

12.1 Engine Efficiency Metrics

- ☐ Specific Fuel Consumption (SFC): The weight of fuel burnt (in lbs or kg) per hour for the power produced (BHP)²⁵. It is a measure of the engine's fuel efficiency.
- ☐ Thermal Efficiency: The efficiency at which the heat energy from the fuel is converted into useful work²⁶. For a piston engine, this is typically only 25-28%²⁷.
- ☐ Volumetric Efficiency: The ratio of the weight of the fuel/air mixture actually drawn into the cylinder compared to the weight that could fill the cylinder at standard atmospheric pressure²⁸. Supercharging is a method used to increase volumetric efficiency²⁹.
- ☐ Compression Ratio: The ratio of the total volume in the cylinder with the piston at BDC to the volume with the piston at TDC³⁰.

12.2 Engine Construction

- ☐ Firing Order: The sequence in which the cylinders fire (e.g., 1-3-4-2 for a four-cylinder engine)³¹. Cylinders do not fire consecutively to reduce vibration and load on the crankshaft³².
- ☐ Crankshaft: Converts the reciprocating (up-and-down) motion of the pistons into rotary motion to turn the propeller³³.
- ☐ Connecting Rod: Links the piston to the crankshaft³⁴.
- ☐ Valve Operating Gear:
 - Camshaft: Driven by the crankshaft at half crankshaft speed, it has lobes that operate the valves³⁵.
 - Valve (Tappet) Clearance: A small gap required between the rocker arm and the valve tip to allow for thermal expansion³⁶³⁶³⁶³⁶³⁶³⁶³⁶³⁶³⁶. Too much clearance causes the valve to open late and close early; too little can prevent the valve from closing at all³⁷³⁷³⁷³⁷.
 - Valve Springs: Typically two springs per valve are used to keep the valves closed and to

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- prevent 'valve bounce' at high RPM₃₈.

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