

Lecture F11 Mud: Intro to Compressible Flows

1. **When would we see a non-perfect gas?** (1 student)

At extremely high pressures (e.g. blast waves), or at extremely high temperatures (e.g. start of Shuttle re-entry). Also at extremely low (cryogenic) temperatures when the gas is close to its condensation point.

2. **Why doesn't gravity affect motion of individual molecules?** (1 student)

Imagine tossing a sealed insulated air tank out of an airplane at 10K feet. By the time it reaches the ground, gravity will have done a huge amount of work on the tank and the air inside. But the air temperature and pressure inside the tank will not change during the descent, so gravity clearly has no effect on the internal energy. Gravity only affects the bulk kinetic energy of the fluid, which is not part of internal energy.

3. **Can you use the isentropic relation for compressible flows?** (1 student)

Yes. That was the main motivation for deriving it.

4. **Confused by shockwave. What's the background?** (1 student)

I mentioned it to point out how very wrong the incompressible area/velocity relation is when dealing with compressible flow. We'll get to shock waves for real later on.

5. **Will we ever use the control [illegible] form of the 1st law in fluids?** (1 student)

Sorry, couldn't decipher the question. We will apply the 1st law in control-volume form shortly.

6. **How are boundary layers affected by high speeds?** (1 student)

Surprisingly little. A boundary layer at Mach 2 looks a lot like a boundary layer at Mach 0.1, except the Mach 2 b.l. is warm from the frictional heating. It's also a bit thicker for a given Reynolds number than in low speed flow, but not by much.

7. **No mud** (8 students)