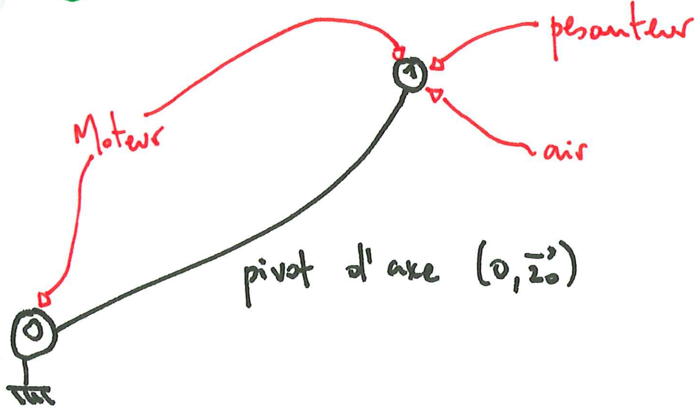
Hélice de ventilateur

1



$$\{0 \xrightarrow{P} 1\} = \begin{cases} \vec{R}_{0 \xrightarrow{P} 1} = X_{01} \cdot \vec{x_0} + Y_{01} \cdot \vec{y_0} + Z_{01} \cdot \vec{z_0} \\ \vec{M}_{O,0 \xrightarrow{P} 1} = L_{01} \cdot \vec{x_0} + M_{01} \cdot \vec{y_0} \pm C_r \cdot \vec{z_0} \underbrace{- f \cdot \dot{\theta} \cdot \vec{z_0}}_{= -f \cdot \vec{\Omega}_{1/0}} \end{cases}_O$$

f : coefficient de frottement visqueux $(N.m/(rad/s))$
C_r : " " " sec $(N.m)$

2 J'isole 1 soumis aux actions mécaniques extérieures suivantes :

- $0 \xrightarrow{P} 1$
- $0 \xrightarrow{mot} 1$
- $air \longrightarrow 1$
- $pes \longrightarrow 1$

J'écris le th. des moments en G et en projection sur $\vec{z_0}$:

$$\underbrace{\vec{M}_{G,0 \xrightarrow{P} 1} \cdot \vec{z_0}}_{\pm C_r - f \cdot \dot{\theta}} + \underbrace{\vec{M}_{G,0 \xrightarrow{mot} 1} \cdot \vec{z_0}}_{C_m} + \underbrace{\vec{M}_{G,pes \longrightarrow 1} \cdot \vec{z_0}}_{0} + \underbrace{\vec{M}_{G,air \rightarrow 1} \cdot \vec{z_0}}_{-f_{air} \cdot \dot{\theta}} = \vec{\delta}_{G,1/0} \cdot \vec{z_0}$$

$$\vec{\delta}_{G,1/0} \cdot \vec{z_0} = \frac{d}{dt}\left(\vec{\sigma}_{G,1/0}\right)_0 \cdot \vec{z_0} + (m \cdot \underbrace{\vec{V}_{G/0} \wedge \vec{V}_{G \in 1/0}}_{=\vec{0} \text{ car } \hat{m} \text{ vitesse}}) \cdot \vec{z_0}$$

$$= \frac{d}{dt}\left(\vec{\sigma}_{G,1/0} \cdot \vec{z_0}\right)$$

Et
$$\vec{\sigma}_{G,1/0} \cdot \vec{z_0} = (I(G,1) \cdot \overbrace{\vec{\Omega}_{1/0}}^{= \dot{\theta} \cdot \vec{z_{01}}}) \cdot \vec{z_0} + (m \cdot \underbrace{\cancel{\vec{GG}} \wedge \vec{V}_{G \in 1/0}}_{= \vec{0}}) \cdot \vec{z_0}$$

$$= \left[\begin{bmatrix} A & -F & -E \\ \vdots & B & -D \\ Sym.. & & C \end{bmatrix}_1 \cdot \begin{bmatrix} 0 \\ 0 \\ \dot{\theta} \end{bmatrix}_1 \right] \cdot \vec{z_0}$$

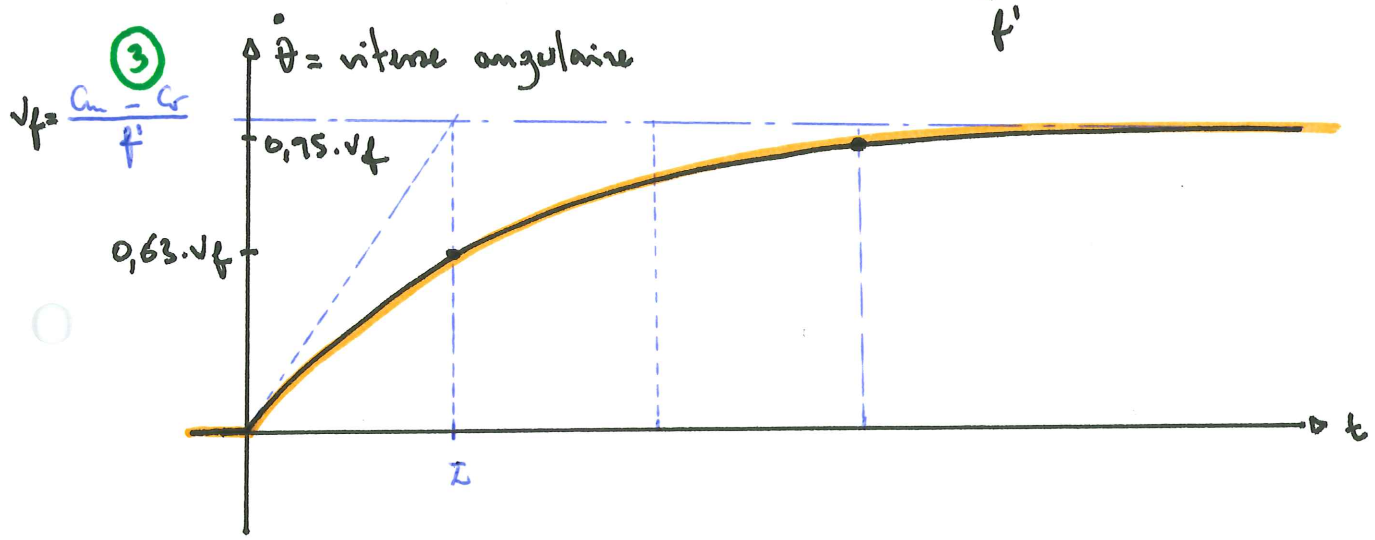
$$\vec{T}_{G,1/0} \cdot \vec{z_0} = \left(-E.\dot{\theta}.\vec{x_1} - D.\dot{\theta}.\vec{y_1} + C.\dot{\theta}.\vec{z_1} \right) . \vec{z_{01}}$$

$$= C.\dot{\theta}$$

donc $\vec{\delta}_{G,1/0} \cdot \vec{z_0} = C.\ddot{\theta}$

On a donc : $C_m \pm C_r = C.\ddot{\theta} + \underbrace{(f + f_{air})}_{f'} . \dot{\theta}$

③



$$\frac{C_m \pm C_r}{C} = \underbrace{\ddot{\theta}}_{rad/s^2} + \underbrace{\frac{f'}{C}}_{s^{-1} = \frac{1}{\tau}} . \underbrace{\dot{\theta}}_{rad/s}$$