Objectives	▪ The student should develop knowledge of the elements related to the Piper Seminole systems and their operation
Key Elements	▪ Counter rotating engines (unconventional Twin) ▪ 108 gallons of usable fuel ▪ Stabilator / Anti-servo trim tabs ▪ Hartzell adjustable pitch, constant speed, full feathering props
Elements	▪ Primary Flight Controls / Trim ▪ Flaps ▪ Powerplant & Oil ▪ Propellers ▪ Landing Gear & Hydraulic ▪ Fuel ▪ Electrical (6 – Pack, G500, & G1000) ▪ Avionics ▪ Pitot-Static ▪ Gyroscopic & Vacuum ▪ Environmental ▪ Deicing & Anti-Icing
Schedule	▪ Review objective ▪ Present Elements ▪ Conclusion & Review
Equipment	▪ White Board / Markers ▪ References
CFI Actions	▪ Present lesson ▪ Use teaching aids ▪ Ask/ answer questions
Student Actions	▪ Participate in discussion ▪ Take notes ▪ Ask / answer questions
Completion Standards	▪ The student understands the systems found in the Piper Seminole

Additional Notes: ____

____

Introduction

Overview

Review objectives / Elements

What

This lesson develops the students understanding of the PA44-180 Systems including the Primary flight controls, Secondary flight controls, Propellers, Landing Gear, Fuel, Oil, Hydraulic system, electrical, avionics, flight instruments, and environmental systems

Why

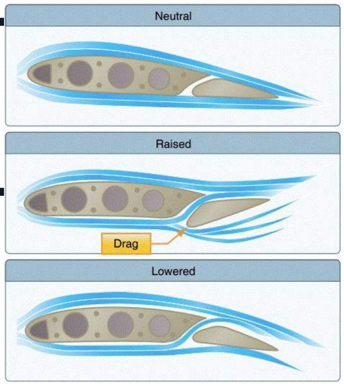
Understanding the inner workings of your aircraft greatly increases proficiency in operating them as well as troubleshooting in the event of a system malfunction

How

Primary Flight Controls / Trim

General

- The piper Seminole uses cables and pulleys to control the 3 main flight controls about the aircraft



Ailerons

- The Seminole uses differential, fries-type ailerons
  - Up 23° (±2°) Down 17° (±2°) (making it differential)
  - The frise is not as pronounced on the Seminole due to the rounded nature of the leading edge however they are still to be considered frise type

Empennage

- Horizontal Stabilator
  - A horizontal stabilator is the control surface that controls the pitch of the Seminole
  - A stabilator is essentially a moving stabilizer
    - Since the entire stabilizer moves, this allows pilots to pitch the aircraft using less force
    - The anti-servo tab on the trailing edge of the horizontal stabilator resists the pilots control inputs preventing overcontrolling
      - This is accomplished by the anti-servo tab deflecting further in the desired direction of the control surface
      - The anti-servo tab also serves as a trim for the horizontal stabilator, this is controlled via the trim wheel in between the pilots' seats

- Rudder
  - The rudder is attached to the trailing edge of the vertical stabilizer and controls the yaw axis of the aircraft
  - There is an anti-servo trim tab attached to the trailing edge of the rudder which is controlled by the trim wheel in between the pilots' seats

Flaps

General

- **The PA-44 uses manually operated single slotted flaps that are spring loaded to return to the up position**
- **There are 4 flaps positions (0, 10, 25, 40) (Vfe for all flaps is 111kts)**
- **The right flaps use an over-center lock that holds it in the up position and allows it to be used as a step**

Operation

- **To extend flaps, pull the handle up to the desired position (it will click into every flap setting)**
- **To retract the flaps, push the button at the end of the flap handle and lower the assembly to the desired setting, then release the button**

Powerplant & Oil

Engines

- The PA-44 uses 2 counter rotating Lycoming engines (Left = O-360-A1H6, Right = LO-360=A1H6)
- LHAND
  - Lycoming
  - Horizontally opposed
  - Air cooled
  - Naturally aspirated
  - Direct drive
- The engines are carbureted, 4-cylinder 180HP engines
- The right engine rotates to the left (counterclockwise) hence the L designation
  - Eliminates the Critical engine – Both engines have the same level of adverse effects on performance and controllability when lost

Engine Controls

- Throttle, Prop, and Mixture
  - Throttle - controls manifold pressure (how much we are constricting airflow)
  - Prop – Sets desired RPM - More in Propeller
  - Mixture – adjusts level of fuel dispensed in carburetor (Air fuel ratio changes)
- There Is a friction knob located on the right side of the throttle quadrant

Air Indication and Carb Heat

- Air is either brough through a air filter or a heated air bypass which functions as carb heat and an alternate air source.
  - Carb heat is operated by a level on the bottom side of the throttle quadrant
- Carb heat should not be used during ground ops with exception of the brief test in the runup

Oil System

- The Seminole uses a wet sump, pressure-type oil system
  - Wet sump oil systems store oil in a oil pan, dry sump is stored in a separate tank
- 8Qt max 2Qt minimum capacity (6qt per ATP policy)

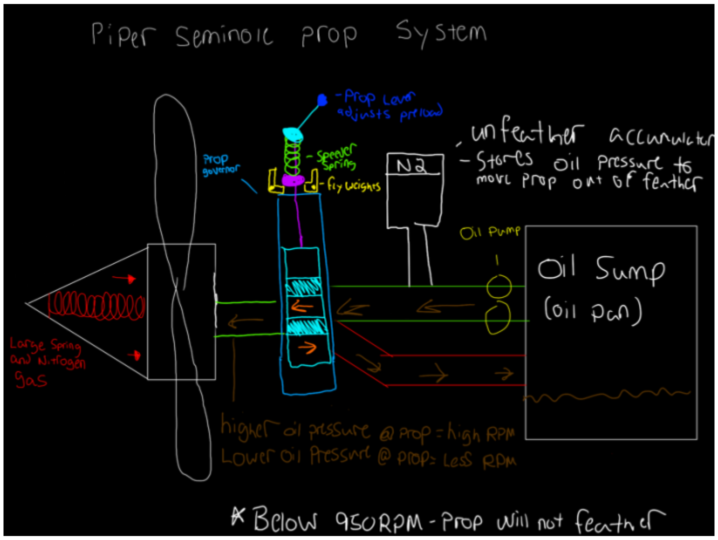
Cowl Flaps

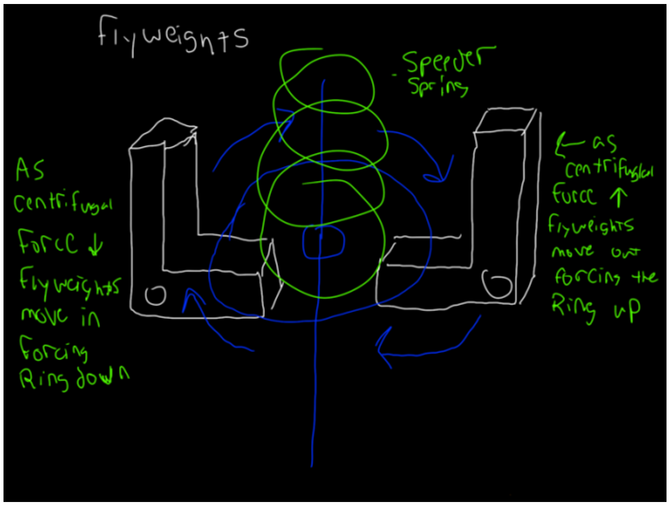
- Cowl flaps are used to regulate the amount of cooling for the engines
- They have three positions open, closed, and intermediate
- Operation
  - Press the button and move the lever into the desired position
  - <40F = Closed, >40F Open

Propellers

General

- The Seminole uses 2 Hartzell 74", two blade, constant speed, controllable pitch, fully featherable propellers





Components

- **Propeller control lever**
  - Controls the tension of the speeder spring (basically sets a target RPM)
  - Forward = High RPM low pitch or fine pitch
  - Aft = Low RPM, high pitch or course pitch
  - Fully aft past detent = Feathers the prop

- **Governor**
  - One per engine
  - Uses oil to change the pitch of the propeller
  - Speeder spring and flyweights controls how much oil is let in or out
- **Accumulators**
  - Store pressurized engine oil to assist with moving the props out of the feather position

Controlling Propeller Pitch

- **Pitch is controlled by the propeller hub**
  - More oil = more RPM
  - Less oil = less RPM
- **Nitrogen, a spring and the counterweights all move the prop into a low RPM / feather position**

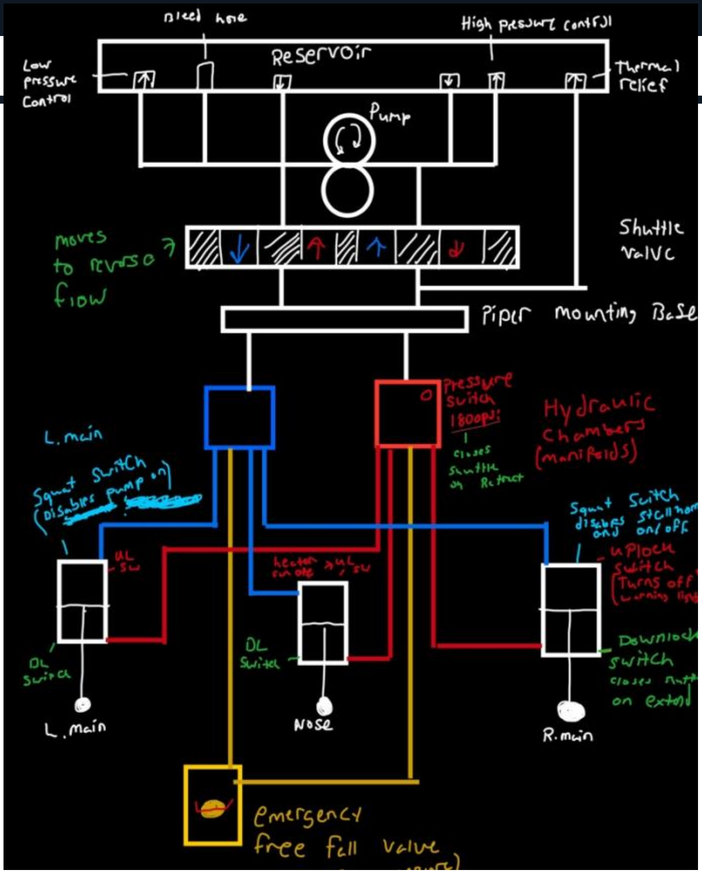
Feathering Lock

- **The feather lock is accomplished by a set of centrifugal locking pins**
- **These prevent the prop from moving to the feather position under 950RPM**
  - If engine begins to lock up during an engine failure, you must feather before 950RPM or else it will lock

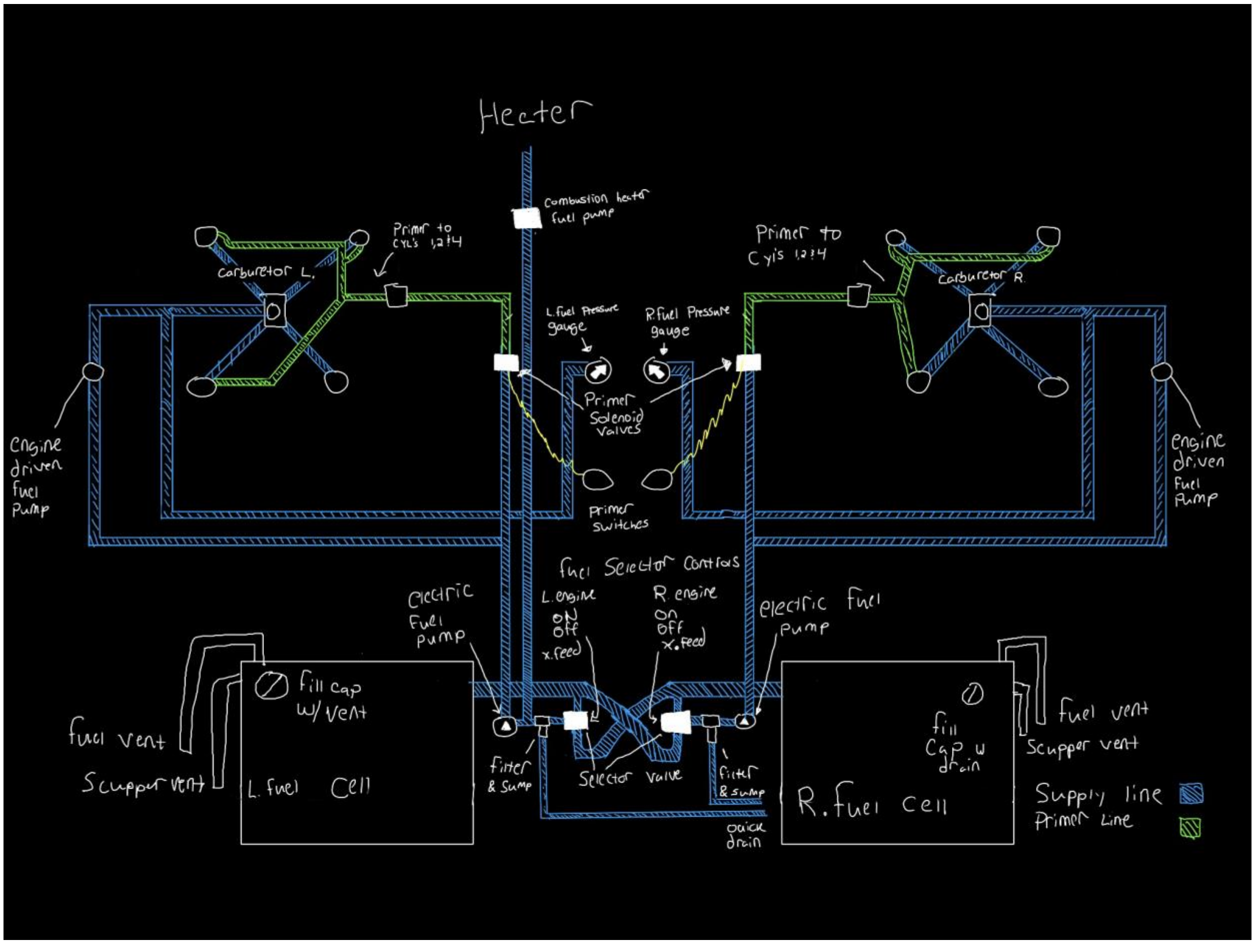
Landing Gear & Hydraulic

General

- **Electrically powered, hydraulically actuated fully retractable, tricycle landing gear**
- **Oleo struts on all three struts**
- **Gear warning horn (90 beeps per min) will sound when**
  - Flaps 25 or 40 with no gear down
  - 14''MP no gear down
  - Gear selector up when squat switch active (on ground)



Fuel



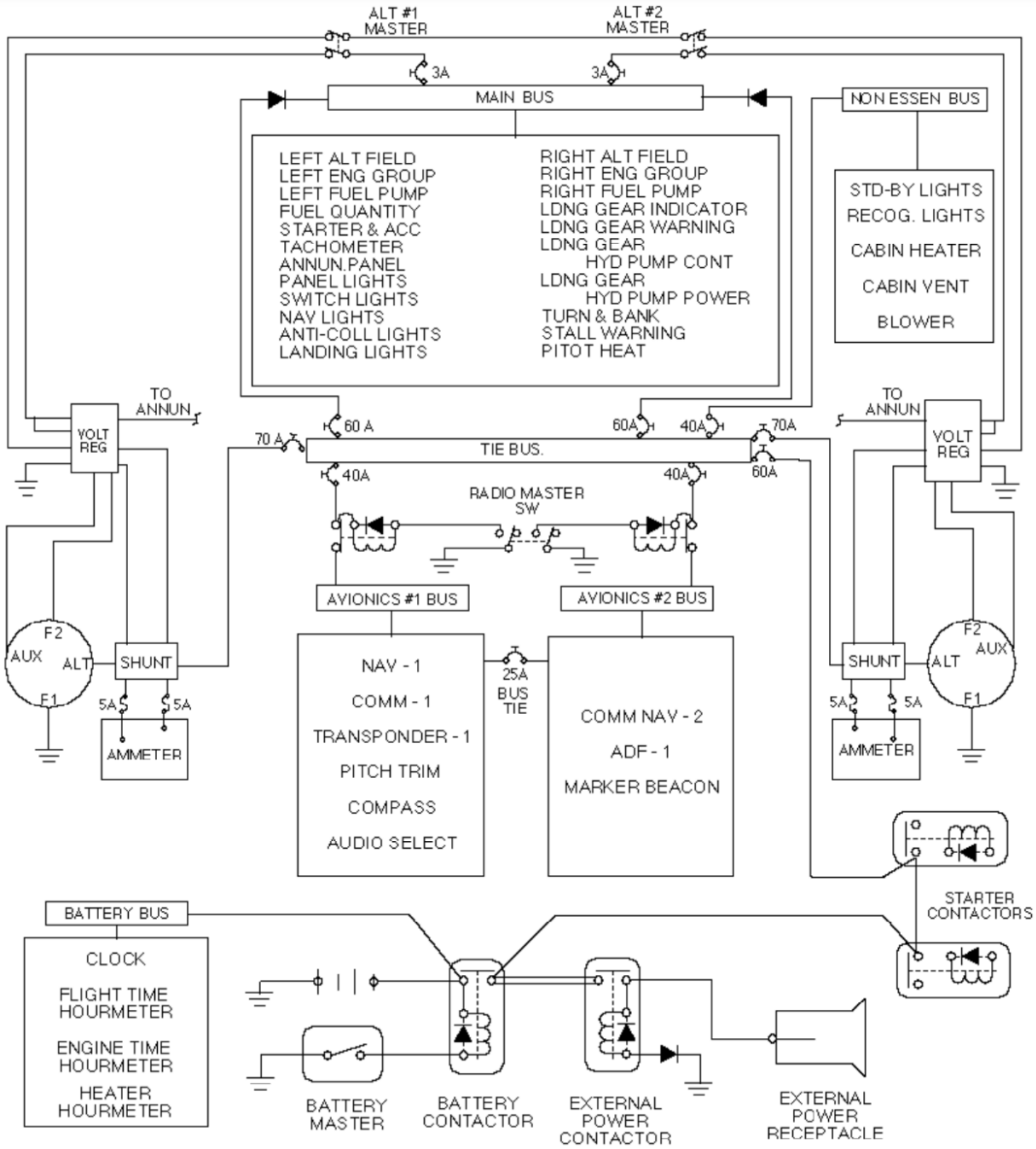
Electrical

6-Pack Electrical System

- **BATMAN to remember busses**
- **14V system with 2 14V 70A alternators and a 12V 35AH battery**
  - The alternators have a voltage regulator to maintain 14 volts
  - If >17V the ALT light will illuminate
    - Alternator circuit breaker may pop in an over volt scenario
  - <12.5V the LO BUS annunciator will illuminate indicating an alternator failure

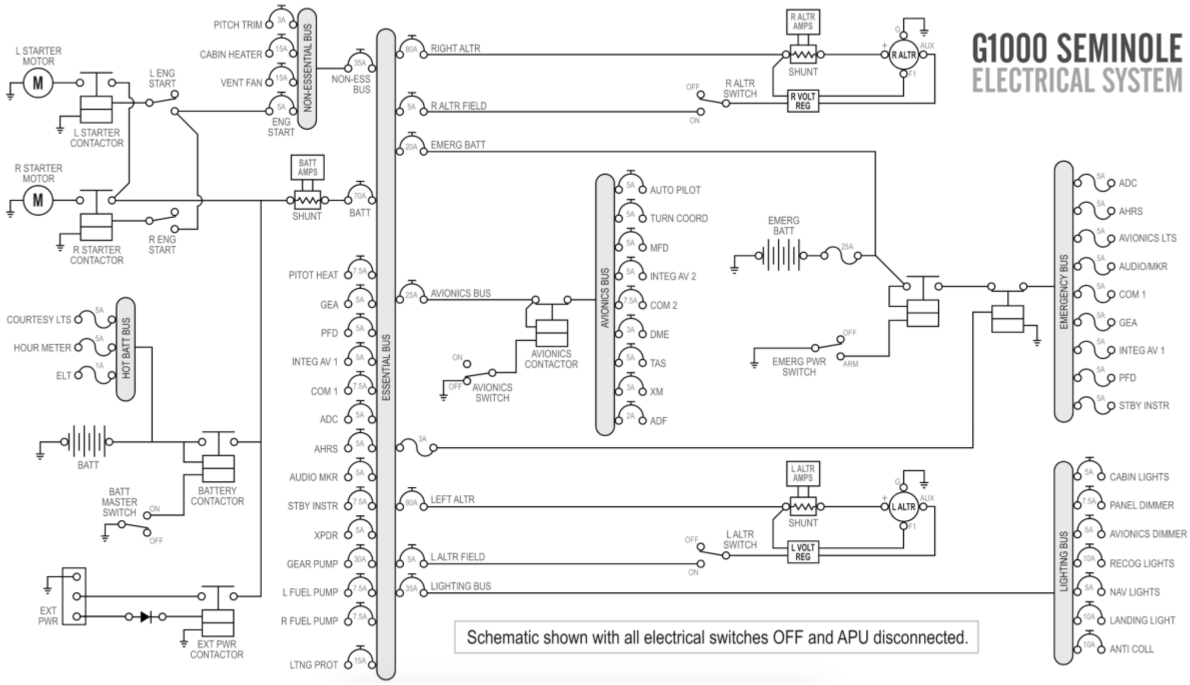
G500 Electrical System

- **The G500 Electrical system is identical to the 6-pack with the exception of the g500 being powered by the main bus**



G1000 Electrical System

- **HENALE for busses**
- **28V system with 2 28V 80A alternators and a 24V 13.6Ah battery**



Avionics

See CFII lesson plans

Pitot-Static

- **The piper Seminole uses a pitot mast which combines the pitot tube and the static port**
  - This allows the static port to befit from the pitot heat
- **The alternate static is located under the dash on the pilot's side**
- **Static system drains are located near the floor by the pilot's seat**

Gyroscopic & Vacuum System

- **2 Vacuum pumps (only in 6-pack) normal pressure of 4.8 to 5.2 inHg**

Environmental Systems

- **The heater is a janitrol heater located in the nose of the aircraft**
  - Burns about ½ gallon per hour
- **Environmental air is provided by ram air in flight or the fresh air vent and fan on the ground**

Anti-Icing & Deicing Systems

- **Carb heat**
- **Pitot heat**
- **Window Defroster**

Review & Conclusion

Review

Review main points