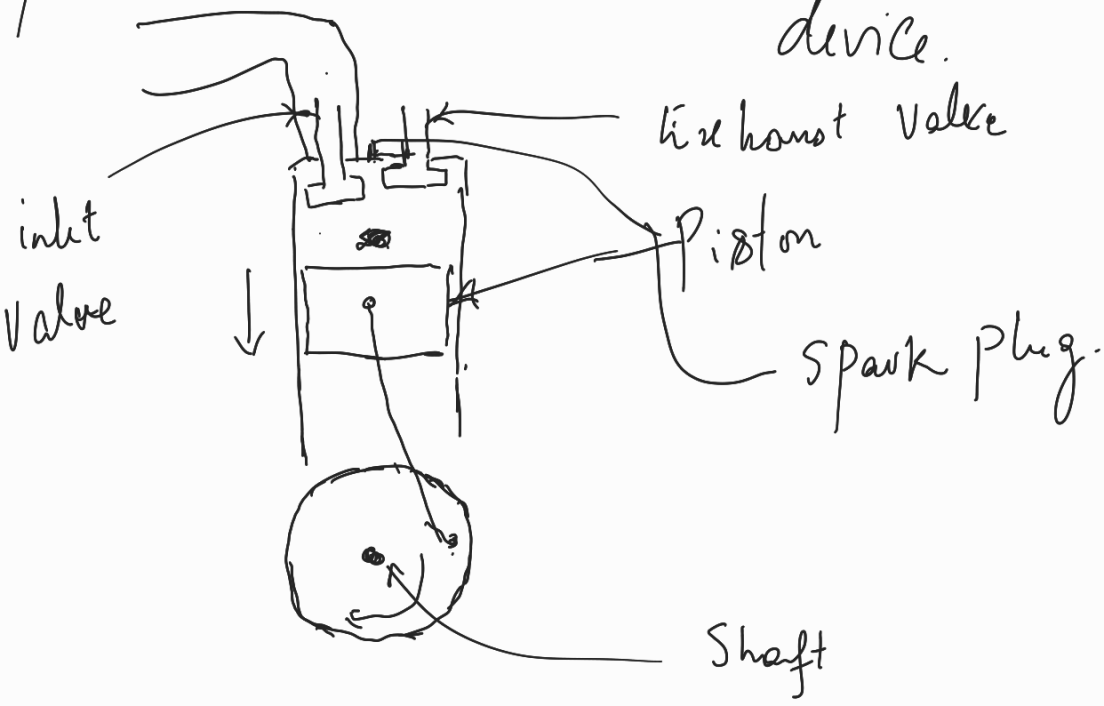
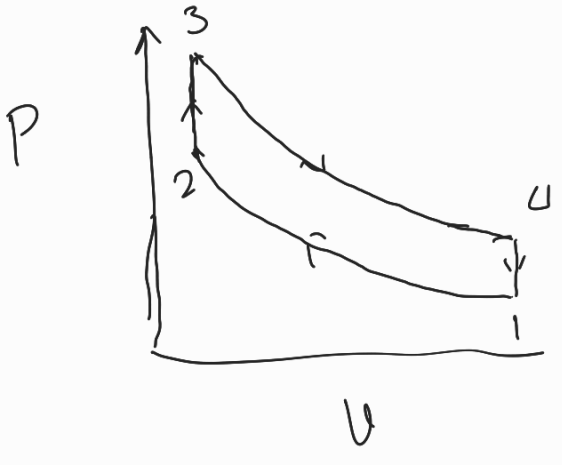
Piston Engine & Propeller

Piston engine ⟶ Power producing device

Propeller ⟶ thrust producing device.



Top dead Center.



Otto Cycle

1-2 isentropic Comp.

2-3 Content Vol. heat addition

3-4 Expension (isentropic)

4-1 Content vol. heat rejection.

1. Work mechanism.

4 – Stroke mechanism

1 power stroke for 2 revolutions of Crankshaft

2 – Stroke mechanism

1 power stroke for 1 revolution of Crank Shaft

Power developed by the engine.

$$P = \dot{m}_f \, Q_{cal} \, \eta_{th.} \qquad (25\% - 35\%)$$

$\eta_{th.}$ → thermal efficiency

Q_{cal} → Calorific value (44 MJ/kg)

$\dot{m}_f$ → mass flow rate of fuel.

$\dot{m}_{air}$

$$P = K(\rho_{air} \, V_C \, N) f \, \frac{Q_{cal} \, \eta_{th.}}{60}$$

f → fuel air ratio

ρ_{air} – density of air

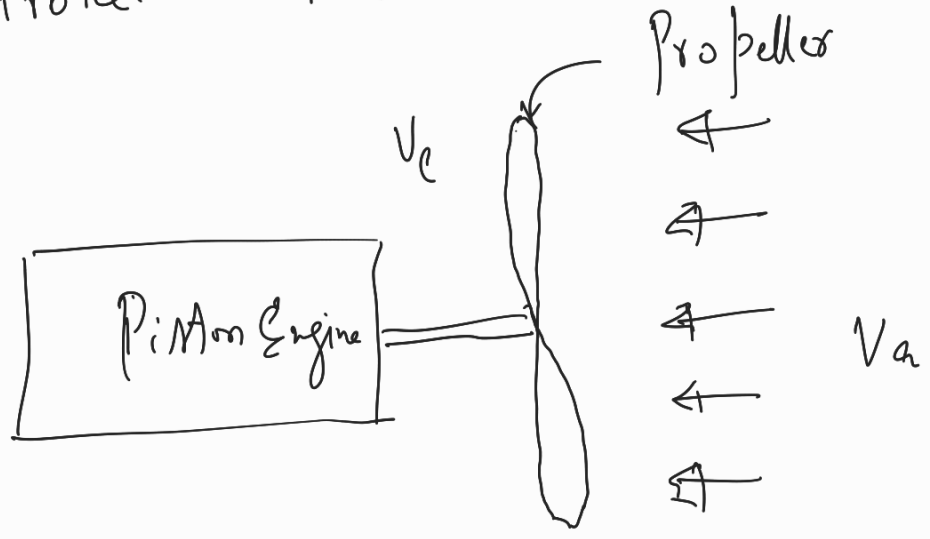
V_C – Vol. of the engine

N – rpm of the engine

K — 1 , 0.5

↓ ↓

2 Stroke. 4 stroke



$$P\eta_{Prop} = F \times V_a$$

Power → $P\eta_{Prop}$ → Propeller efficiency 70 - 80 %

$$F = \frac{P\eta_{Prop}}{V_a}$$

V_a → Va Velocity of Vehicle.

35 CC engine

Thrust Specific fuel Consumption.

$$TSFC = \dot{m}_f / F$$