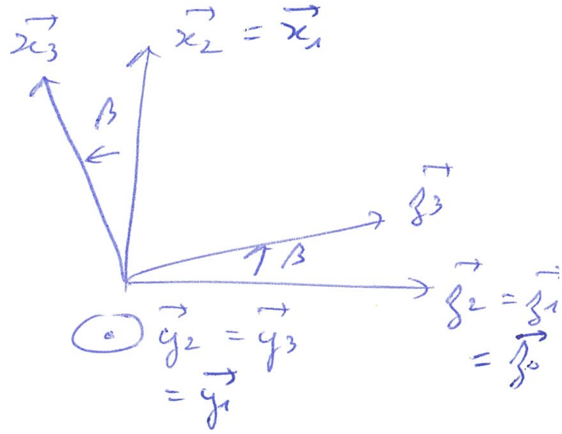
Exo 1 — Correction DS



Q1 $\vec{v}(G \in 3/0) =$

$$\vec{OG} = \lambda \vec{z_0} + a \vec{x_1} + l \vec{x_3}$$

$$\left(\frac{d\vec{x_3}}{dt}\right)_0 = \left(\frac{d\vec{x_3}}{dt}\right)_2 + \vec{\Omega}^{2/0} \wedge \vec{x_3}$$

$$= -\dot{\beta} \vec{z_3} + \dot{\alpha} \vec{z_1} \wedge \vec{x_3}$$

$$= -\dot{\beta} \vec{z_3} + \dot{\alpha} \cos\beta \, \vec{y_2} \qquad (\times l)$$

$$\vec{v}(G \in 3/0) = \dot{\lambda} \vec{z_0} + a \dot{\alpha} \vec{y_1} - l \dot{\beta} \vec{z_3} + l \dot{\alpha} \cos\beta \, \vec{y_2}$$

$$\left(\frac{d\vec{z_3}}{dt}\right)_0 = \left(\frac{d\vec{z_3}}{dt}\right)_2 + \vec{\Omega}^{2/0} \wedge \vec{z_3}$$

$$= \dot{\beta} \vec{x_3} + \dot{\alpha} \vec{z_1} \wedge \vec{z_3}$$

$$= \dot{\beta} \vec{x_3} + \dot{\alpha} \sin\beta \, \vec{y_2} \qquad (\times -l\dot{\beta})$$

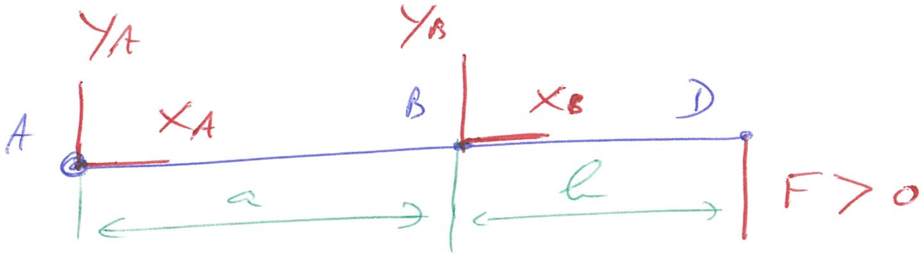
$$\vec{a}(G \in 3/0) = \ddot{\lambda} \vec{z_0} + a \ddot{\alpha} \vec{y_1} - a \dot{\alpha}^2 \vec{x_1} - l \ddot{\beta} \vec{z_3}$$

$$- l \dot{\beta}^2 \vec{x_3} - l \dot{\alpha} \dot{\beta} \sin\beta \, \vec{y_2} + l \ddot{\alpha} \cos\beta \, \vec{y_2} - l \dot{\alpha} \dot{\beta} \sin\beta \, \vec{y_2}$$

$$- l \dot{\alpha}^2 \cos\beta \, \vec{x_2}$$

② **EXO 2**

<u>On isole ②</u>



$$\begin{cases} Y_A + Y_B = F \\ X_A + X_B = 0 \\ Y_B \times a - F \times (a+l) = 0 \end{cases}$$

(actions sur (2))

$$\Rightarrow Y_B = \frac{a+l}{a} \cdot F$$

$$Y_A = F - Y_B = -\frac{l}{a} F$$

<u>On isole ①</u> : solide soumis à 2 forces
(solide ① orienté à 45°)

<u>Rem :</u> Y_B et X_B actions de (1) → (2).

$$X_B = Y_B$$

X_C et Y_C actions de (0) → (1).

$$X_C = X_B = Y_C = Y_B$$

③ **Pb** <u>Exosquelette lombaire</u>

(Q1) Avec 60 N, on divise par 2 les pressions...

(Q2) Avant 20 %

Milieu 45 %

Arrière 25 %

(Q3) $\vec{OC} + \vec{CD} = \vec{OE} + \vec{ED}$

$h\vec{y} + b\vec{x_3} = a\vec{x} + l_2\vec{y_2}$

$\vec{x_3} = \cos\varphi\,\vec{x} + \sin\varphi\,\vec{y}$ $(\times b)$

$\vec{y_2} = -\sin\beta\,\vec{x} + \cos\beta\,\vec{y}$ $(\times l_2)$

$$\begin{cases} b\cos\varphi = a - l_2\sin\beta \\ h + b\sin\varphi = l_2\cos\beta \end{cases}$$

$l_2\cos\beta = h + b\sin\varphi$

$l_2\sin\beta = a - b\cos\varphi$

$$l_2(t) = \sqrt{(h + b\sin\varphi) + (a - b\cos\varphi)^2}$$

(Q4) $a = 100$ mm ; $b = 150$ mm ; $h_0 = 100$ mm ; $\Delta h = 50$ mm.

à $t = 0 \Rightarrow \varphi = 0 \Rightarrow l_2 = 111,8$ mm

à $t = T \Rightarrow \varphi = 20° \Rightarrow l_2 = 205,4$ mm

$\Rightarrow \Delta l_2 = 205,8 - 111,8 = 93,6$ mm.