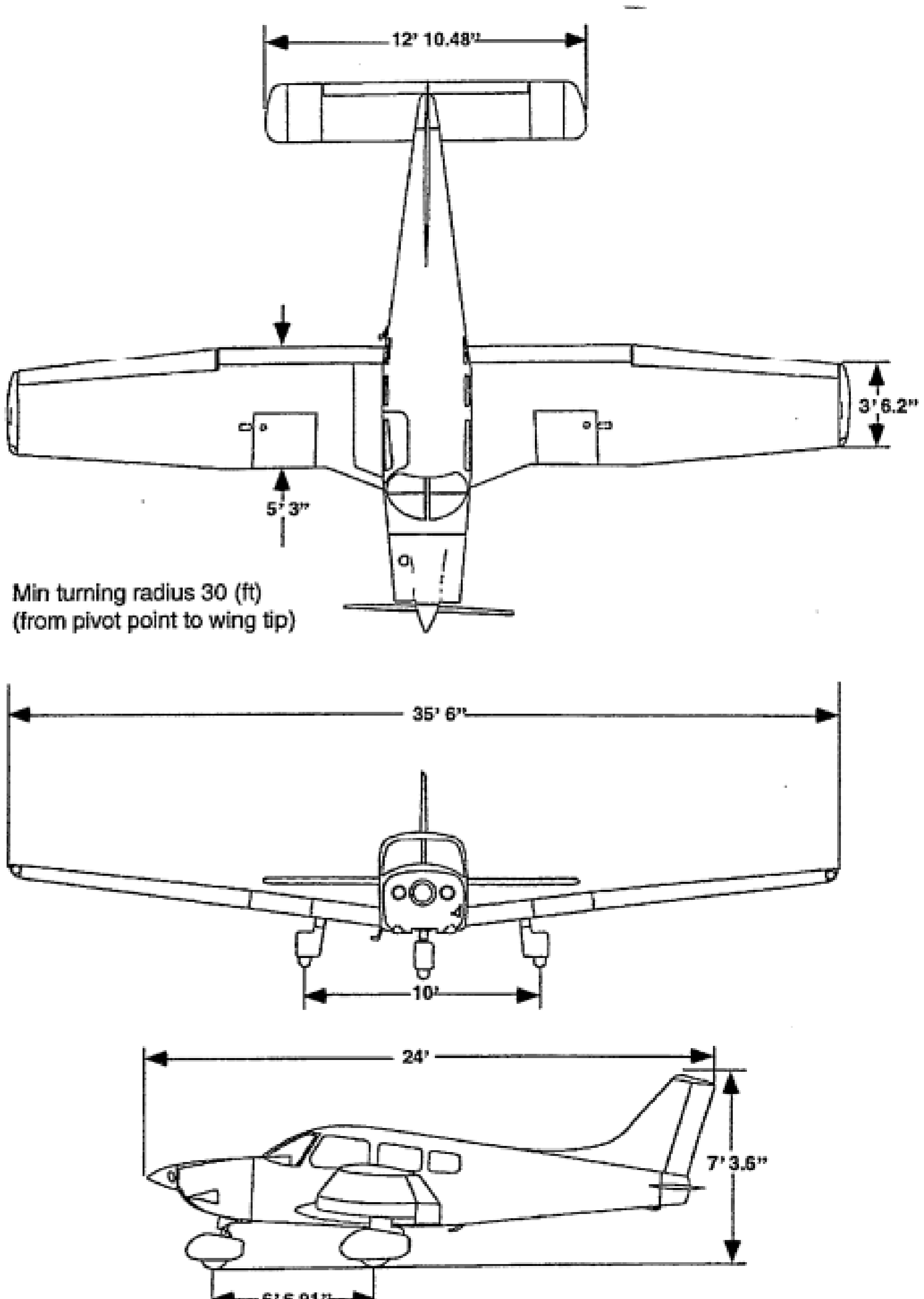
Piper Archer Systems

MIDDLE GEORGIA STATE UNIVERSITY

Aircraft General Information



THREE VIEW

Piper Archer V-Speeds

Piper Archer V-Speeds

Speeds listed below are in Knots Indicated Airspeed (KIAS).

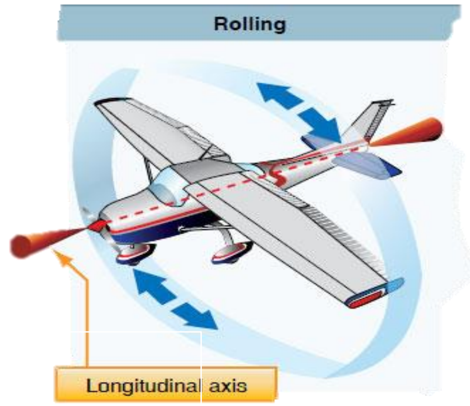
V-Speed	*KIAS*	*Description*	*Airspeed Indicator Marking*
V_{SO}	45	Stall speed in landing configuration	Bottom of White Line
V_S	50	Stall speed with zero flaps	Bottom of Green Line
V_R	60	Rotation speed (start rotation)	
V_X	64	Best angle of climb	
V_Y	76	Best rate of climb	
V_G	76	Best glide speed at max weight	
V_{FE}	102	Maximum flap extension speed	Top of White Line
V_{NO}	125	Max Structural Cruising Speed	Top of Green Line
V_{NE}	154	Never exceed speed	Red Line
V_A	113	Maneuvering speed at 2,550 pounds	
V_A	89	Maneuvering speed at 1,634 pounds	

Maximum demonstrated crosswind 17 knots

Primary Flight Controls

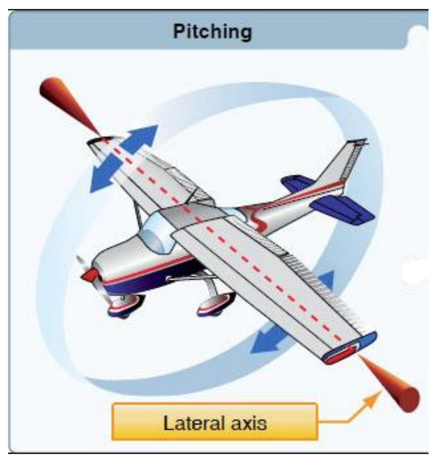
Ailerons

Ailerons control roll about the longitudinal axis. The ailerons are attached to the outboard trailing edge of each wing and move in the opposite direction from each.



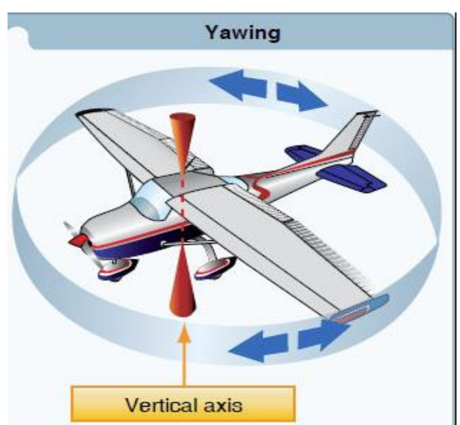
Stabilator

Controls Movement of the Aircraft about its lateral axis; Pitch. A Stabilator is essentially a one-piece horizontal stabilizer that pivots from a central hinge point.



Rudder

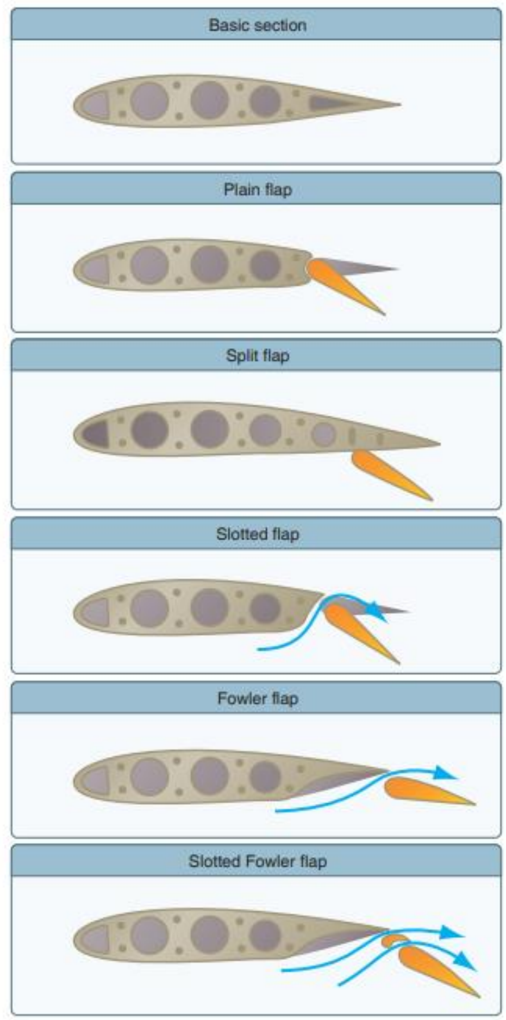
Controls movement of the aircraft about its vertical axis, this movement is known as Yaw.



Secondary Flight Controls

Flaps

Flaps are high lift Devices used to increase both lift and induced drag. It works by increasing in airfoil camber, resulting a increase in the coefficient of lift. Archers have “Plain flaps”. It is equipped with a manual flap system. The flaps are extended with a lever located between the two pilot seats. Flap settings are 0°, 10°, 25°, and 40°, and are spring-loaded to return to the 0 ° position.



Trim

The Archer has Antiservo Trim tabs as the trim system. It works by deflecting in the same direction as the control surface, making the movement of the control surface more difficult and requires more force applied to the controls by the pilot. This may seem counter-productive, but it is commonly used on aircraft where the controls are too light or the aircraft requires additional stability in that axis of movement.

Power plant and Propeller

The Archer is equipped with a Lycoming, 4-cylinder, O-360 (opposed, 360 cubic inches) engine rated at 180 horsepower at 2700 RPM. The engine is direct drive (crankshaft connected directly to the propeller), horizontally opposed (pistons oppose each other), piston driven, carbureted and normally aspirated (no turbo or supercharging). Engine ignition is provided through the use of two engine driven magnetos, which are independent of the aircraft's electrical system and each other.

Acceptable range for oil in the Archer is 6–8 quarts. Never depart with the oil indicating below 6 quarts.

L Lycoming 0-360-A4M

H Horizontally Opposed

A Air-cooled

N Naturally Aspirated

D Direct Drive

Lycoming O-360-A4M

Rubber baffles to redirect airflow for cooling

Cylinder

Fins for air cooling

2 engine driven magnetos attached to engine in left and right positions.

Ignition wires leads to spark plugs.

Top

Bottom

Spark plugs- There are 8 spark plugs that provide spark for combustion. 2 spark plugs per cylinder, for increased reliability, power, and even combustion.

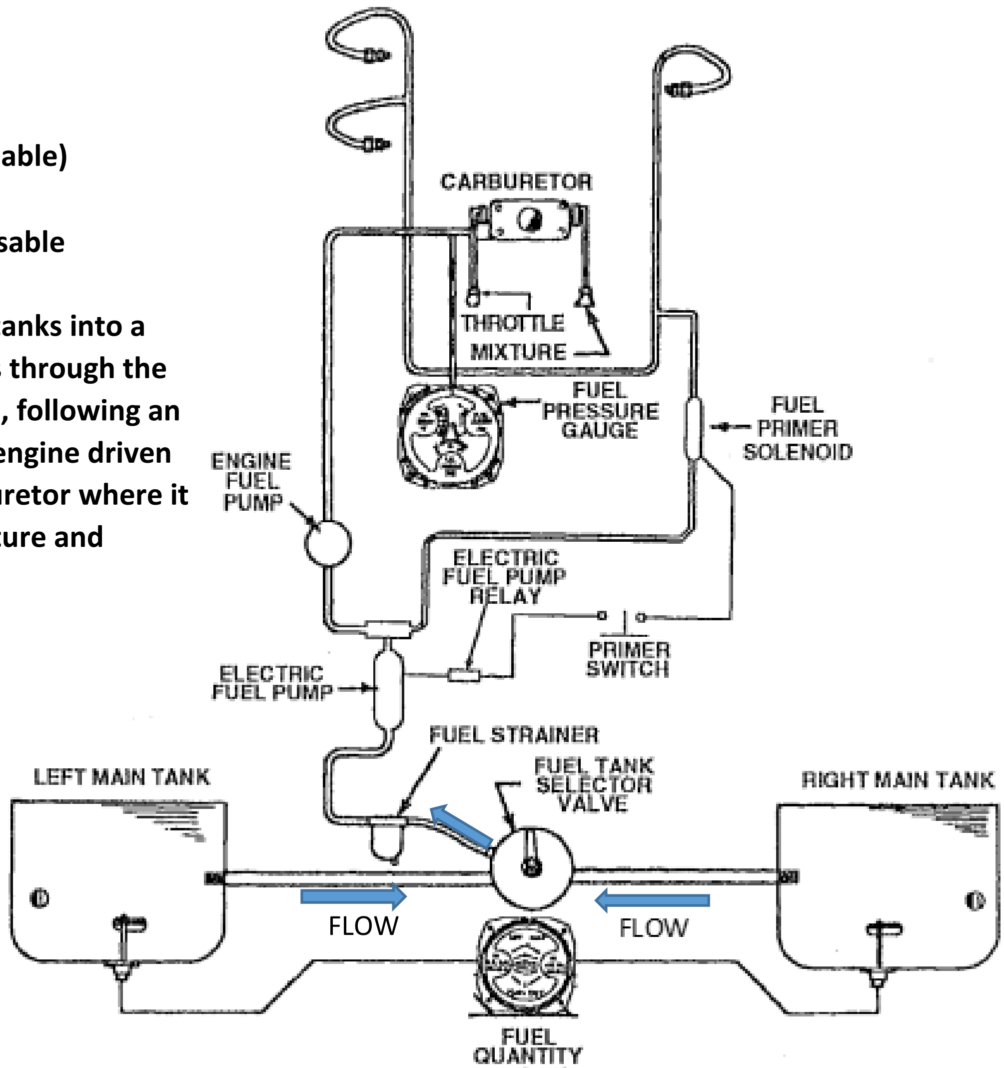
Propeller

The Archer is equipped with a Sensenich two-bladed, fixed pitch, metal propeller. Propeller diameter is 76 inches. Maximum RPM (red line) is 2700 RPM. MSRP $4,544.5

Fuel System

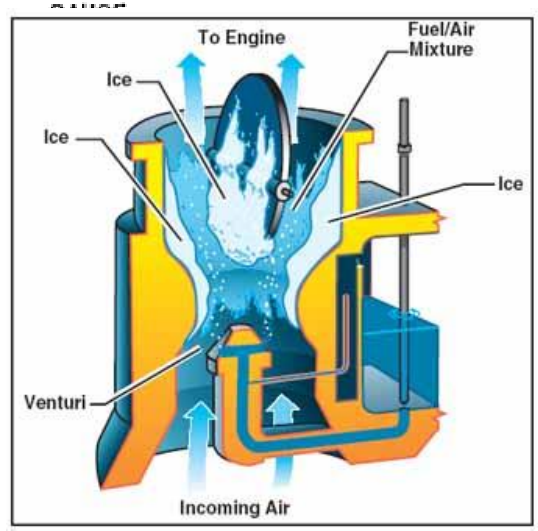
- **2x 25 U.S gal tanks (24 usable) (Tabs17gal)**
- **Total 50 U.S gal /48 gal usable**

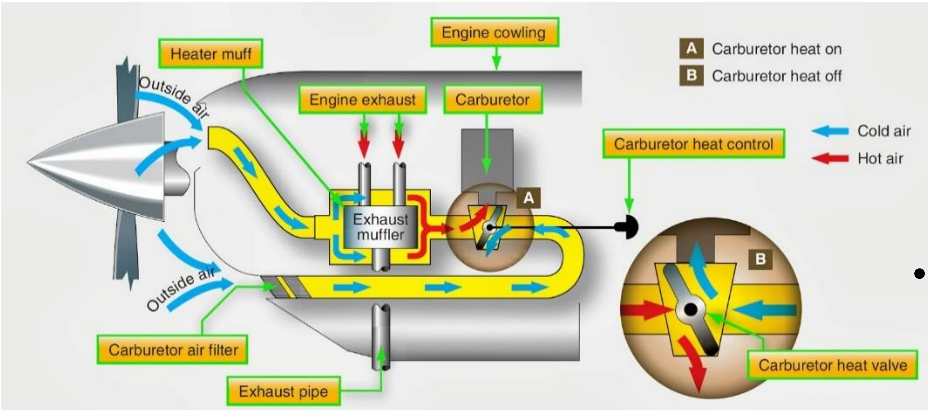
  Fuel flows from the fuel tanks into a fuel selector, then passes through the gascolator "fuel strainer", following an electric fuel pump, then engine driven pump, and into the carburetor where it will be regulated via mixture and throttle controls.
- **Minimum Fuel Grade**
  100 Green or 100LL Blue



Carburetor Icing

Under certain atmospheric conditions at temperatures of 20° to 70° F (-5° to 20°C), it is possible for ice to form in the induction system, even in summer weather. This is due to the high air velocity through the carburetor venturi and the absorption of heat from this air by vaporization of the fuel. To avoid this, carburetor heat is provided to replace the heat lost by vaporization. The initial signs of carburetor ice can include engine roughness and a drop in RPM. Carburetor heat should be selected on full if carburetor ice is encountered. Adjust mixture for maximum smoothness.



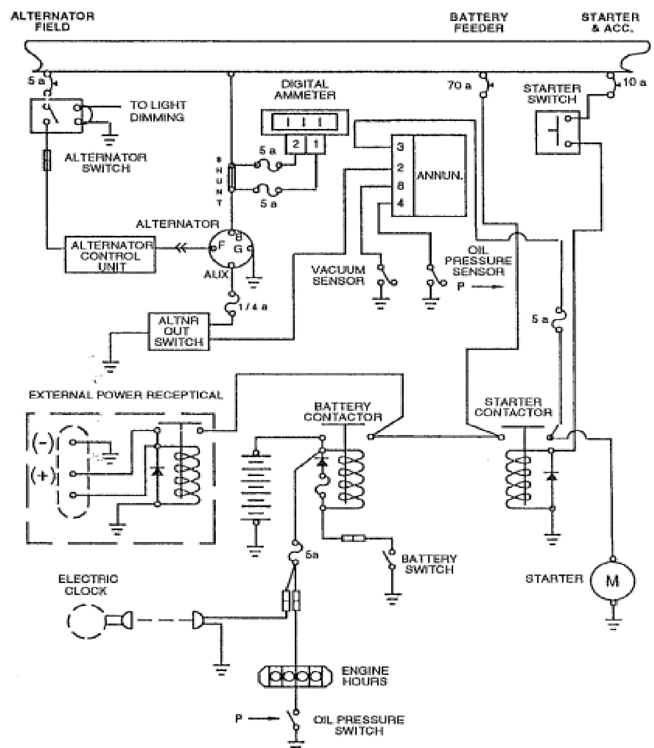


ARCHER POH- "Carburetor heat should not be applied unless there is an indication of carburetor icing, since the use of carburetor heat causes a reduction in power which may be critical in case of a go-around. Full throttle operation with carburetor heat on can cause detonation."

- Partial carburetor heat may be worse than no heat at all, since it may melt part of the ice, which will refreeze in the intake system. Therefore when using carburetor heat, always use full heat and when the ice is removed, return the control to the full cold position.

Electrical System

The Archer is equipped with a 28-volt DC electrical system and a 24-volt lead acid battery. Electrical power is supplied by a 70-amp, engine-driven alternator. A voltage regulator maintains a constant 28-volt output from the alternator. An overvoltage relay is located on the forward left side of the fuselage behind the instrument panel. Alternator output is displayed on a digital ammeter on the instrument panel.



ALTERNATOR AND STARTER SCHEMATIC
Figure 7-11

24- Volt battery/35amp hour

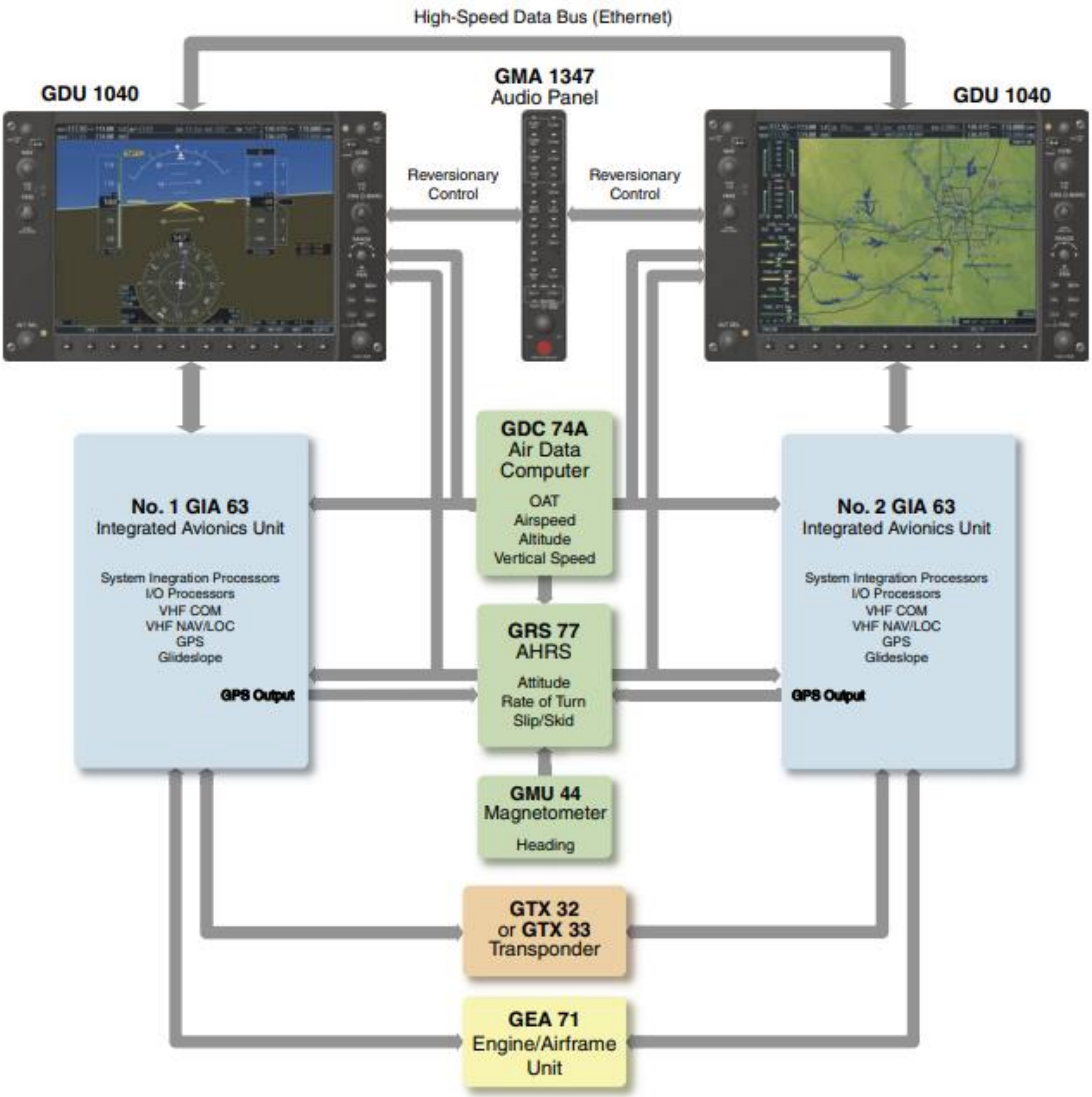
Electrical System 28- volt

28- Volt 70 Amp Alternator

Avionics

The piper archer is equiped with a Garmin G1000 as the primary avionics and a Aspen Evolution backup display. The G1000 has 2 primary screens PFD and MFD, Primary flight display replaces the traditional 6 pack and Multi-function flight display provides navigation information and engine indicators.

PFD **MFD**



Garmin G1000 Components

AHRS

ATTITUDE
HEADING
REFRENCE
SYSTEM

- **Substitutes traditional mechanical gyros with modern solid state MEMS Gyros.**

Micro
Electro
Mechanical
System

In aircraft instruments, gyros are used in attitude, compass and turn coordinators. These instruments contain a wheel or rotor rotating at a high RPM which gives it two important properties: rigidity and precession. The rotor or gyro can be electrically or vacuum/pressure driven by a separate pump on the engine. These old large mechanical, heavy gyro's are now being replaced with new small sized Micro Electromechanical System aka MEMS. This system is part of the G1000, you will find these in attitude and Heading Reference System (AHRS) for detecting acceleration and thus aircraft movement in three axis.

These devices are based on microscopically small vibrating structures packaged in similar to integrated circuits and able to provide digital and/or analog outputs. Most of them contain several sensors for multiple axis, ie X,Y and Z. They are used in extensively in aviation, automotive and small personal devices such as smartphones.

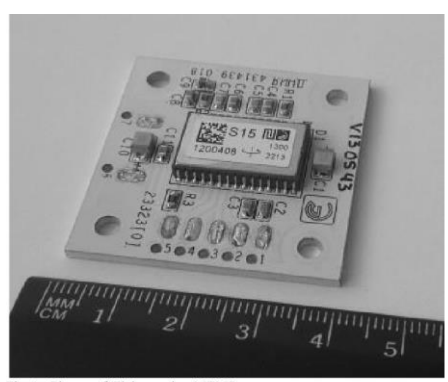
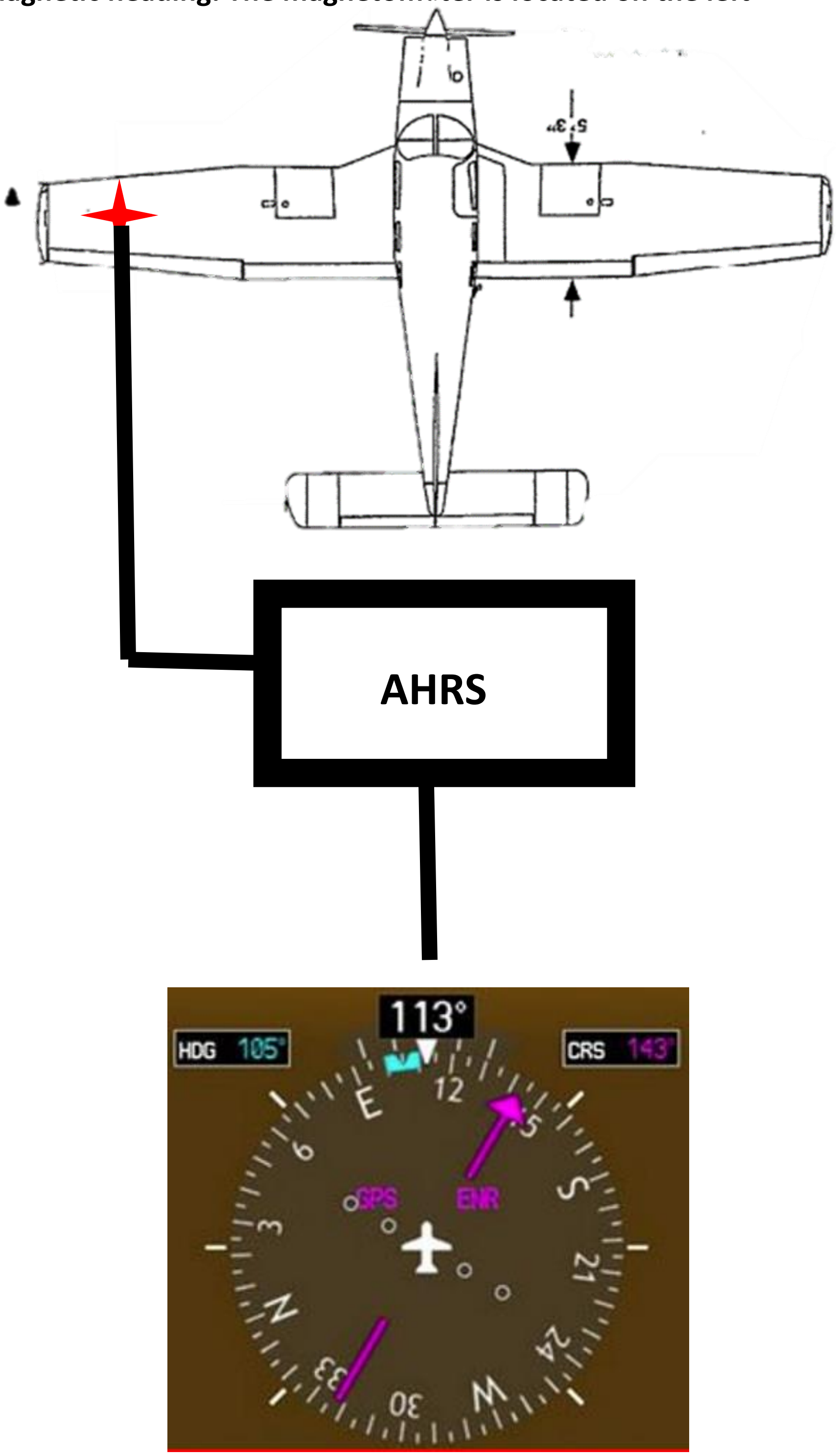


Fig. 1. Picture of *Elektropribor* MEMS gyro

Magnetometer/Flux Gate Compass System

Our Piper Archer does not have a traditional whiskey compass, it is replaced by a modern magnetometer. A magnetometer is a device that measures magnetism and direction, strength or relative change of magnetic field at a particular location. The magnetometer senses the earth's magnetic field and sends data to the AHRS for processing to determine magnetic heading. The magnetometer is located on the left wing.



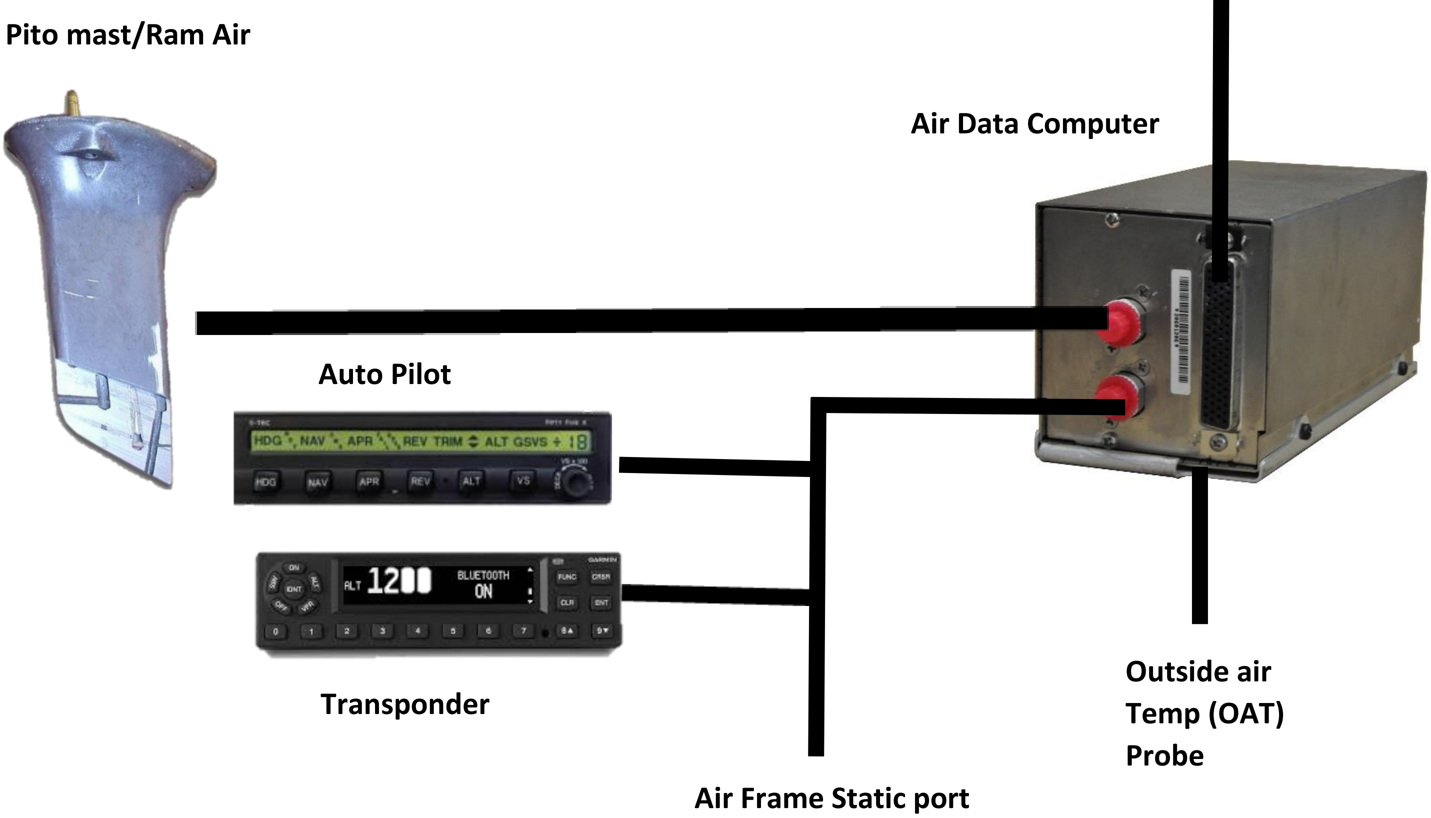
ADC

Air

Data

Computer

This system uses pitot and static pressure combined with total air temperature to calculate indicated and true airspeeds, outside air temperatures and vertical speed fed to autopilots, transponders and our EFIS system.



GPS

Part of the G1000 includes the navigation feature GPS, The G1000 Integrated Avionics system installed in this aircraft is approved for approach procedures with vertical guidance including “LPV” (WAAS)

gps, “LNAV/VNAV”, and “LNAV + V” within the U.S. National Airspace System.

RAIM

Receiver

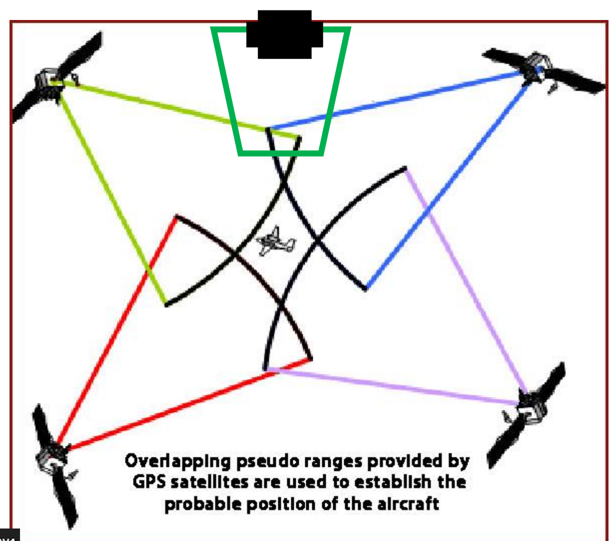
Autonomous

Integrity

Monitoring

RAIM is the capability of a GPS receiver to perform integrity monitoring on itself by ensuring available satellite signals meet the integrity requirements for a given phase of flight. Without RAIM, the pilot has no assurance of the GPS position integrity

- 5 satellites are necessary to compute RAIM.
- 4 satellites proved 3D navigation
- 3 satellites provide 2D navigation



RAIM (Receiver Autonomous Integrity Monitoring) is used to establish if the GPS receiver can depend on the data position coming from the satellite. RAIM works by using 4 satellites to obtain a position. If a fifth satellite is available, RAIM can be calculated by the GPS receiver by substituting the fifth satellite in place of each of the other satellites, replacing one at a time.