9.103

9.103 A Piper Cub airplane has a gross weight of 1750 lb, a cruising speed of 115 mph, and a wing area of 179 ft^2. Determine the lift coefficient of this airplane for these conditions.

For equilibrium $\mathcal{L} = W = 1750\ \text{lb}$, where $\mathcal{L} = C_L \frac{1}{2}\rho V^2 A$

Thus, with $V = (115\ \text{mph})\frac{(88\ \frac{\text{ft}}{\text{s}})}{(60\ \text{mph})} = 169\ \frac{\text{ft}}{\text{s}}$

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