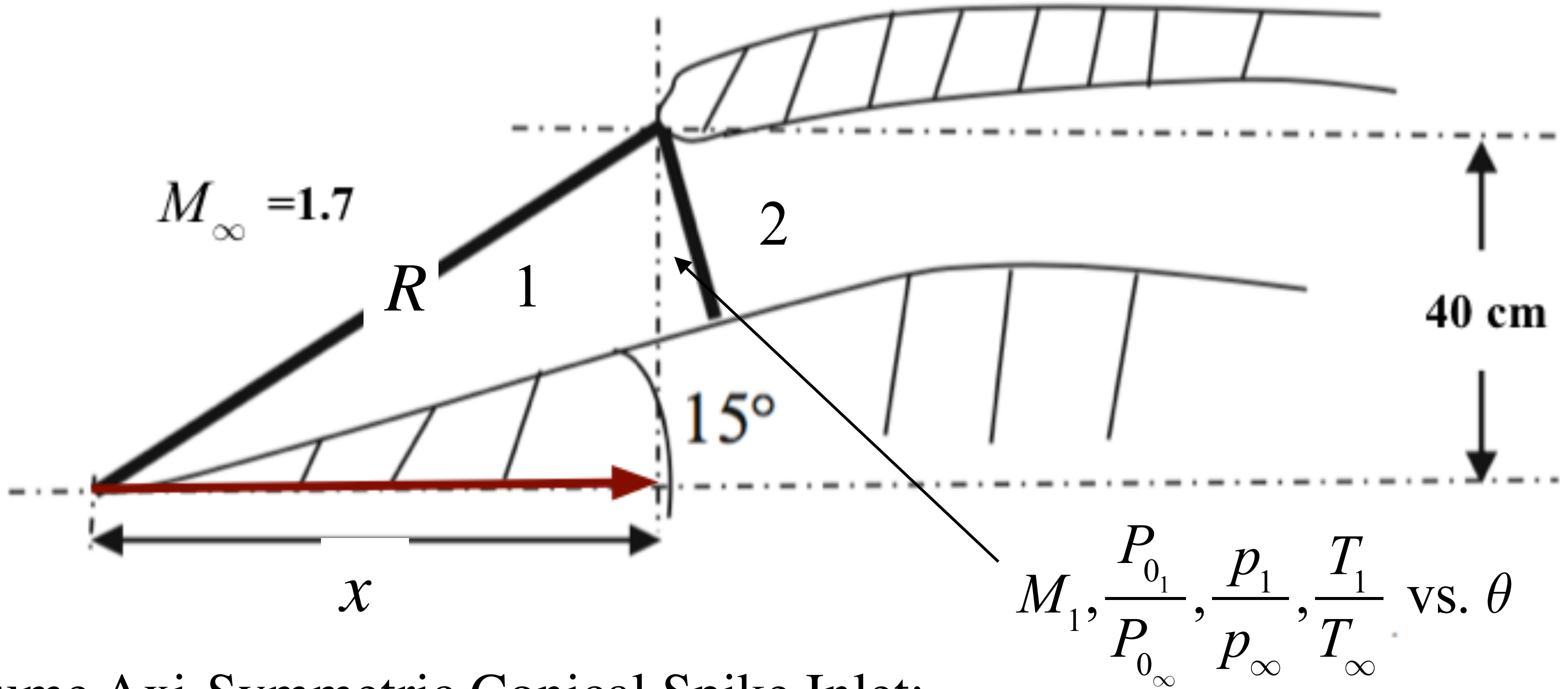
Homework 2.1, Part 1

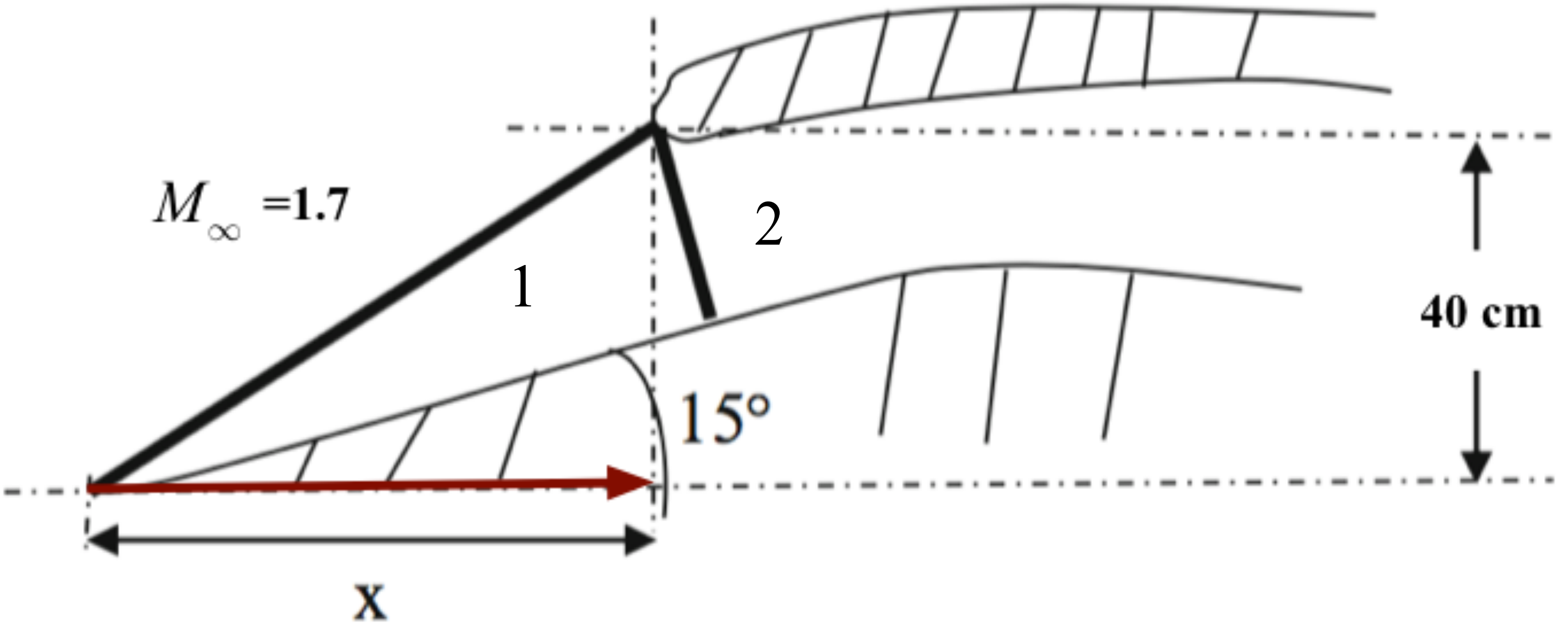


Assume Axi-Symmetric Conical Spike Inlet:
15° Spike Half Angle
40 cm Inlet Half Width

→ Calculate:

Shock Angle (β)
Radial (*R*), Longitudinal (*x*) Distance from Spike Tip to Cowl Inlet
Mach Number, Total, Pressure, Temperature Ratio Distribution vs. θ at Cowl Inlet (1)→(2)

Homework 2.1. Part 2

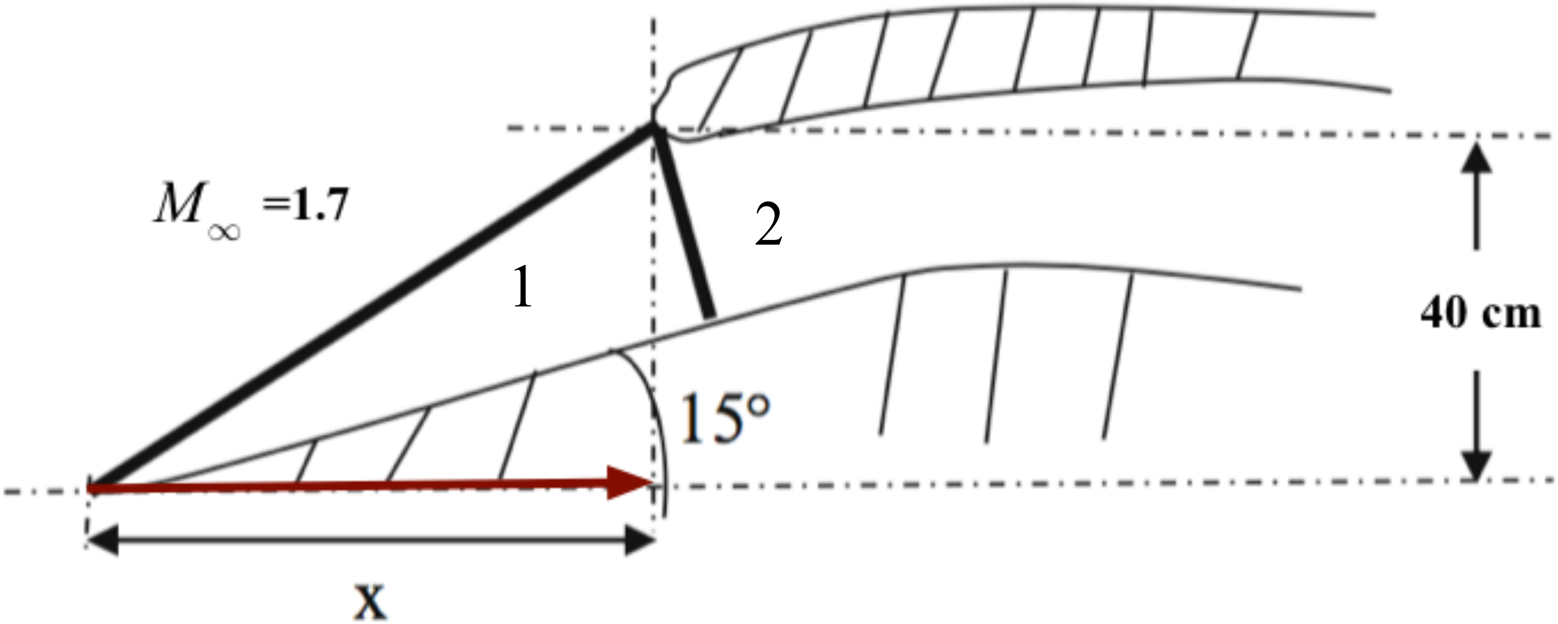


• Calculate Area-Weighted Mean Mach Number, Pressure Ratio at Cowl Inlet (1) → (2)

Example …

$$\bar{M} = \frac{2\pi \cdot \int_{\theta_{cone}}^{\beta} M_\theta R \cdot \sin\theta \cdot R \cdot d\theta}{2\pi \cdot \int_{\theta_{cone}}^{\beta} R \cdot \sin\theta \cdot R \cdot d\theta} = \frac{2\pi \cdot R^2 \int_{\theta_{cone}}^{\beta} M_\theta \sin\theta\, d\theta}{2\pi \cdot R^2 \left(\cos\theta_{cone} - \cos\beta\right)} = \frac{\int_{\theta_{cone}}^{\beta} M_\theta \sin\theta\, d\theta}{\left(\cos\theta_{cone} - \cos\beta\right)}$$

Homework 2.1. Part 3

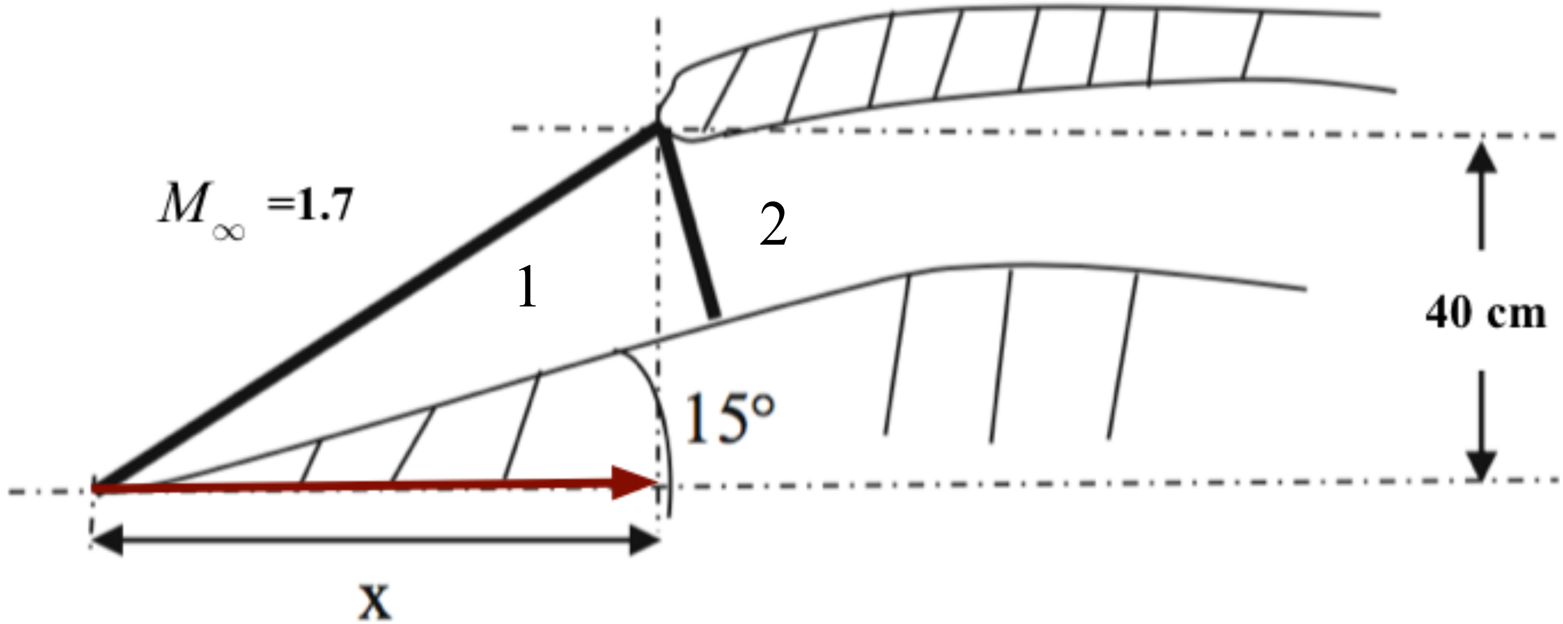


- Based on Mean Conditions at Cowl Inlet, Calculate 1-D Mach Number, Compression Ratio, Stagnation Pressure Behind Normal Shock (2), Relative to Freestream

- Compare to 2-D Inlet Solution from Problem 4.3

- What is the Optimal Cone Angle for Minimum Stagnation Pressure Loss

Homework 2.1. Part 4



- What is the Optimal Cone Angle for Minimum Stagnation Pressure Loss

- Compare Optimal to 2-D Inlet Solution