

35.1 Electromagnetic Induction

- The primary source of electrical power on an aircraft is a generator or alternator, which
- converts mechanical energy into electrical energy through electromagnetic induction.
- ☐ Principle: When a conductor is moved through a magnetic field (or a magnetic field is moved past a conductor), a voltage is induced in the conductor.
- ☐ Simple Generator: Consists of a rotating loop of wire (the armature) spinning within a magnetic field. This rotation induces an AC voltage in the loop. In a DC generator, a device called a commutator is used to mechanically reverse the connections to the loop every half-turn, resulting in a DC output.

35.2 DC Generators vs. Alternators

- ☐ DC Generator: Has a rotating armature and stationary field magnets. The high-load output current must pass through the commutator and brushes, which can cause sparking and wear, especially at high altitudes.
- ☐ Alternator (Most Common on Piston Aircraft): Has a rotating field magnet and a stationary armature (stator). The high-load output current is taken directly from the stationary windings, which is more reliable. The small current needed to energize the rotating field is supplied through simple slip rings. An alternator's AC output is converted to DC by a solid-state rectifier. Alternators are lighter and more efficient at low engine RPM than DC generators.

35.3 Voltage Control

- The output voltage of a generator or alternator must be kept constant (e.g., 14V or 28V) regardless of engine speed or electrical load. This is done by a voltage regulator. The regulator senses the output voltage and automatically adjusts the current flowing through the field winding. Increasing the field current strengthens the magnetic field and increases the

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- output voltage; decreasing it does the opposite.

35.4 DC Distribution

- ☐ Bus Bar: A central distribution point for electrical power. The generator, battery, and all electrical consumers are connected to the bus bar.
- ☐ Earth Return System: On metal aircraft, the airframe itself is used as the negative conductor for the electrical system. The negative terminal of the generator and battery, and one side of every electrical component, are connected to the airframe ("grounded"). This saves a significant amount of wiring weight.
- ☐ Ammeters:
 - Centre-Zero Ammeter: Shows the current flowing into (charging) or out of (discharging) the battery.
 - Load Meter: Shows the total current output from the alternator. A zero reading in flight indicates an alternator failure.

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