

Lecture F17 Mud: Oblique Waves

1. **In the 1st PRS, why did the streamlines have to become horizontal and parallel to the wall again?** (2 students)

Since each streamline sees the same two shocks, they are all turned the same amount. So if they all started parallel, they must end up parallel. Also, they must all end up parallel to the wall, since we must have $\vec{V} \cdot \hat{n} = 0$ at a wall.

2. **How do you tell what kind of shock will occur (oblique, bow, normal)?** (1 student)

Mainly by the θ , M_1 combination. The M_1 determines θ_{\max} . Then if $\theta < \theta_{\max}$, we'll get an oblique shock. If $\theta > \theta_{\max}$, we'll get a bow shock. A bow shock is actually a combination: it's a normal shock at the frontmost point, and becomes an oblique shock out in the flow.

3. **What makes strong shock waves unstable?** (1 student)

Perhaps "unstable" was too strong a term. It can be set up inside a supersonic wind tunnel. However, a strong shock on a body in an external flow can very easily jump ahead of the body and form a bow shock.

4. **Is a bow shock desirable or undesirable on a vehicle?** (1 student)

It's bad if you want low drag, like on a supersonic aircraft. It's good if you want high drag, like on an orbit re-entry vehicle.

5. **For last PRS, if the shock was strong rather than weak, wouldn't a larger β give a smaller θ ?** (1 student)

Correct. I should have stated that we were talking about the more common weak shock.

6. **For last PRS, what if θ was greater than θ_{\max} ?** (1 student)

Then we couldn't have an oblique shock as drawn.

7. **Are there commonplace occurrences of oblique shocks?** (1 student)

Supersonic wind tunnels, like the one in the Bldg 33 hangar. Supersonic aircraft. Pointy rifle bullets. Also, the trailing legs of a bow shock are in effect oblique shocks.

8. **What do all the results for M_{n1} , M_2 , p_2 , etc. tell us?** (1 student)

They give information on the flowfield and forces on the body: pressures, loads, losses, etc.

9. **No mud** (3 students)