

## Equilibrium equations

$$\boxed{+\uparrow \sum V = 0} \quad (I)$$

$$\text{Lift} \cdot \cos \gamma + (\text{Drag} + \text{Dragliner} + \text{Dragpilot}) \cdot \sin \gamma - W_{\text{wing}} - W_{\text{liner}} - W_{\text{gl}} - W_{\text{pilot}} = 0$$

$$\boxed{+\rightarrow \sum H = 0} \quad (II)$$

$$-\text{Lift} \cdot \sin \gamma + (\text{Drag} + \text{Dragliner} + \text{Dragpilot}) \cdot \cos \gamma = 0$$

$$\boxed{+\curvearrowright \sum M = 0} \quad (III)$$

Moments around  $C_p$ :

$$\begin{aligned} &-(C_{py} - G_y) W_{\text{wing}} \cdot \cos \alpha - (C_{pz} - G_z) W_{\text{wing}} \cdot \sin \alpha \\ &-(C_{py} - G_{Ly}) W_{\text{liner}} \cdot \cos \alpha - (C_{pz} - G_{Lz}) W_{\text{liner}} \cdot \sin \alpha \\ &-(C_{py} - P_y) W_{\text{pilot}} \cdot \cos \alpha - (C_{pz} - P_z) W_{\text{pilot}} \cdot \sin \alpha \\ &+(C_{py} - D_{Ly}) D_{\text{liner}} \cdot \sin \alpha + (C_{pz} - D_{Lz}) D_{\text{liner}} \cdot \cos \alpha \\ &+(C_{py} - P_y) D_{\text{pilot}} \cdot \sin \alpha + (C_{pz} - P_z) D_{\text{pilot}} \cdot \cos \alpha = 0 \end{aligned}$$

moments  
by vertical components

moments  
by horizontal  
components