7.2 Energy Climb Distance

γ small

$$\frac{dx}{dt} = V$$

$$\frac{dE_s}{dt} = P_s \qquad h = E_s - \frac{V^2}{2g}$$

$$\frac{dx}{dE_s} = \frac{V}{P_s}$$

$$x_f - x_0 = \int_{E_{s0}}^{E_{sf}} \frac{dE_s}{(P_s/V)}$$

Hence, minimum distance is achieved for the velocity profile $V(E_s)$ where P_s/V is a maximum, that is, where

$$* \qquad \frac{\partial}{\partial V}\left(\frac{P_s}{V}\right)\Bigg|_{E_s = \text{Const.}} = 0$$

$$\frac{P_s}{V} = \frac{P_s(h, V)}{V} = \frac{P_s\left(E_s - \frac{V^2}{2g}, V\right)}{V}$$

P, W assumed constant