**9.85**

9.85 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 $\mathscr{L} = W = 1750$ lb, where $\mathscr{L} = C_L \frac{1}{2}\rho U^2 A$

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

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

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**9.86**

9.86 A light aircraft with a wing area of 200 ft² and a weight of 2000 lb has a lift coefficient of 0.40 and a drag coefficient of 0.05. Determine the power required to maintain level flight.

For equilibrium $\mathscr{L} = W = 2000 \text{ lb} = C_L \frac{1}{2}\rho U^2 A$

or

$2000 \text{ lb} = (0.40) \frac{1}{2}(0.00238 \frac{slugs}{ft^3}) U^2 (200 ft^2)$

Hence,

$U = 145 \frac{ft}{s}$

Also, $\mathscr{P} = \text{power} = \mathscr{D} U$, where

$\mathscr{D} = C_D \frac{1}{2}\rho U^2 A = (0.05)\frac{1}{2}(0.00238 \frac{slugs}{ft^3})(145 \frac{ft}{s})^2 (200 ft^2) = 250 \text{ lb}$

Note: This value of $\mathscr{D}$ could be obtained from

$\dfrac{W}{\mathscr{D}} = \dfrac{\mathscr{L}}{\mathscr{D}} = \dfrac{C_L}{C_D} = \dfrac{0.40}{0.05} = 8$, or $\mathscr{D} = \dfrac{W}{8} = \dfrac{2000 \text{ lb}}{8} = 250 \text{ lb}$

Thus,

$\mathscr{P} = 250 \text{ lb}(145 \frac{ft}{s}) = 3.63 \times 10^4 \frac{ft \cdot lb}{s}\left(\dfrac{1 \text{ hp}}{550 \frac{ft \cdot lb}{s}}\right) = \underline{\underline{65.9 \text{ hp}}}$