

Calculations

Reynolds Number

$$Re = (\rho V l) / \mu$$

$$Re = \underline{63\,530}$$

Force of Lift

$$Fl = \frac{1}{2} \rho A V^2 Cl$$

$$Fl = \frac{1}{2} \times 1.293 \times 0.903 \times 6^2 \times 1.491$$

$$Fl = \underline{31.34N}$$

Maximum Power Output

$$\text{Power} = \text{Current} \times \text{Voltage}$$

$$P = IV$$

$$P = 0.535A \times 6.72V$$

$$P = \underline{3.582W}$$

Coefficient of Power

$$Cp = P / (0.5 \rho A V^3)$$

$$Cp = 34.94 / 72.97$$

$$Cp = \underline{0.47}$$

Power

$$P = \frac{1}{2} \times \rho \times A \times V^3 \times Cp$$

$$P = \frac{1}{2} \times 1.293 \times 0.903 \times 6^3 \times 0.47$$

$$P = \underline{59.26W}$$

Measured Power Output

$$P = IV = 0.535 \times 6.72 = \underline{3.582W}$$

Revolutions Per Minute

$$RPM = \text{TSR} \times 60 \times V_{\text{wind}} / \pi \times D$$

$$RPM = 5 \times 60 \times 6 / 3.142 \times 0.557$$

$$RPM = \underline{971.42rpm}$$

Speed

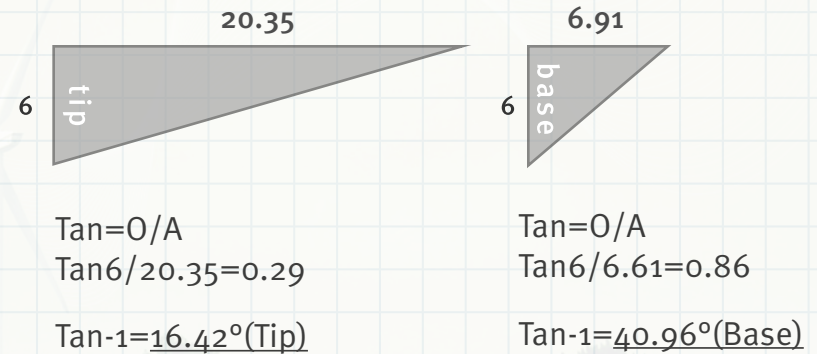
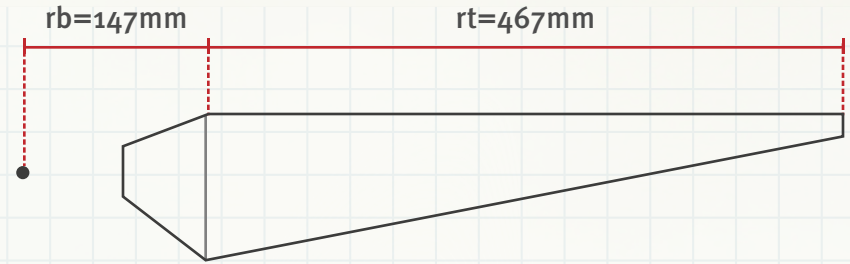
$$\text{Tip and Base Speed} = RPM \times \pi \times D / 60$$

$$\text{Tip Speed} = 971.42 \times \pi \times 0.41 / 60$$

$$\text{Tip Speed} = \underline{20.35m/s}$$

$$\text{Base Speed} = 971.42 \times \pi \times 0.147 / 60$$

$$\text{Base Speed} = \underline{6.91m/s}$$



$$\text{Angle of Twist} = 40.96 - 16.42$$

$$= \underline{24.54^\circ}$$