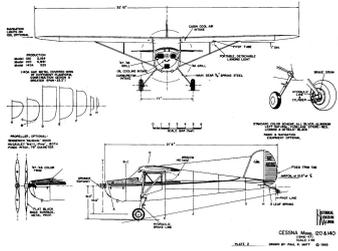


AIRCRAFT GENERAL KNOWLEDGE 4

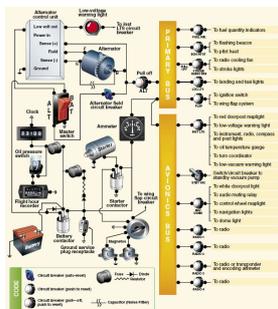


LECTURE FOUR: SYSTEMS

1. Electrical System
2. Vacuum System
3. Pitot Static System



INSTRUMENTS: ELECTRICAL SYSTEM



Most light aircraft run on a Direct Current (DC) electrical system

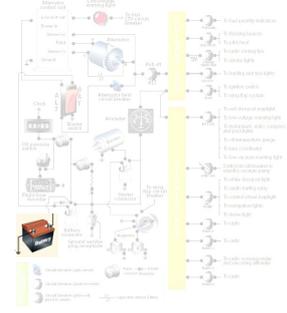
Current is provided from an alternator when the engine is running and from a battery when the engine is not running

We will run through each element in turn...



INSTRUMENTS: ELECTRICAL SYSTEM

GROUND SCHOOL



BATTERY
Provides electrical power when engine is not running or in case of electrical failure

Most aircraft use a lead-acid vented battery

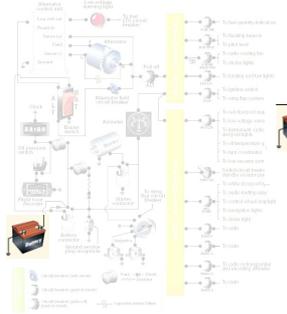
Usually a 12 or 24 volt battery which will also give a "amp-hours" on how long it will provide power

Battery power used in start procedure is recharged during flight by the alternator



INSTRUMENTS: ELECTRICAL SYSTEM

GROUND SCHOOL



If more than one battery is used they can be connected in different ways to change the amp-hours:

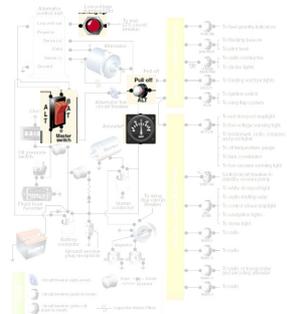
IN SERIES
2 x 12 volt / 40 amp/hr
= 24 volts / 40 amp/hr

IN PARALLEL
2 x 12 volt / 40 amp/hr
= 12 volt / 80 amp/hr



INSTRUMENTS: ELECTRICAL SYSTEM

GROUND SCHOOL



MASTER SWITCH
Selects whether battery power, alternator or both are required

AMMETER
Shows the state of charge of the battery

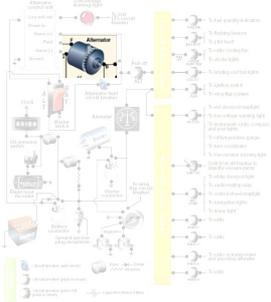
LOW VOLTAGE LIGHT
Illuminates when the battery is discharging

ALTERNATOR CIRCUIT BREAKER
Can be used to take alternator off-line if required



INSTRUMENTS: ELECTRICAL SYSTEM

GROUND SCHOOL



ALTERNATOR

The alternator is powered by an engine-driven belt

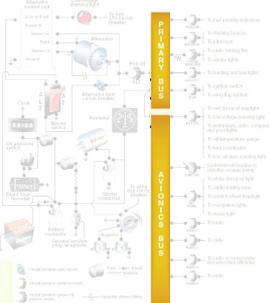
The alternator produces alternating current which is rectified to direct current by the use of diodes

Alternator also recharges the battery



INSTRUMENTS: ELECTRICAL SYSTEM

GROUND SCHOOL



BUS BAR

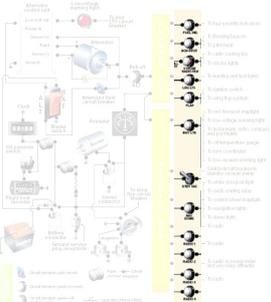
Distribution board which allows current supply to various elements of the system

Usually avionics will have a separate bus bar



INSTRUMENTS: ELECTRICAL SYSTEM

GROUND SCHOOL



CIRCUIT BREAKERS / FUSES

Protect the electrical equipment in the case of overload or other malfunction

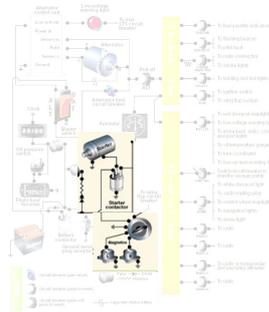
Fuses should only ever be replaced once before seeking engineering assistance to investigate

Circuit breakers should only ever be reset once before seeking engineering assistance to investigate



INSTRUMENTS: ELECTRICAL SYSTEM

GROUND SCHOOL



RELAYS

Used so that one electrical circuit can produce a change in another electrical circuit – used in starters in aircraft

Safety – means that high currents don't need to be in the cockpit!

The magneto system is a form of relay



INSTRUMENTS: ELECTRICAL SYSTEM: MALFUNCTIONS

GROUND SCHOOL

Alternator Malfunction

Switch off "alternator" side of master switch and "load shed" to ensure battery lasts the maximum amount of time (30 minutes in C152)

Starter Warning Light stays on after start

Immediately shut down engine – the battery is trying to run the alternator and this will cause damage

Low voltage light illuminates

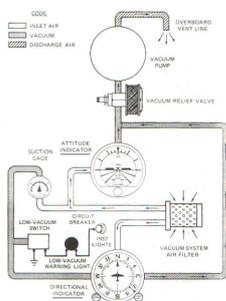
"Load shed" to reduce load on system – sometimes, however, during taxiing on a hot day is not a problem.

More details in the individual POH for your aircraft



VACUUM SYSTEM: BASICS

GROUND SCHOOL



Used to "spin" gyroscopes in the Attitude Indicator (AI) and Directional Indicator (DI)

Suction pump driven by the engine

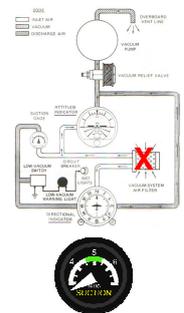
Filtered air sucked through filter, via suction gauge and then through instruments

Vacuum relief valve operates in event of over-vacuum situation



VACUUM SYSTEM: MALFUNCTIONS

GROUND SCHOOL

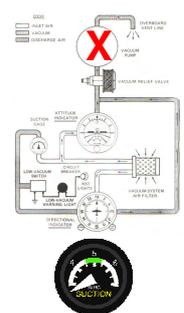


BLOCKED AIR FILTER
Reduced airflow will cause gyros to run down
Suction gauge will indicate low suction



VACUUM SYSTEM: MALFUNCTIONS

GROUND SCHOOL

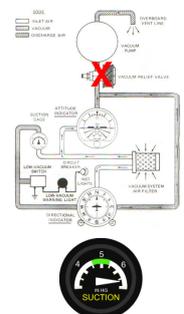


VACUUM PUMP FAILURE
Zero reading on the suction gauge
Gyros will wind down within a few minutes



VACUUM SYSTEM: MALFUNCTIONS

GROUND SCHOOL



EXCESSIVE HIGH SUCTION
Vacuum relief valve should prevent this
Failure of this valve means gyros will spin too fast and suffer damage
Land as soon as possible



INSTRUMENTS: PITOT STATIC SYSTEM

GROUND SCHOOL

The Pitot Static system provides data for 3 instruments:



Altimeter



Vertical Speed Indicator (VSI)



Airspeed Indicator (ASI)



INSTRUMENTS: PITOT STATIC SYSTEM

GROUND SCHOOL

There are 2 elements to the Pitot-Static System



PITOT TUBE

Usually beneath a wing. In free-stream airflow. Often heated to avoid the entrance being blocked by ice



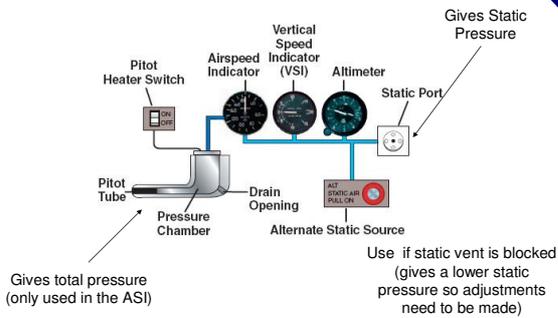
STATIC VENT

Usually on side of fuselage. Out of airflow. Some aircraft have 2 to average out reading and reduce errors



INSTRUMENTS: PITOT STATIC SYSTEM

GROUND SCHOOL



Lecture complete
Any Questions?