

$$\dot{v} = -g + \frac{F_L}{m}$$

$$\dot{\omega} = \frac{1}{I} T$$

$$\dot{p} = v$$

$$\sin \phi = \frac{v}{w}$$

$$\cos \phi = \frac{wR}{w}$$

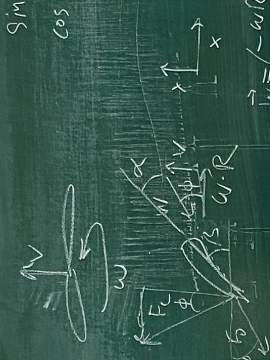
$$\vec{F}_L = F_L \begin{pmatrix} -\sin \phi \\ \cos \phi \end{pmatrix}$$

$$\vec{F}_D = F_D \begin{pmatrix} -\cos \phi \\ -\sin \phi \end{pmatrix}$$

$$T = R \cdot (-\sin \phi F_L - \cos \phi F_D)$$

$$F = \cos \phi F_L - \sin \phi F_D$$

$$w = \sqrt{v^2 + wR^2}$$



Flow Angle $\phi = \arctan(\frac{v}{wR})$

Pitch α

$\alpha = \beta - \phi$



$$F_L = \frac{1}{2} \rho A w^2 C_L(\alpha)$$

$$F_D = \frac{1}{2} \rho A w^2 C_D(\alpha)$$

$$C_L(\alpha) = \overline{C}_L - \alpha$$

$$C_D(\alpha) = C_{D0} + \overline{C}_D \cdot C_L(\alpha)^2$$

INDUCED DRAG

VS