

**EXO 1** Chariot filoguidé

Q1)  $\vec{BA} = a \vec{y}_1 \Rightarrow \vec{v}(AE^{1/0}) = -a \dot{\alpha} \vec{x}_1$

$\vec{a}(AE^{1/0}) = -a \ddot{\alpha} \vec{x}_1 - a \dot{\alpha}^2 \vec{y}_1$

Q2)  $\vec{BC} = c \vec{z}_2$

$\left(\frac{d\vec{z}_2}{dt}\right)_0 = \left(\frac{d\vec{z}_2}{dt}\right)_1 + \Omega^{1/0} \wedge \vec{z}_2 = \dot{\beta} \vec{x}_2 + \dot{\alpha} \vec{z}_1 \wedge \vec{z}_2$   
 $= \dot{\beta} \vec{x}_2 + \dot{\alpha} \sin \beta \vec{y}_1$

$\Rightarrow \vec{v}(CE^{2/0}) = c \dot{\beta} \vec{x}_2 + c \dot{\alpha} \sin \beta \vec{y}_1$

$\left(\frac{d\vec{x}_2}{dt}\right)_0 = \left(\frac{d\vec{x}_2}{dt}\right)_1 + \Omega^{1/0} \wedge \vec{x}_2 = -\dot{\beta} \vec{z}_2 + \dot{\alpha} \vec{z}_1 \wedge \vec{x}_2$   
 $= -\dot{\beta} \vec{z}_2 + \dot{\alpha} \cos \beta \vec{y}_1$

$\vec{a}(CE^{2/0}) = c \ddot{\beta} \vec{x}_2 - c \dot{\beta}^2 \vec{z}_2 + 2c \dot{\alpha} \dot{\beta} \cos \beta \vec{y}_1 + c \ddot{\alpha} \sin \beta \vec{y}_1 - c \sin \beta \dot{\alpha}^2 \vec{x}_1$

**Pl.** Escosquelette lombaire

Q1) 50 N permet de diminuer la pression de 0,5 à 0,25 N

Q2) Avant → 22% ; Italien → 48% ; Américain → 25%.

Q3)  $\vec{OC} + \vec{CD} = \vec{OB} + \vec{ED} \Rightarrow k \vec{y}_1 + l \vec{x}_3 = a \vec{x}_1 + l_2 \vec{y}_2$

$\Rightarrow \begin{cases} l \cos \varphi = a - l_2 \sin \beta \\ k + l \sin \varphi = l_2 \cos \beta \end{cases} \Rightarrow \begin{cases} l_2 \sin \beta = a - l \cos \varphi \\ l_2 \cos \beta = k + l \sin \varphi \end{cases}$

$l_2 = \sqrt{(k + l \sin \varphi)^2 + (a - l \cos \varphi)^2}$

$\Delta l_2 = l_{2max} - l_{2min} = 205,4 - 111,8 = 93,6 \text{ mm}$