

Cameron Sutton

HW 2.2

17.30.) Given: Graph 17.11 shown in textbook

Airfoil chord length is 1.4m

Span = 6.8m

$V = 200 \text{ km/h} = 55.6 \text{ m/s}$

Determine: Find lift and drag at angle of attack of 10° at (a) 200m and (b) 10000m.

Solution: $\rho_{\text{air}} = 1.225 \text{ kg/m}^3$

$$A = (b)(c) \quad A$$

$$A = (6.8 \text{ m})(1.4 \text{ m})$$

$$A = 9.52 \text{ m}^2$$

a.) ρ_{air} at 200m is 1.202 kg/m^3

$C_L = .85$, from chart

$$F_L = C_L (\rho v^2 / 2) A$$

$$F_L = .85 ((1.202 \text{ kg/m}^3)(55.6 \text{ m/s})^2 / 2) 9.52 \text{ m}^2$$

$$F_L = 15034.2 \text{ kg} \cdot \text{m/s}^2$$

$$F_D = C_D (\rho v^2 / 2) A$$

$$F_D = .05 ((1.202 \text{ kg/m}^3)(55.6 \text{ m/s})^2 / 2) 9.52 \text{ m}^2$$

$$F_D = 884.4 \text{ kg} \cdot \text{m/s}^2$$

b) ρ_{air} at 10000m is $.4135 \text{ kg/m}^3$

$$F_L = C_L (\rho v^2 / 2) A$$

$$F_L = .85 ((.4135 \text{ kg/m}^3)(55.6 \text{ m/s})^2 / 2) 9.52 \text{ m}^2$$

$$F_L = 5171.9 \text{ kg} \cdot \text{m/s}^2$$

$$F_D = C_D (\rho v^2 / 2) A$$

$$F_D = .05 ((.4135 \text{ kg/m}^3)(55.6 \text{ m/s})^2 / 2) 9.52 \text{ m}^2$$

$$F_D = 304 \text{ kg} \cdot \text{m/s}^2$$