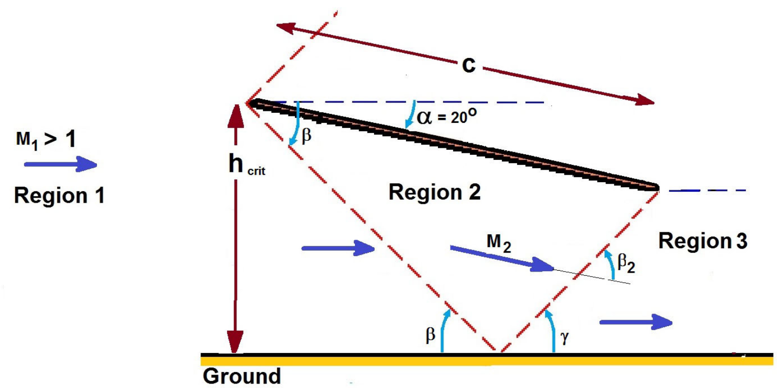
Solution to Problem 354C:



The oblique shock generated at the leading edge will be reflected by the ground and may or may not impinge on the foil. The critical clearance, h_{crit}, will be that at which the reflected shock just touches the trailing edge.

In terms of the angles β and γ shown above, it follows from the geometry that

$$\frac{h_{crit}}{c} = \left[\frac{\sin 20^\circ}{\tan\gamma} + \cos 20^\circ\right]\left[\frac{1}{\tan\beta} + \frac{1}{\tan\gamma}\right]^{-1} \tag{1}$$

Now to find β and γ. With $M_1 = 5$ and an angle of turn of 20°, the oblique shock table or graph gives $\beta = 30^\circ$. Hence $M_1 \sin\beta = 2.5$ and the shock table yields $M_2 \sin(\beta - \theta) = 0.513$ and therefore $M_2 = 2.95$.

Since the angle of turn through the reflected shock is 20° and the upstream Mach number for the reflected shock is 2.95 it follows from the oblique shock table or graph that the flow deflection angle through the reflected shock is $\beta_2 = 38^\circ$ and therefore the inclination, $\gamma = 38^\circ - 20^\circ = 18^\circ$.

With these angles the above geometrical relation yields

$$\frac{h_{crit}}{c} = 0.414 \tag{2}$$