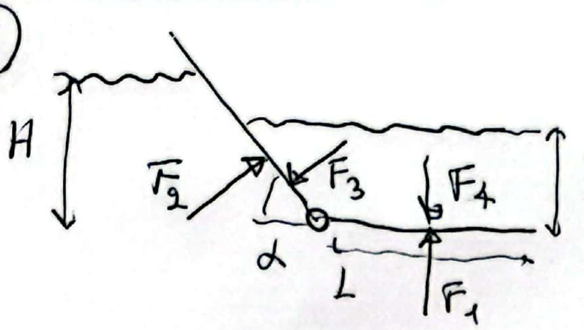
1



$F_1 = \rho g H L b \qquad b_1 = L/2$

$F_2 = \rho g \dfrac{H^2 b}{2\sin\alpha} \qquad b_2 = \dfrac{H}{3\sin\alpha}$

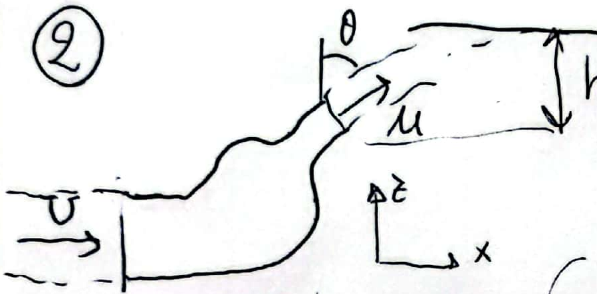
$F_3 = \rho_1 g \dfrac{h^2 b}{2\sin\alpha} \qquad b_3 = \dfrac{h}{3\sin\alpha}$

$F_4 = \rho_1 g h L b \qquad b_4 = L/2$

$$F_1 b_1 + F_3 b_3 = F_2 b_2 + F_4 b_4$$

$$\rho_1 = \rho \frac{\dfrac{H^3}{3\sin^2\alpha} - HL^2}{\dfrac{h^3}{3\sin^2\alpha} - hL^2} = 3272{,}8\ kg/m^3$$

2



$u\cos\theta = \sqrt{2gh} \Rightarrow u = 10\ m/s$

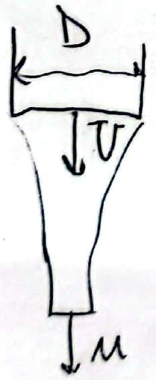
$U = u\left(\dfrac{d}{D}\right)^2 = 0.225\ m/s$

$F_x = -\rho U^2 \dfrac{\pi D^2}{4} + \rho u^2 \sin\theta \dfrac{\pi d^2}{4} - (p - p_0)\dfrac{\pi D^2}{4}$

$F_z = \rho g V + \rho u^2 \cos\theta \dfrac{\pi d^2}{4} = 36.2\ N$

$p \simeq p_0$

3



$U = \dfrac{\dot{m}4}{\pi D^2} = 0.05\ m/s \qquad \dfrac{U^2}{2} + \dfrac{p_0}{\rho} + gh = \dfrac{u^2}{2} + \dfrac{p_0}{\rho}$

$u = \sqrt{U^2 + 2gh} \simeq 2.21\ m/s$

con. massa $\longrightarrow d = D\sqrt{\dfrac{U}{u}} = 3\ mm$

4

$$\tau(x) = \mu \frac{\partial u}{\partial y}\Big|_{y=0} = \frac{3}{2}\frac{\mu U}{\delta(x)} = \frac{3\mu U}{16\cdot 10^{-3}\, x^{1/2}}$$

$$F = \int_S \tau\, dS = \frac{3\mu U b}{16\cdot 10^{-3}} \int_0^L \frac{dx}{x^{1/2}} = \frac{3\mu U b\sqrt{L}}{8\cdot 10^{-3}} = 282\ N$$

5

Se la pressione è strettamente costante $F = \int_V \frac{dP}{dz} dV = 0$. Come esempio, nei viaggi spaziali, dove non ci sono forze di volume, non c'è la spinta di Archimede