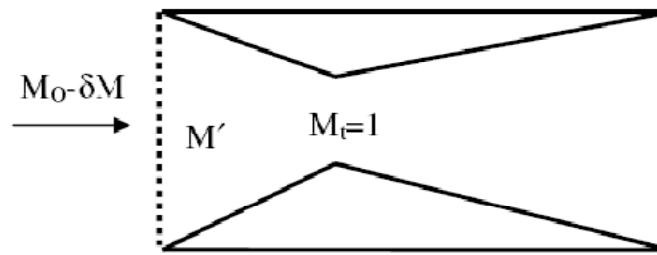
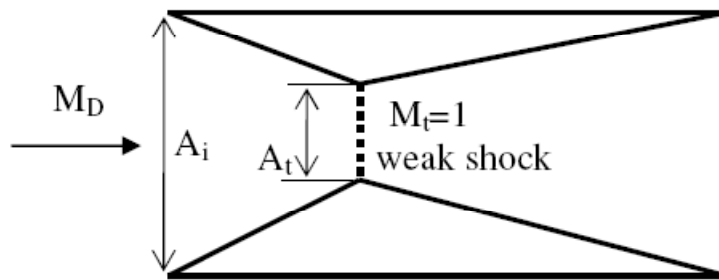


Start-up Process

$$M_D = 1.6$$

$$\frac{A_a}{A^*} = \frac{A_i}{A_t} = \frac{1}{M_D} \left[\frac{1 + \frac{\gamma-1}{2} M_D^2}{\frac{\gamma+1}{2}} \right]^{\frac{\gamma+1}{2(\gamma-1)}} = 1.25$$



$$\frac{A_i}{A^*} = \frac{A_i}{A_t} = 1.25 \xrightarrow{\text{IS}} M' = 0.553$$

$$M' = 0.553 \xrightarrow{\text{NS}} M_O = 2.15$$

$$M_O \rightarrow \infty$$

$$M' = \lim_{M_O \rightarrow \infty} \sqrt{\frac{\frac{2}{\gamma-1} + M_O^2}{\frac{2\gamma}{\gamma-1} \cdot M_O^2 - 1}} = \sqrt{\frac{\gamma-1}{2\gamma}} = \sqrt{\frac{0.4}{2.8}} = \frac{1}{\sqrt{7}} = 0.378$$

$$M' = 0.378 \xrightarrow{\text{IS}} \frac{A_i}{A_t} = 1.666$$

$$\frac{A_i}{A^*} = 1.666 \xrightarrow{\text{IS}} M_D = 1.98$$