Core Equations — asdf

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$$144 p_x V_x = R T_x \tag{1.9}$$

$$\frac{1}{2gJ}(v_x^2 - v_i^2) = C_p(T_i - T_x) \tag{1.10}$$

$$\frac{A_i v_i}{144 V_i} = \frac{A_x v_x}{144 V_x} \tag{1.11}$$

$$p_i V_i^\gamma = p_x V_x^\gamma \tag{1.12}$$

$$\frac{(p_{cinj})}{(p_{cns})} = \frac{(1 + \gamma M_i^2)}{(1 + \frac{\gamma-1}{2} M_i^2)^{\frac{\gamma}{(\gamma-1)}}} \tag{1.14}$$

$$\frac{p_{inj}}{p_i} = 1 + \gamma M_i^2 \tag{1.15}$$

$$\frac{p_t}{(p_{cns})} = (\frac{2}{(\gamma+1)})^{\frac{\gamma}{\gamma-1}} \tag{1.16}$$

$$v_e = \sqrt{\frac{2g\gamma}{\gamma-1} R T_i (1 - \frac{p_e}{p_i})^{(\frac{\gamma-1}{\gamma})} + v_i^2} \tag{1.17}$$

$$v_e = \sqrt{\frac{2g\gamma}{\gamma-1} R T_{cns} (1 - \frac{p_e}{(p_{cns})})^{(\frac{\gamma-1}{\gamma})}} \tag{1.18}$$

$$W dot = A_t p_{cns} \sqrt{\frac{g\gamma(\frac{2}{\gamma+1})^{(\frac{\gamma+1}{\gamma-1})}}{R T_{cns}}} \tag{1.19}$$

$$\frac{A_e}{A_t} = \frac{(\frac{2}{\gamma+1})^{(\frac{1}{\gamma-1})}(\frac{(p_{cns})}{p_e})^{\frac{1}{\gamma}}}{\sqrt{\frac{\gamma+1}{\gamma-1}(1 - (\frac{p_e}{(p_{cns})}))^{(\frac{\gamma-1}{\gamma})}}} \tag{1.20}$$

$$p_t = (p_{cns})(\frac{2}{\gamma+1})^{\frac{\gamma}{\gamma-1}} \tag{1.21}$$

$$v_t = \sqrt{\frac{2g\gamma}{\gamma+1} RT_{cns}} \tag{1.22}$$

$$\frac{A_x}{A_t} = \frac{1}{M_x} (\frac{2}{\gamma+1} (1 + \frac{\gamma-1}{2} M_x^2))^{\frac{\gamma+1}{2(\gamma-1)}} \tag{1.24}$$

$$\frac{A_x}{A_t} = \frac{(\frac{2}{\gamma+1})^{\frac{1}{\gamma-1}} (\frac{(p_{cns})}{p_x})^{\frac{1}{\gamma}}}{\sqrt{\frac{\gamma+1}{\gamma-1} (1 - (\frac{p_x}{(p_{cns})})^{\frac{\gamma-1}{\gamma}})}} \tag{1.25}$$

$$v_x = \sqrt{\frac{2g\gamma}{\gamma-1} RT_{cns} (1 - (\frac{p_x}{(p_{cns})})^{\frac{\gamma-1}{\gamma}})} \tag{1.26}$$

$$\frac{v_x}{v_t} = \sqrt{\frac{\gamma+1}{\gamma-1} (1 - \frac{p_x}{(p_{cns})})^{\frac{\gamma-1}{\gamma}}} \tag{1.27}$$