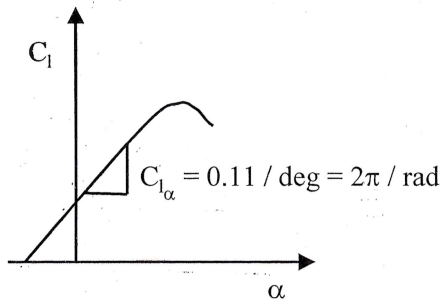


2-D Airfoils

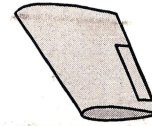


Lift $L \equiv C_L q S$ $C_L \equiv$ 2-D Airfoil Lift Coeff

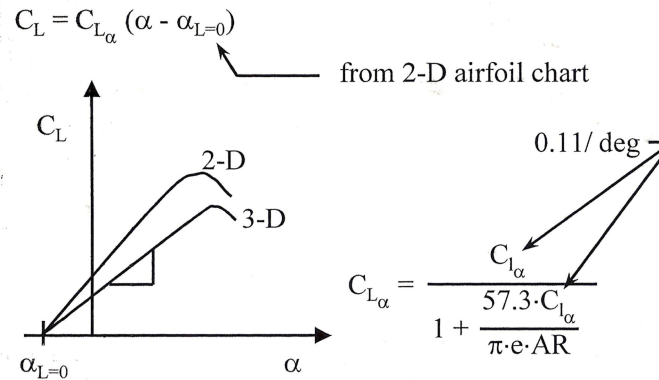
$C_L = C_{L\alpha} (\alpha - \alpha_{i=0})$ or Airfoil Charts (if available)



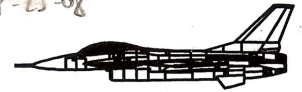
3-D Wings



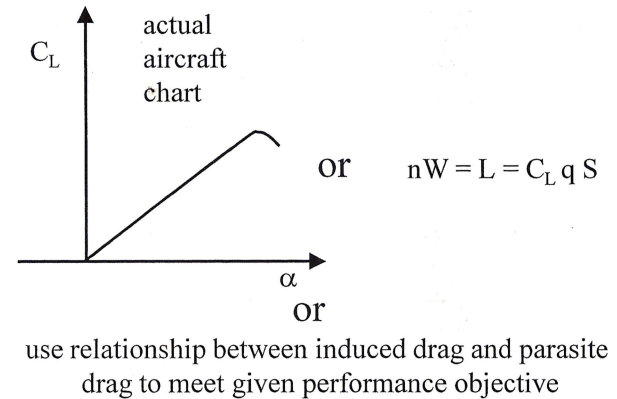
Lift $L \equiv C_L q S$ $C_L \equiv$ 3-D Wing Lift Coefficient



Whole Aircraft



Lift $L \equiv C_L q S$ $C_L \equiv$ Aircraft Lift Coefficient



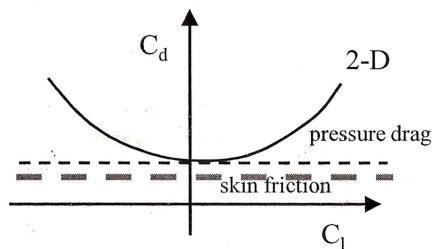
Drag

$D \equiv C_D q S$ $C_D \equiv$ 2-D Airfoil Drag Coeff

Profile Drag

Skin Friction Drag Pressure Drag

Airfoil charts



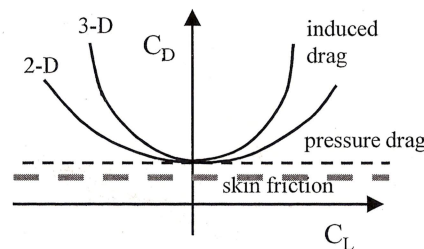
Drag

$D \equiv C_D q S$ $C_D \equiv$ 3-D Wing Drag Coefficient

$$C_D = C_d + k C_L^2$$

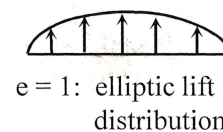
Profile Drag Coeff (2-D drag chart)
Note: $C_d = f(C_L)$

Induced Drag (drag due to lift)



$$k = \frac{1}{\pi \cdot e \cdot AR}$$

$e \equiv$ Span Efficiency Factor



Drag

$D \equiv C_D q S$ $C_D \equiv$ Aircraft Drag Coefficient

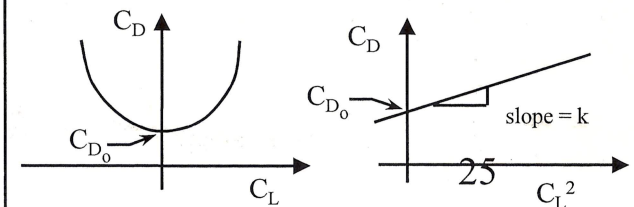
$$C_D = C_{D_0} + k C_L^2$$

Parasite Drag Coeff (zero-lift drag)
Note: $C_{D_0} \neq f(C_L)$

Induced Drag (drag due to lift)

$$k = \frac{1}{\pi \cdot e_o \cdot AR}$$

$e_o \equiv$ Oswald's Efficiency Factor



Lift and Drag Summary