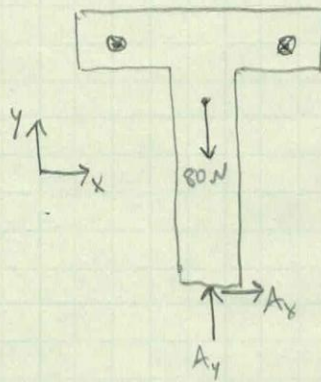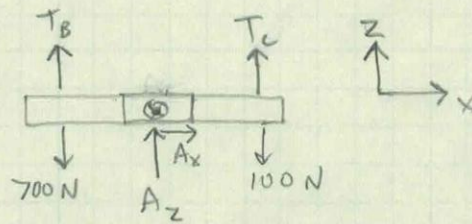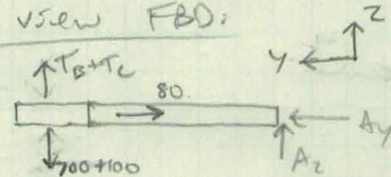Top View FBD:

End View FBD:

Side view FBD:

From top view:

$$\Sigma F_x = 0 \rightarrow A_x = 0$$

$$\Sigma F_y = 0 \rightarrow A_y - 80\,N = 0$$

$$\therefore A_y = 80\,N$$

From end view:

Moments about y-axis:

$$\Sigma M_y = 0 \rightarrow -700 \cdot 0.2 + T_B \cdot 0.2 - T_C \cdot 0.2 + 100 \cdot 0.2 = 0$$

$$\therefore T_B - T_C = 600 \qquad \text{①}$$

$$\Sigma F_y = 0 \rightarrow T_B + T_C + A_z - 800 = 0$$

From side view:

Moments about x-axis:

$$\Sigma M_x = 0 \rightarrow T_B \cdot 0.55 + T_C \cdot 0.55 - 700 \cdot 0.55 - 100 \cdot 0.55 = 0$$

$$\therefore T_B + T_C = 800 \qquad \text{②}$$

Adding equation ① to ② gives:

$$2T_B = 1400 \qquad \therefore \boxed{T_B = 700\,N \qquad T_C = 100\,N}$$

Therefore:

$$A_z = 800 - 700 - 100 = 0$$

$$\therefore \boxed{\vec{A} = (80\,N)\hat{\jmath}}$$

(a) Nosecone:

$$W = \gamma_p \cdot \frac{1}{3}\pi \left(\frac{d}{2}\right)^2 h = 0.043 \cdot \frac{1}{3}\pi \cdot (2in)^2 \cdot 20 \, in$$

$$= \underline{3.60 \, lb}$$

$$\bar{x} = \frac{3}{4}h = \frac{3}{4} \cdot 20 \, in = \underline{15 \, in}$$

Body tube outer:

$$W = \gamma_f \cdot \pi \left(\frac{d}{2}\right)^2 \cdot L = 0.065 \cdot \pi \left(2 \, in\right)^2 \cdot 60 \, in$$

$$= \underline{49.01 \, lb}$$

$$\bar{x} = 20 \, in + \frac{L}{2} = 20 + \frac{60}{2} = \underline{50 \, in}$$

Body tube inner:

$$W = -0.065 \cdot \pi \left(\frac{3.875 \, in^2}{2}\right) \cdot 60 \, in = \underline{-45.99 \, lb}$$

$$\bar{x} = 20 \, in + \frac{L}{2} = \underline{50 \, in}$$

Composite c.g.:

	W (lb)	$\bar{x}$ (in)	$\bar{x}W$ (in-lb)
Nosecone	3.60	15	54
B.T. outer	49.01	50	2450.5
B.T. inner	-45.99	50	-2299.5

$$\bar{X} = \frac{\Sigma \bar{x}W}{\Sigma W} = \boxed{30.47 \, in}$$

(b) Yes, the c.g. will change. Use same table as before but eliminate inner body tube:

$$\bar{X} = \frac{\Sigma \bar{x}W}{\Sigma W} = \boxed{47.61 \, in}$$