Consider an airfoil in a high subsonic \((M > 0.3)\) cruising. At a point on the airfoil, the airspeed measured is 950 ft/s. The freestream conditions are: airspeed = 750 ft/s, temperature = 550 °R, and pressure = 10 psi (absolute).

(a) If (from a low-speed wind tunnel test with \(M < 0.3\)), the pressure coefficient at this point is known as: \(C_{p,0} = -0.45\), estimate the pressure coefficient at this point, by using Prandtl-Glauert rule.

(b) Determine (more accurately) the pressure coefficient at this point by assuming that the flow is isentropic and calorically perfect ideal gas of air (means: applying the energy equation).

Hints . . .

- Pressure coefficient for subsonic incompressible flow is: \(C_{p,0} = 1 - \left( \frac{V}{V_\infty} \right)^2 \).
- (a) Apply Prandtl-Glauert rule to correct this pressure coefficient.
- (b) Apply energy equation, together with isentropic relation and calorically perfect ideal gas assumption.