

AE 234/711 Aircraft Propulsion

Quiz 3

Consider a 3-blade propeller, with a diameter of 3 m and an input power of 746 kW. Assume that the propeller is limited to a tip Mach number of 0.8.

1. Estimate the thrust, speed of the exit stream (downstream from the propeller), and rpm for static sea-level operation.

$V_a = 0 \text{ m/s}$, $\mathcal{T} = 21.3 \text{ kN}$, $w = 35.05 \text{ m/s}$, $V_e = 70.1 \text{ m/s}$, $\omega = 181.46 \text{ rad/s}$, $\text{rpm} = 1732.8$.

2. Estimate how the following change as the vehicle flies at a Mach number of 0.2 near sea-level conditions:

- (a) Permitted rpm

$\omega = 175.7 \text{ rad/s}$, $\text{rpm} = 1677$.

- (b) Thrust

$V_a = 68 \text{ m/s}$, $\mathcal{T} = 9.87 \text{ kN}$, $w = 7.54 \text{ m/s}$, $V_e = 83.12 \text{ m/s}$.

- (c) Range of values taken by the parameter ϕ if the hub radius is 20 % of the tip radius.

52° at the hub to 14.5° at the tip.