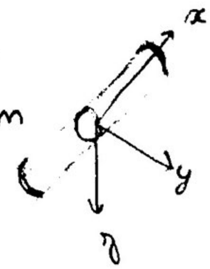
$w = 0{,}12$ m

$\ell = 1$ m

$x = \frac{\ell}{2} = 0{,}5$ m

$z = y = \frac{w}{2} = 0{,}06$ m




$$I = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{pmatrix}$$

$$I = \int_V \rho(x,y,z) \begin{pmatrix} y^2+z^2 & -xy & -xz \\ -xy & x^2+z^2 & -yz \\ -xz & -yz & x^2+y^2 \end{pmatrix} dx\,dy\,dz$$

où
$$\begin{cases} V = \left[-\frac{\ell}{2}, \frac{\ell}{2}\right] \times \pi \times \left[0, \frac{w}{2}\right]^2 \\ \forall (x,y,z) \in V \quad \rho(x,y,z) = \rho \in \mathbb{R} \\ m = \rho V = \rho \ell \pi \frac{w^2}{4} \end{cases}$$

$$I = \begin{pmatrix} \frac{1}{2} m R^2 & 0 & 0 \\ 0 & \frac{1}{4} m R^2 + \frac{1}{3} m H^2 & 0 \\ 0 & 0 & \frac{1}{4} m R^2 + \frac{1}{3} m H^2 \end{pmatrix}$$

où $R = \frac{w}{2}$, $H = \frac{\ell}{2}$

On suppose que l'AUV est inertiellement symétrique (m̂ si le propulseur arrière vient fausser cette symétrie en rota° autour de l'axe y) + inertie dynamique (=qui évolue dr de tps car propulseurs reconfigurables)

$r_p = \frac{w_p}{2}$

$h_p = \frac{\ell_p}{2}$

$$\boxed{\begin{array}{l} w_p = 0{,}04 \text{ m} \\ \ell_p = 0{,}10 \text{ m} \end{array}}$$

| i | right 1 | left 2 | rear 3 |
|---|---|---|---|
| q(i) | $\begin{pmatrix} 0 \\ a \\ 0 \end{pmatrix}$ | $\begin{pmatrix} 0 \\ -a \\ 0 \end{pmatrix}$ | $\begin{pmatrix} -b \\ 0 \\ 0 \end{pmatrix}$ |
| d(i) | $\begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$ | $\begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix}$ | $\begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$ |
| | $\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ $\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$ | $\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ $\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$ | $\begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$ $\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$ |

$a = R + r_p = \frac{w}{2} + \frac{w_p}{2}$

$b = H + h_p = \frac{\ell}{2} + \frac{\ell_p}{2}$

→ coef de traînée et portance à trouver

$$f_r = \begin{pmatrix} 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 \end{pmatrix} \begin{pmatrix} f_{1x} \\ f_{1y} \\ f_{2x} \\ f_{2y} \\ f_{3y} \\ f_{3y} \end{pmatrix}$$

$$\tau_r = \begin{pmatrix} q(1) \wedge d(1) & \cdots & q(6) \wedge d(6) \end{pmatrix} \overbrace{\begin{pmatrix} f_{1x} \\ f_{1y} \\ f_{2x} \\ f_{2y} \\ f_{3y} \\ f_{3y} \end{pmatrix}}^{=f}$$

$$= \begin{pmatrix} a & 0 & -a & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & b & 0 \\ 0 & -a & 0 & a & 0 & -b \end{pmatrix}$$

$$\begin{pmatrix} f_r \\ \tau_r \end{pmatrix} = \underbrace{\begin{pmatrix} 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ a & 0 & -a & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & b & 0 \\ 0 & -a & 0 & a & 0 & -b \end{pmatrix}}_{=C} f$$

$$f = C^{-1} \begin{pmatrix} f_r \\ \tau_r \end{pmatrix}$$