

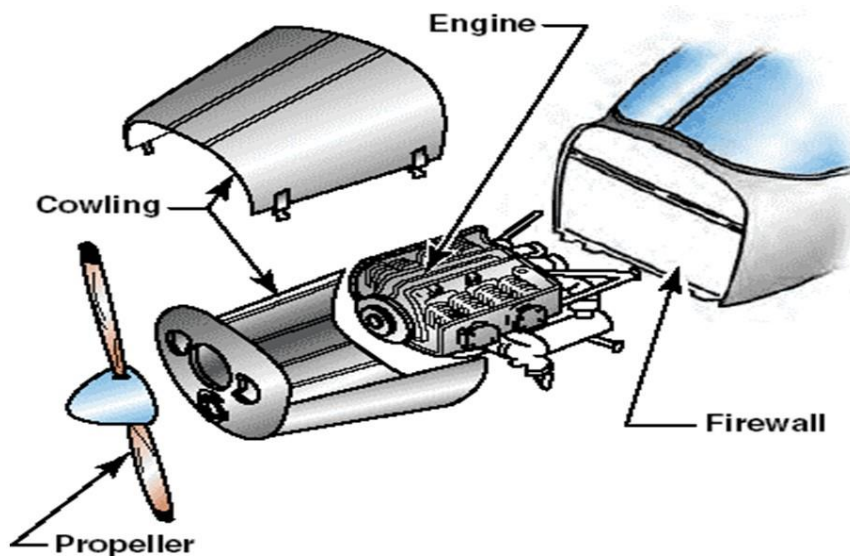


Subject Code & Name: **23AST101 Fundamentals of Aerospace Engineering**

Topic: Basic ideas about aircraft power plant

An aircraft power plant is essentially the engine and its related systems that provide the necessary power for the operation of an aircraft. Here are some basic ideas about different types of aircraft power plants:

Power Plant



1. Piston Engines

- **Overview:** Piston engines, also known as reciprocating engines, operate similarly to car engines. They use one or more pistons to convert pressure into a rotating motion.
- **Components:**
 - **Cylinders:** Where fuel combustion occurs.
 - **Pistons:** Move up and down within the cylinders.
 - **Crankshaft:** Converts the piston's linear motion into rotational motion.
 - **Propeller:** Attached to the crankshaft to produce thrust.
- **Types:**
 - **In-line Engines:** Cylinders arranged in a single row.
 - **V-type Engines:** Cylinders arranged in two rows in a V-shape.
 - **Radial Engines:** Cylinders arranged in a circle around the crankshaft.
- **Applications:** Typically used in small aircraft and older models.

2. Turboprop Engines

- **Overview:** Combines features of both turbine and propeller engines, using a turbine engine to drive a propeller.
- **Components:**
 - **Gas Generator:** Includes a compressor, combustion chamber, and turbine.
 - **Propeller:** Driven by the turbine.
 - **Reduction Gearbox:** Reduces the high rotational speed of the turbine to a speed suitable for the propeller.
- **Applications:** Used in medium-sized aircraft that require good fuel efficiency and the ability to operate from shorter runways.

3. Turboshift Engines

- **Overview:** Similar to turboprop engines but designed primarily to drive a shaft rather than a propeller.
- **Components:**
 - **Gas Generator:** Same as in turboprop engines.
 - **Free Power Turbine:** Drives the output shaft without being directly connected to the gas generator.
- **Applications:** Commonly used in helicopters and other applications requiring shaft power.

4. Jet Engines

- **Overview:** Operate by expelling jet gases at high speed to produce thrust based on Newton's third law of motion.
- **Types:**
 - **Turbojet Engines:** Basic jet engines that produce thrust directly from jet exhaust.
 - **Components:** Air intake, compressor, combustion chamber, turbine, and exhaust nozzle.
 - **Turbofan Engines:** Similar to turbojets but with a large fan at the front to improve efficiency and thrust.
 - **Components:** Fan, compressor, combustion chamber, turbine, and exhaust nozzle.
 - **Bypass Ratio:** Ratio of air passing through the fan to air passing through the core; higher ratios improve efficiency and reduce noise.

- **Applications:** Used in commercial airliners, military jets, and other high-speed aircraft.

5. Rocket Engines

- **Overview:** Produce thrust by expelling high-speed exhaust gases from a combustion process.
- **Types:**
 - **Liquid Rocket Engines:** Use liquid propellants (fuel and oxidizer) stored in tanks.
 - **Components:** Fuel and oxidizer tanks, pumps, combustion chamber, and nozzle.
 - **Solid Rocket Engines:** Use solid propellants that are pre-mixed and packed into a casing.
 - **Components:** Casing, solid propellant, and nozzle.
- **Applications:** Used in space exploration and military missiles.

Basic Principles of Aircraft Power Plants

- **Thermodynamics:** The study of heat and energy conversion, fundamental to understanding how engines produce power.
- **Combustion:** The chemical process of burning fuel to release energy.
- **Propulsion:** The mechanism by which an aircraft is moved forward, achieved through thrust generation.

Understanding these basic ideas about aircraft power plants provides a foundation for further study in aerospace engineering. If you need more detailed notes on specific types or additional concepts, let me know!