

I. Axis Transfers

The external balance measures forces and moments with respect to the wind axes. The final coefficients are rotated to both the stability axes and the body axes. Refer to the Axes Diagram section on page 2 for diagrams of the wind, body, and stability axes. The stability axes equations are:

$$\begin{aligned}
 C_{L_{SA}} &= C_{L_{WA}} \\
 C_{D_{SA}} &= C_{D_{WA}} \cos \psi - C_{Y_{WA}} \sin \psi \\
 C_{M_{SAXX}} &= C_{M_{WAXX}} \cos \psi - \frac{b_{REF}}{(MAC)} C_{R_{WAXX}} \sin \psi \\
 C_{N_{SAXX}} &= C_{N_{WAXX}} \\
 C_{R_{SAXX}} &= C_{R_{WAXX}} \cos \psi + \frac{(MAC)}{b_{REF}} C_{M_{WAXX}} \sin \psi \\
 C_{Y_{SA}} &= C_{Y_{WA}} \cos \psi + C_{D_{WA}} \sin \psi
 \end{aligned}$$

The body axes equations are:

$$\begin{aligned}
 C_{L_{BA}} &= C_{L_{WA}} \cos \alpha_c + C_{D_{WA}} \cos \psi \sin \alpha_c - C_{Y_{WA}} \sin \psi \sin \alpha_c \\
 C_{D_{BA}} &= C_{D_{WA}} \cos \psi \cos \alpha_c - C_{L_{WA}} \sin \alpha_c - C_{Y_{WA}} \sin \psi \cos \alpha_c \\
 C_{M_{BAXX}} &= C_{M_{WAXX}} \cos \psi - \frac{b_{REF}}{(MAC)} C_{R_{WAXX}} \sin \psi \\
 C_{N_{BAXX}} &= C_{N_{WAXX}} \cos \alpha_c + C_{R_{WAXX}} \cos \psi \sin \alpha_c + \frac{(MAC)}{b_{REF}} C_{M_{WAXX}} \sin \psi \sin \alpha_c \\
 C_{R_{BAXX}} &= C_{R_{WAXX}} \cos \psi \cos \alpha_c + \frac{(MAC)}{b_{REF}} C_{M_{WAXX}} \sin \psi \cos \alpha_c - C_{N_{WAXX}} \sin \alpha_c \\
 C_{Y_{BA}} &= C_{Y_{WA}} \cos \psi + C_{D_{WA}} \sin \psi
 \end{aligned}$$

AXES DIAGRAMS

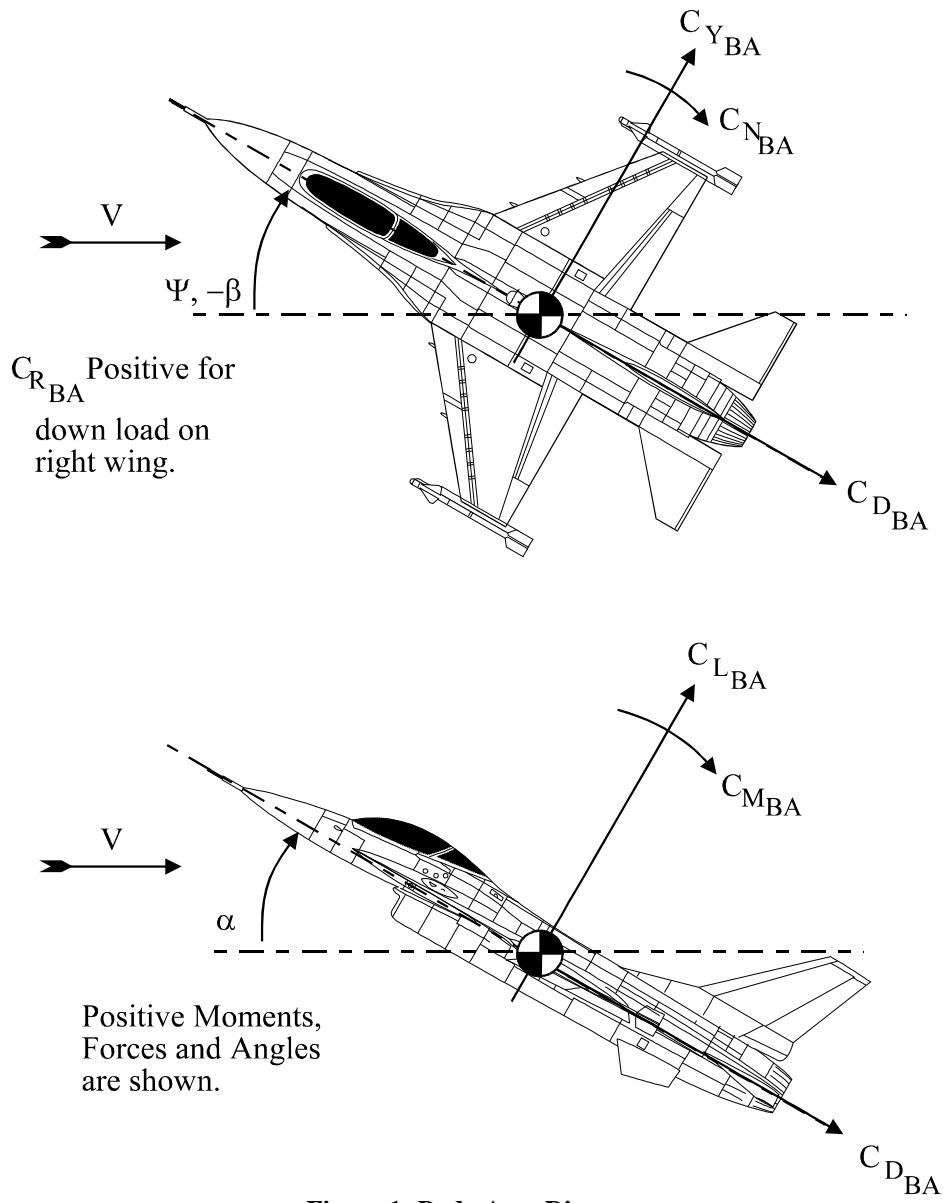


Figure 1: Body Axes Diagram

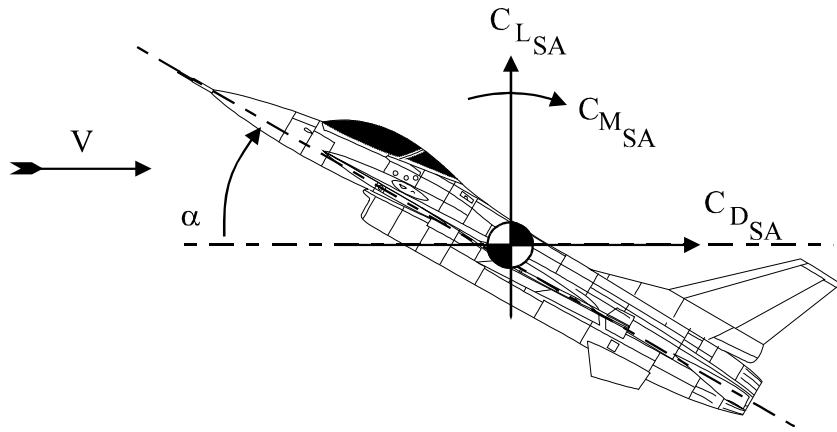
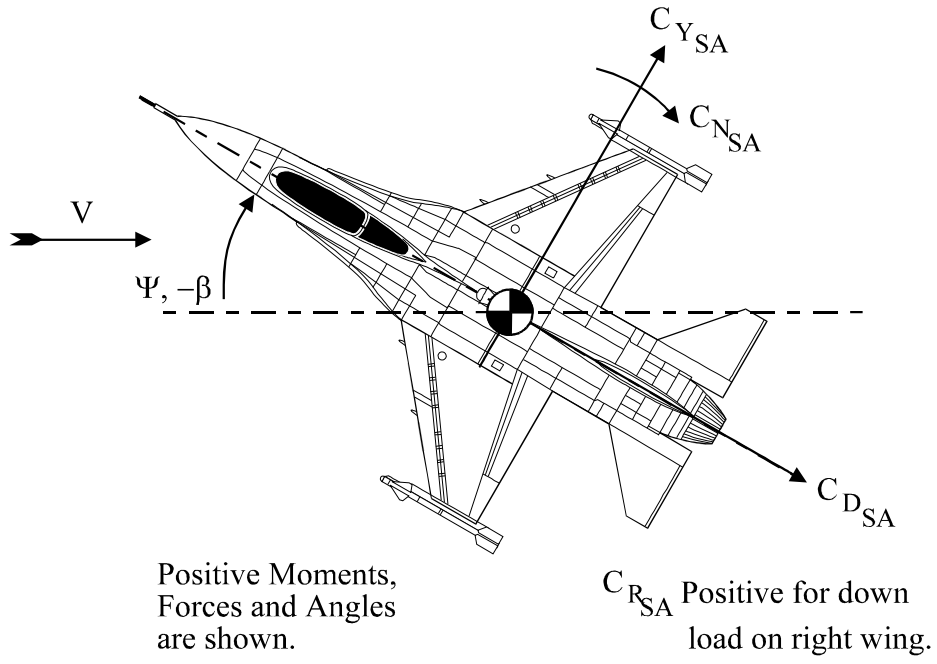
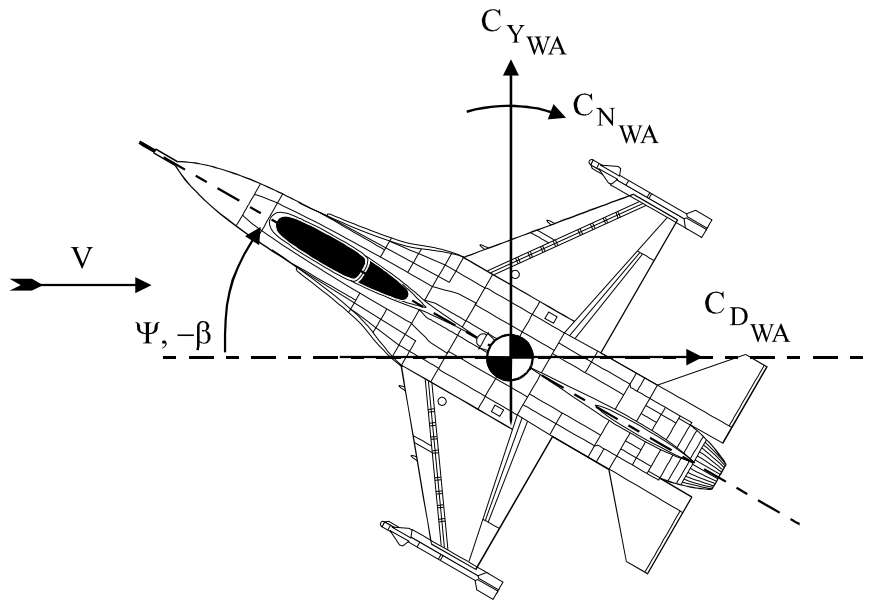


Figure 2: Stability Axes Diagram



Positive Moments,
Forces and Angles
are shown.

$C_{R_{WA}}$ Positive for down
load on right wing.

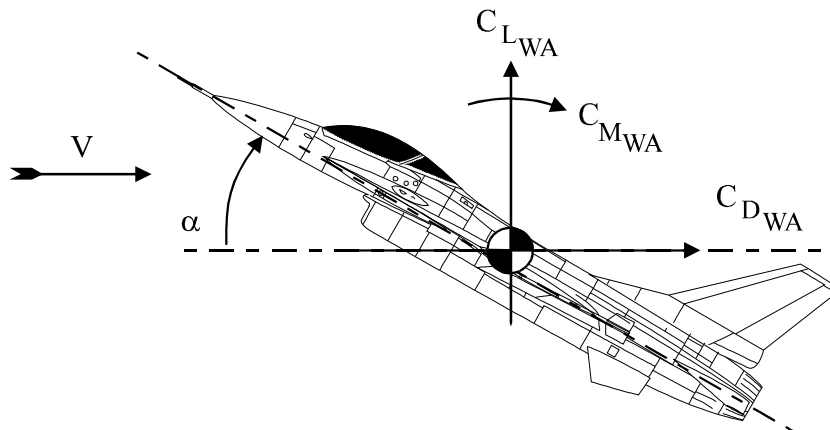


Figure 3: Wind Axes Diagram