

$$F_{Ab} = \begin{bmatrix} F_{Lb} & F_{Db} \end{bmatrix}^T = \frac{\rho S_1 v^2}{2} \begin{bmatrix} C_{L1} & C_{D1} \end{bmatrix}^T$$

$$L_b = \begin{bmatrix} F_{Zb} & F_{Xb} \end{bmatrix}^T = \begin{bmatrix} \cos \alpha & \sin \alpha \\ \sin \alpha & -\cos \alpha \end{bmatrix} F_{Ab}$$

$$F_{At} = \begin{bmatrix} F_{Lt} & F_{Dt} \end{bmatrix}^T = \frac{\rho S_2 v^2}{2} \begin{bmatrix} C_{L2} & C_{D2} \end{bmatrix}^T$$

$$L_{t} = \begin{bmatrix} F_{Zt} & F_{Xt} \end{bmatrix}^{T} = \begin{bmatrix} \cos \alpha & \sin \alpha \\ \sin \alpha & -\cos \alpha \end{bmatrix} F_{At}$$

对质心取力矩:

$$J\dot{\omega} = M = F_{Zb}l_1 - F_{Zt}(l_3\cos\theta + l_2) - F_{Xt}l_3\sin\theta$$

$$\diamondsuit M = 0$$

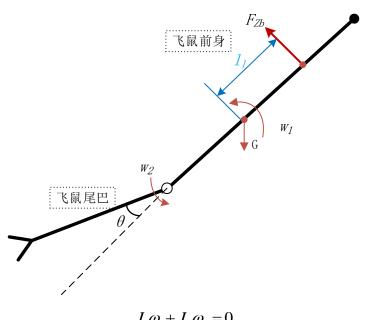
$$\exists \Gamma : \quad F_{Zb}l_1 - F_{Zt}(l_3\cos\theta + l_2) - F_{Xt}l_3\sin\theta = 0$$

$$F_{Zt}\cos\theta + F_{Xt}\sin\theta = \frac{F_{Zb}l_1 - F_{Zt}l_2}{l_3}$$

$$\diamondsuit: \quad \gamma = \arctan \frac{F_{Zt}}{F_{v}}$$

$$heta$$
=arcsin $\left(rac{F_{Zb}l_1-F_{Zi}l_2}{l_3 \parallel L_t \parallel^2}
ight)$ - γ //俯仰稳定目标值注:($lpha \propto arphi$)

接下来是多刚体调节: 以翼型主体为参考



$$\begin{split} J_1\omega_1 + J_2\omega_2 &= 0 \\ F_{Zb}l_1 + M_{_t} &= J_1 \frac{d\omega}{dt} \\ &\dot{\omega}_2 = \frac{F_{Zb}l_1 - J_1\dot{\omega}}{J_2} \\ &\dot{\frac{d\omega_2}{dt}} = &(F_{Zb}l_1 - J_1 \frac{d\omega}{dt})/J_2 \end{split}$$

速度控制:

$$\begin{cases} mg\sin(\alpha-\varphi)-F_{Dt}-F_{Db}=ma \\ v=v_0+at \end{cases} (速度大小增量)$$

$$a=g\sin(\alpha-\varphi)-\frac{F_{Dt}+F_{Db}}{m}$$

$$a=g\sin(\alpha-\varphi)-\frac{\rho v(C_{D1}S_1+C_{D2}S_2)}{2m}$$

$$mv\frac{d\alpha}{dt}=-mg\cos(\alpha-\varphi)+F_{Lb}+F_{Lt}(速度方向)$$

$$\frac{d\alpha}{dt}=-\frac{g\cos(\alpha-\varphi)}{v}+\frac{1}{2m}\rho v(C_{L1}S_1+C_{L2}S_2)$$