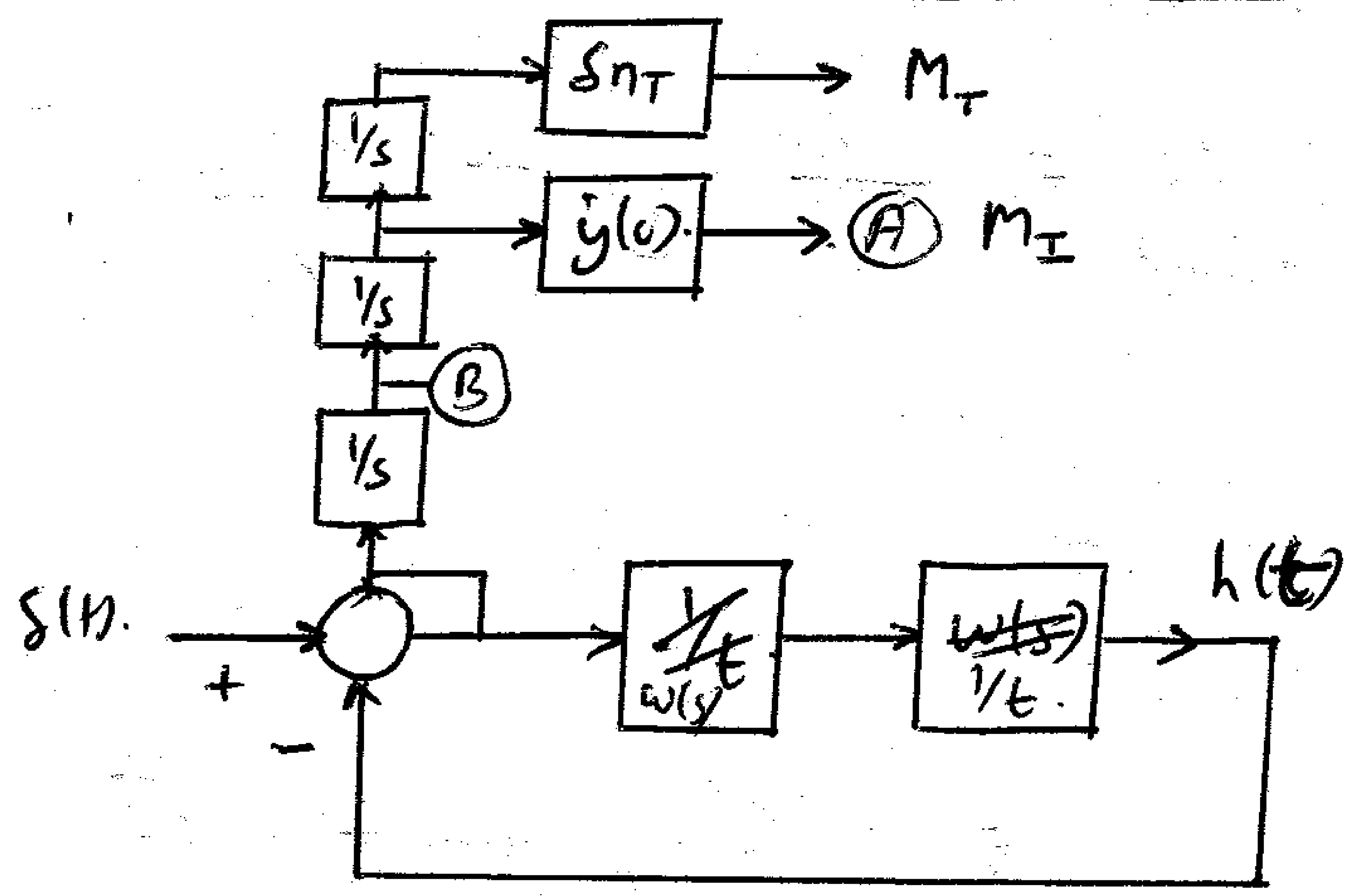

Let $w(t)$ denote the Laplace inverse of $W(s)$, & let $H(s)$ denote the Laplace transform of $h(t)$.

Then, in the feedback loop, we have

$$h(t) = \frac{1}{t}\, w * (\delta - h)(t), \quad * \text{ denotes convolution}$$

$$\therefore\ t h(t) = w * (\delta - h)(t).$$

$$\therefore\ \mathcal{L}(t h(t)) = -\frac{d}{ds} H(s) = W(s)\,(1 - H(s)).$$

$$\therefore\ \frac{-dH(s)}{1 - H(s)} = W(s)\, ds.$$

$$\therefore\ [1 - H(s)] = c\, e^{\int W(s) ds}$$

Since the signal at A has derivative $\dot{y}(0)$ at $t=0$, the signal at B must have value 1 at $t=0$. The Laplace transform of the signal at B is $\frac{1 - H(s)}{s}$. $\therefore$ By the initial value theorem of Laplace transforms

$$1 = \lim_{s\to\infty} s\left(\frac{1 - H(s)}{s}\right) = \lim_{s\to\infty} (1 - H(s)),\ \ \text{~~that is~~}$$

$$\cancel{\lim_{s\to\infty} H(s) = 0.}$$

Next, since $\omega(s) = \dfrac{\lambda V_m / V_c}{s(1+Ts)} = \dfrac{\lambda V_m}{V_c} \cdot \dfrac{1}{s} - \dfrac{\lambda V_m}{V_c} \dfrac{T}{1+Ts}$,

we have $1 - H(s) = C\, e^{\int \omega(s)\, ds}$

$$= C\, e^{\frac{\lambda V_m}{V_c}\left[\ln \frac{s}{1+Ts}\right]} = C \cdot \left[\frac{s}{1+Ts}\right]^{\frac{\lambda V_m}{V_c}}$$

Since $\lim_{s \to \infty} [1 - H(s)] = 1$ we conclude that $C = T^{\frac{\lambda V_m}{V_c}}$.

$$\therefore\ 1 - H(s) = \left[\frac{Ts}{1+Ts}\right]^{\frac{\lambda V_m}{V_c}}$$

$\therefore$ miss due to step target maneuver,

$$M_T(s) = \frac{\delta n_T}{s^3}\left[\frac{Ts}{1+Ts}\right]^{\frac{\lambda V_m}{V_c}}.$$

Can be solved for specific values of $\frac{\lambda V_m}{V_c}$.

For $\frac{\lambda V_m}{V_c} = 4$,

$$M_T(s) = \frac{\delta n_T}{1}\left[\frac{T^4 s}{(1+Ts)^4}\right].$$

$$= \frac{\delta n_T}{} \frac{s}{(s+1/T)^4}$$

The inverse Laplace transform is

$$m_T(t) = \frac{\delta n_T}{1}\, t^2 e^{-t/T}\left(\frac{1}{2} - \frac{t}{6T}\right)$$

yields miss distance as a function of flight time t_F on putting $t = t_F$.

The miss distance due to an initial heading error is

$$M_I(s) = \frac{\dot{y}(0)}{s^2}\left[\frac{Ts}{1+Ts}\right]^{\frac{\lambda V_m}{V_c}}.$$

For $\frac{\lambda V_m}{V_c} = 4$, we have

$$M_I(s) = \dot{y}(0).\frac{T^4 s^2}{(1+Ts)^4} = \frac{\dot{y}(0)}{1}\,\frac{s^2}{(s+1/T)^4}$$

Taking inverse Laplace transforms, & substituting

$$\dot{y}(0) = -V_m\,\delta\theta_M(0)\cos(\beta^* - \theta_M^*)$$

$$\approx -V_m\,\delta\theta_M(0). \quad \text{yields}$$

$$m_I(t) = -\frac{V_m\,\delta\theta_i(0)}{}\, t e^{-t/T}\left(1 - \frac{t}{T} + \frac{t^2}{6T^2}\right).$$

Substitute $t = t_F$ to obtain miss distance for any flight time.

note that miss $\longrightarrow 0$ as $\frac{t_F}{T} \rightarrow \infty$.