

$$(.30) E_k \text{ in}$$

$$\frac{1}{2} \dot{m} u^2$$

$$u = 20 \text{ knots}$$

$$\approx 10.2889 \text{ m/s}$$

$$d = 80 \text{ m}$$

$$A = \pi \frac{D^2}{4}$$

$$V = Au$$

$$\dot{m} = \rho V$$

$$\rho_{\text{air}} = 1.29 \frac{\text{kg}}{\text{m}^3}$$

$$T_{\text{air}} = 300 \text{ K} \quad P = 1 \text{ bar} \quad C_v = \frac{5R}{2}$$

$$\dot{m} = 1.29 \frac{\text{kg}}{\text{m}^3} \cdot \pi \frac{(80 \text{ m})^2}{4} \cdot 10.2889 \frac{\text{m}}{\text{s}}$$

$$\dot{m} = \boxed{66716 \frac{\text{kg}}{\text{s}}}$$

$$\dot{E}_k = \frac{1}{2} 66716 \frac{\text{kg}}{\text{s}} (10.2889 \frac{\text{m}}{\text{s}})^2$$

$$\dot{E}_k = 343217 \frac{\text{kg} \cdot \text{m}^2}{\text{s}^2} \left| \frac{1 \text{ N}}{1 \text{ kg} \cdot \text{m}} \right| = \boxed{343217 \text{ W}}$$

30% of E_k in

$$(.30) 343217 = \boxed{102965 \text{ W}} \text{ in}$$

$$P V_{\text{in}} = P V_{\text{out}} \Rightarrow P A u_{\text{in}} = P A u_{\text{out}}$$

$$u_{\text{out}} = \frac{P_{\text{in}}}{P} \frac{A_{\text{in}}}{A_{\text{out}}} u_{\text{in}}$$

Speed Dec. $u_{\text{out}} = \frac{A_{\text{in}}}{A_{\text{out}}} u_{\text{in}} = \frac{D_{\text{in}}^2}{D_{\text{out}}^2} \text{ in } u_{\text{in}}$

$$\dot{Q} + \dot{W}_s = \Delta U + P \Delta V + \Delta \dot{E}_k$$

No heat exchange $\therefore \dot{Q} = 0$

$$\dot{W}_s = \Delta U + P \Delta V + \Delta \dot{E}_k$$

$$u + Pv = h$$

$$\dot{W}_s = \dot{H} + \Delta \dot{E}_k$$