

Lecture F19 Mud: Quasi-1D-Flow

1. **Why was h_o constant?** (1 student)

The flow is assumed to be adiabatic (no heat addition via combustion, etc). The flow is also assumed to be frictionless, so ρ_o and p_o are constant as well.

2. **Why did M increase linearly in the PRS question?** (1 student)

I just declared that it was. The objective was then to deduce the duct area $A(x)$ which would generate this given linear $M(x)$ distribution.

3. **Which way will the flow go after the sonic throat? Will it go back to subsonic ($M < 1$), or go to supersonic ($M > 1$)?** (1 student)

It depends on what pressure is imposed at the very exit. If the exit pressure is low enough, the flow will accelerate to supersonic after the throat. Otherwise, it will stay subsonic. We'll cover this in the next (and last) lecture.

4. **What would happen if you try making $A < A^*$?** (1 student)

This would force a reduction in the channel mass flow \dot{m} , which would in turn decrease A^* to be equal to or less than the new minimum A . Ya can't trick it.

5. **What properties determine the boundary layer thickness?** (1 student)

Primarily the Reynolds number Re , and the velocity gradient du/dx . Increasing the Re reduces the boundary layer (BL), and vice versa. A positive du/dx , or accelerating flow, tends to reduce the BL thickness. A negative du/dx , or decelerating flow, tends to increase the BL thickness.

6. **You drew the effective area slightly within the BL? Is this intentional?** (1 student)

Yes. The area reduction is not as big as the full BL thickness. It's typically only about 1/5 to 1/3 of the BL thickness. This will be looked at in subsequent fluids courses, which treat BL's in more detail.

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