THE EQUATIONS

Energy conservation in compressible flow: $\frac{v^2}{2} + c_p T = \text{constant}$
For adiabatic compression to stagnation ($v = 0$),

$$M^2 = \frac{v^2}{\gamma R_a T} = \left\{ \left(\frac{2c_v}{R_d} \right) \left[\left(\frac{p+q}{p} \right)^{R_a/c_p} - 1 \right] \right\}$$

$$q = p \left\{ \left(\frac{v^2}{2c_p T} + 1 \right)^{c_p/R_a} - 1 \right\} = p\chi$$

where the last equality defines $\chi(v, T)$. Write in terms of measured quantities $p_m = p - \Delta p$ and $q_m = q - \Delta q$ and unknown $\Delta p = -\Delta q$:

$$\Delta p = \frac{q_m - p_m \chi}{1 + \chi}$$