1) TIEMPO DE COMBUSTIÓN = t_b ?

3'5

$$\varepsilon = \frac{\Gamma(\gamma)}{\left(\frac{p_s}{p_c}\right)^{1/\gamma}\sqrt{\frac{2\gamma}{\gamma-1}\left[1-\left(\frac{p_s}{p_c}\right)^{\frac{\gamma-1}{\gamma}}\right]}} \rightarrow \left(\frac{p_s}{p_c}\right) = \left\{\frac{\Gamma(\gamma)}{\varepsilon\sqrt{\frac{2\gamma}{\gamma-1}\left[1-\left(\frac{p_s}{p_c}\right)^{\frac{\gamma-1}{\gamma}}\right]}}\right\}^{\gamma}$$

Con $p_s/p_c\big|_0 = 0'01$ e iterando ... $\frac{p_s}{p_c} = 0'01255$

$$p_c = \frac{p_s}{0'01255} = 2'02 \text{ MPa}$$

$$\dot{r} = a \cdot p_c^{\,n} = 4\cdot 10^{-6}\cdot (2'02\cdot 10^6)^{0'7} = 0'104 \text{ m/s}$$

$$t_b = L/r_a = 1'6/0'104 = 15'4 \text{ s} \rightsquigarrow \boxed{t_b = 15'4 \text{ s}}$$

1'5 2) ÁREA DE LA GARGANTA, A_g

$$c^* = \frac{\sqrt{R_g T_c}}{\Gamma(\gamma)} = 1324'6 \text{ m/s}$$

$$\dot{m} = \dot{r}\cdot A_b \cdot \rho_p = 0'104\cdot 8\cdot 10^{-3}\cdot 1600 = 1'33 \text{ kg/s}$$

$$A_g = \frac{c^*\cdot \dot{m}}{p_c} = 8'71\cdot 10^{-4} \text{ m} \rightsquigarrow \boxed{A_g = 8'71\cdot 10^{-4} \text{ m}}$$

1'5 3) EMPUJE, E

$$C_c \overset{\text{(adapt.)}}{=} \Gamma(\gamma)\sqrt{\frac{2\gamma}{\gamma-1}\left[1-\left(p_s/p_c\right)^{\frac{\gamma-1}{\gamma}}\right]} = 1'618 \rightsquigarrow$$

$$\rightsquigarrow E = p_c\cdot A_g\cdot C_c \rightsquigarrow \boxed{E = 2840 \text{ N}}$$

3'5 4)

$$A_{b_1}(y) = 2\pi y L$$

$$\dot{r} = \frac{dy}{dt} = a_2 [p(y)]^n = a_2 \cdot \left[\rho_p a_2 C^* \cdot \frac{A_b(y)}{A_0} \right]^{\frac{n}{1-n}} =$$

$$= a_2^{\frac{1}{1-n}} \cdot \left[\rho_p \frac{C^* \cdot 2\pi \cdot L}{A_0} \right]^{\frac{n}{1-n}} \cdot y^{\frac{n}{1-n}} \cdot \frac{dy}{dt} \rightsquigarrow$$

$$a_2^{\frac{1}{1-n}} \left[\left(\frac{\rho_p C^* 2\pi L}{A_0} \right)^{\frac{n}{1-n}} \cdot dt = y^{\frac{-n}{1-n}} dy = y^{\frac{n}{n-1}} dy \right.$$

$$\int_0^{t_b} \int_{y_{int}}^{y_{ext}} a_2^{\frac{1}{1-n}} \left[\rho_p \frac{C^* 2\pi L}{A_0} \right]^{\frac{n}{1-n}} \cdot t_b = \frac{n-1}{2n-1} y^{\frac{2n-1}{n-1}} \Big|_{R_i}^{R_e} \rightsquigarrow$$

$$a_2 = 9'4 \cdot 10^{-8}$$