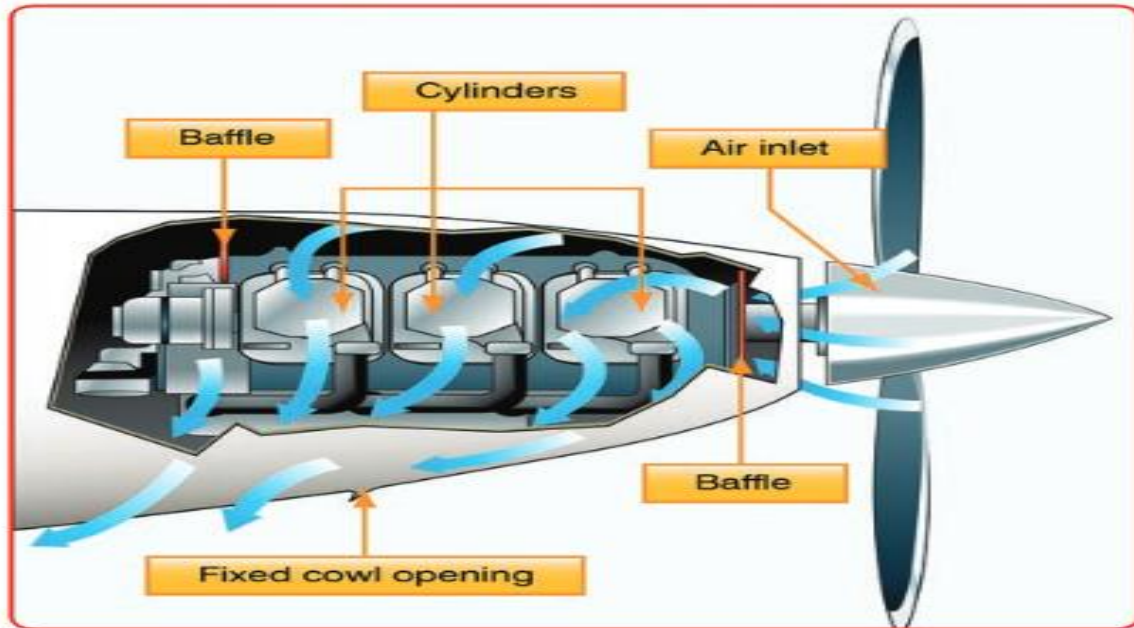




Subject Code & Name: **23AST101 Fundamentals of Aerospace Engineering**

## Topic: Functions of piston Engine

Piston engines, or reciprocating engines, are commonly used in small aircraft. Their primary function is to convert the chemical energy of fuel into mechanical energy, which is then used to propel the aircraft. Here are the key functions and components of a piston engine in an aircraft:



Outside air aids in cooling the engine.

### Functions of a Piston Engine in Aircraft

#### 1. Air-Fuel Mixture Intake:

- **Function:** The engine takes in a mixture of air and fuel. This mixture is critical for the combustion process that generates power.
- **Component Involved:** Carburetor or fuel injection system.

#### 2. Compression:

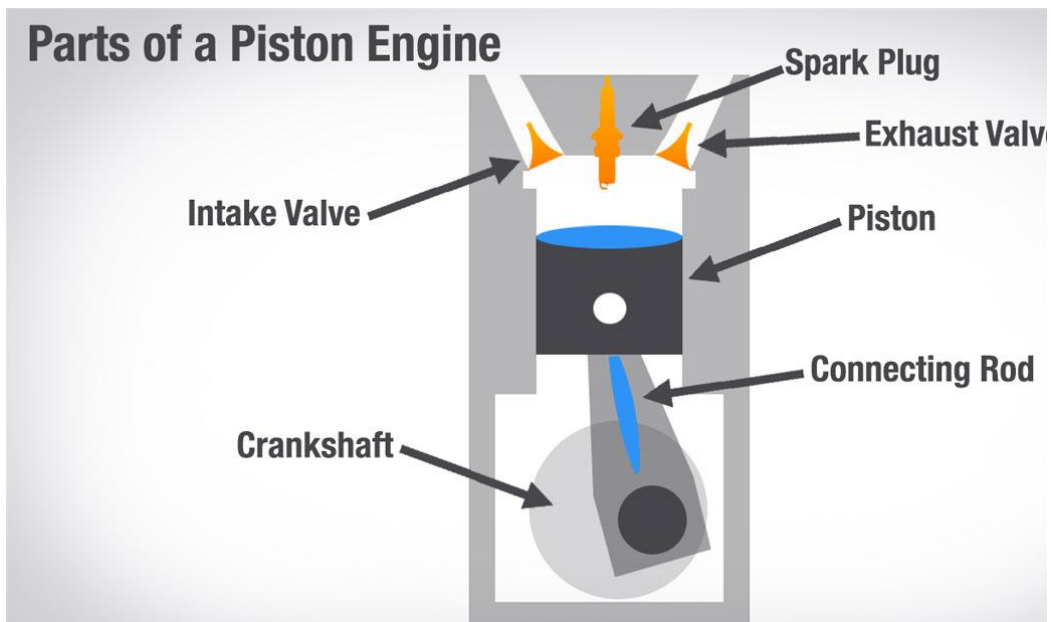
- **Function:** The piston compresses the air-fuel mixture in the cylinder. Compression increases the mixture's pressure and temperature, making it more volatile and ready for combustion.
- **Component Involved:** Pistons and cylinders.

#### 3. Combustion:

- **Function:** The compressed air-fuel mixture is ignited by a spark plug. This combustion process generates a rapid expansion of gases that push the piston downward, creating mechanical energy.
  - **Component Involved:** Spark plugs, pistons, and cylinders.
4. **Power Stroke:**
- **Function:** The force from the expanding gases pushes the piston down, turning the crankshaft. This is the primary power-generating phase of the engine's cycle.
  - **Component Involved:** Pistons, connecting rods, and crankshaft.
5. **Exhaust:**
- **Function:** After the power stroke, the exhaust valve opens, allowing the burned gases to escape the cylinder and be expelled out of the engine.
  - **Component Involved:** Exhaust valves and exhaust manifold.
6. **Crankshaft Rotation:**
- **Function:** The linear motion of the pistons is converted into rotational motion by the crankshaft. This rotational motion is used to drive the propeller.
  - **Component Involved:** Crankshaft and connecting rods.
7. **Propeller Drive:**
- **Function:** The crankshaft's rotational motion is transferred to the propeller, generating thrust to propel the aircraft forward.
  - **Component Involved:** Crankshaft and propeller.

### **Key Components of a Piston Engine**

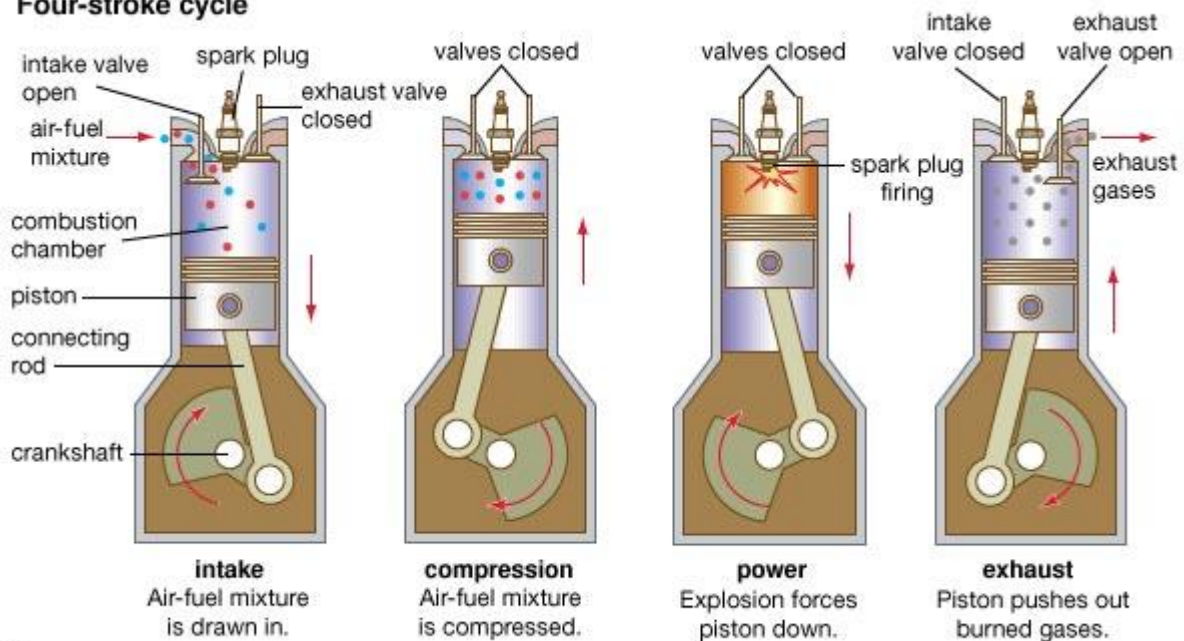
- **Cylinders:** Houses the pistons and is the site for the intake, compression, combustion, and exhaust processes.
- **Pistons:** Move up and down within the cylinders to compress the air-fuel mixture and transfer energy to the crankshaft.
- **Crankshaft:** Converts the pistons' linear motion into rotational motion to drive the propeller.



- **Connecting Rods:** Connect the pistons to the crankshaft.
- **Spark Plugs:** Ignite the air-fuel mixture in the cylinders.
- **Valves:** Control the intake of the air-fuel mixture and the exhaust of combustion gases.
- **Carburetor or Fuel Injection System:** Mixes air and fuel in the correct ratio for combustion.
- **Cooling System:** Keeps the engine at an optimal operating temperature to prevent overheating.
- **Lubrication System:** Reduces friction between moving parts and prolongs engine life.

### Four-Stroke Engine Cycle

#### Four-stroke cycle



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1. **Intake Stroke:** The intake valve opens, and the piston moves down, drawing in the air-fuel mixture.
2. **Compression Stroke:** The intake valve closes, and the piston moves up, compressing the air-fuel mixture.
3. **Power Stroke:** The spark plug ignites the compressed mixture, causing an explosion that pushes the piston down.
4. **Exhaust Stroke:** The exhaust valve opens, and the piston moves up, expelling the exhaust gases.

By understanding these functions and components, you can grasp how piston engines power aircraft, providing the necessary thrust and power for flight. If you need more detailed information on any specific part or process, feel free to ask!