

9.94

9.94 A Piper Cub airplane has a gross weight of 1750 lb, a cruising speed of 115 mph, and a wing area of 179 ft². Determine the lift coefficient of this airplane for these conditions.

For equilibrium $\mathcal{L} = W = 1750 \text{ lb}$, where $\mathcal{L} = C_L \frac{1}{2} \rho U^2 A$
Thus, with $U = (115 \text{ mph}) \frac{(88 \frac{\text{ft}}{\text{s}})}{(60 \text{ mph})} = 169 \frac{\text{ft}}{\text{s}}$

$$C_L = \frac{\mathcal{L}}{\frac{1}{2} \rho U^2 A} = \frac{1750 \text{ lb}}{\frac{1}{2} (0.00238 \frac{\text{slugs}}{\text{ft}^3}) (169 \frac{\text{ft}}{\text{s}})^2 (179 \text{ ft}^2)} = \underline{\underline{0.288}}$$