Aircraft Electrical Systems

By Jake Heindselman
Electricity

- A form of energy associated with stationary or moving electrons, ions, or other charged particles

Electricity provides electrical power throughout the aircraft
Electrical System

Sources, Switches, and Wiring Circuits

- Battery
- Alternator/Generator
- Circuit breakers/Fuses
- Voltage regulator
- Ammeter
- Master switch
Battery

• Stores electrical energy
• Provides electrical power to start the engine
• Stores a limited supply of backup power if alternator or generator fails
• Recharges when engine is running (turning Alt/Gen)
Alternator

• Produces alternating current (AC) which is converted to direct current (DC)

• Belt driven (engine-driven) Recharges battery while engine is running

• Creates sufficient current to operate entire electrical system, even at low Engine R.P.M.

• Electrical current is more constant throughout different engine speeds than a generator
Generator

• Produces direct current electrical charge (DC)

• Belt driven by the engine

• Doesn’t produce enough current at low R.P.M. to operate entire electrical system

• Aircraft with generators use battery power at low engine R.P.M.
Magneto

- Self contained ignition unit that provides pulses of electricity to the two spark plugs
- Used in internal combustion ignition engines
- Doesn’t require a battery to function
- Each spark plug has a separate magneto system
- Converts mechanical energy to electrical energy
Spark Plugs

- Receives ‘spark’ electricity from magneto
- Ignites compressed fuel/air mixture inside engine cylinder
- Aircraft engines have two spark plugs (two magneto systems) per cylinder
- Electricity travels from magneto to magneto spark plug in heavily insulated wires – HIGH VOLTAGE
Circuit Breaker/Fuses

- Protects the electrical system from electrical overload

- Overload can cause damage to components in the electrical system

- Fuses have an internal metal wire or strip that melts when too much electrical current flows through it

- Circuit breakers have a switch that trips if too much electrical current flows through it

- The switch can be manually reset instead of replacing it
Voltage Regulator

• Controls the rate of charge to the battery

• Stabilizes the generator or alternator electrical output

• Compares the generator/alternator voltage output to the battery voltage
Ammeter

- Monitors the performance of the electrical system

- Shows if the alternator/generator is producing an adequate supply of electrical power

- Indicates whether or not the battery receives an electrical charge

- Not all airplanes are equipped with an ammeter

- Some airplanes have a warning light to alert the pilot of an electrical system problem
Master Switch

• Turns Electric system on or off

• Controls entire electrical system except for Magneto Ignition system, including
  • interior/exterior lights,
  • radios, fuel gauges, pumps,
  • - and – engine starter motor

• Some airplanes equipped with battery switch and alternator switch (split switch)

• Alternator switch (ALT) disconnects alternator from electrical system in case of alternator failure (ALT=OFF)
Ground Power Unit (GPU)

- Provides aircraft with power from external power supply

- Very useful for starting engine in cold weather

- Some GPU’s built into airport jet-ways to reduce wear on a/c systems and to provide immediate power for ground ops
Summary

Components

- Battery
- Alternator/Generator
- Magneto
- Spark Plugs
- Fuses/Circuit Breaker
- Voltage Regulator

Controls/Tools

- Master Switch
- Alternator Switch
- Ammeter
- Ground Power Unit (GPU)
References


The End

"I think you're right Bob, it does look like the mechanic....that's odd, I think he wants us to land the plane."