$$\left(1+\frac{\gamma-1}{2}M_9^2\right)^{\frac{\gamma}{\gamma-1}} = \pi_m \tau_r^{\frac{\gamma}{\gamma-1}}$$

then

$$1+\frac{\gamma-1}{2}M_9^2 = \pi_m^{\frac{\gamma-1}{\gamma}}\tau_r \qquad (2)$$

$$M_9 = \sqrt{\frac{2}{\gamma-1}\left(\pi_m^{\frac{\gamma-1}{\gamma}}\tau_r - 1\right)}$$

and (from (1) + (2))

$$\frac{T_9}{T_0} = \tau_m \tau_\lambda \left(\pi_m^{\frac{\gamma-1}{\gamma}}\tau_r\right)^{-1} = \frac{\tau_m\tau_\lambda}{\tau_r}\pi_m^{\frac{1-\gamma}{\gamma}}$$

Note: τ_m + π_m are not connected by isentropic relation (need to use mixer equations)

then

$$\frac{u_9}{u_0} = \sqrt{\frac{T_9}{T_0}}\frac{M_9}{M_0} = \left[\frac{\tau_m\tau_\lambda}{\tau_r}\pi_m^{\frac{1-\gamma}{\gamma}}\right]^{1/2}\frac{1}{M_0}\left[\frac{2}{\gamma-1}\left(\pi_m^{\frac{\gamma-1}{\gamma}}\tau_r - 1\right)\right]^{1/2}$$

$$= \frac{1}{M_0}\left[\frac{2}{\gamma-1}\tau_m\tau_\lambda\left(1-\frac{\pi_m^{\frac{1-\gamma}{\gamma}}}{\tau_r}\right)\right]^{1/2}$$

$$\boxed{\frac{F}{\dot{m}u_0} = (1+\beta)\frac{1}{M_0}\left[\frac{2\tau_m\tau_\lambda}{\gamma-1}\left(1-\frac{\pi_m^{\frac{1-\gamma}{\gamma}}}{\tau_r}\right)\right]^{1/2} - 1}$$