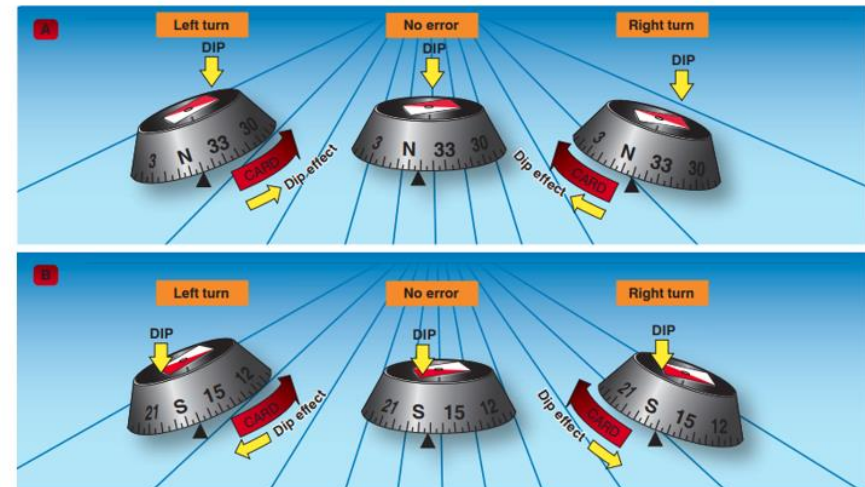
Turn Coordinator



Turn Coordinator



Magnetic Compass



Completion Standards

- Demonstrate understanding of airplane components and systems, the powerplant and related systems, and flight instruments
- Complete the Chapter 2A, B, and C quizzes on Canvas with a minimum score of 80%

Any Questions?

- Next - Ground Lesson 3 – Aerodynamic Principles
- Read Chapter 3, Sections A, B and C