Lecture F13 Mud: Stagnation, Shock Intro

1. **What does "stagnation" mean?** (1 student)
   A flow element or streamline reaches *stagnation* at a point where its speed drops to zero, like on the tip of a blunt leading edge. The pressure, density, temperature at this point are called *stagnation conditions*.

2. **In the PRS, why is the temperature in the tank equal to the outside temperature after mixing?** (1 student)
   That's what the adiabatic enthalpy equation requires. This seems like a cop-out, but I don't know of a more intuitive way to explain it.

3. **In the PRS, why did you decide the pressure is constant?** (1 student)
   A jet exhausting into a still room must have the same static pressure as the room. If it had a different pressure, the streamlines would curve away or towards the jet centerline. But they don't – they are nearly straight an parallel.

4. **What did the extra dashed lines in the $V(x)$ and $p(x)$ figures mean?** (1 student)
   These are the $V(x)$ curves at some past time. They are there to indicate the shock is moving.

5. **Why do shock waves occur?** (1 student)
   In most supersonic flow situations, the only way a physically-possible flow can exist (i.e. satisfy mass, momentum, energy conservation) is with shock waves present. The flow cannot flowing over the supersonic fast plane and remain smooth.

   Another way to look at it ...
   A shock is the only feature in the flowfield which can travel faster than the speed of sound. So if the airplane is traveling faster than the speed of sound, there must be a shock wave ahead of the airplane "breaking the news" to the oncoming air.

6. **Why does breaking the sound barrier cause a shock wave?** (1 student)
   Shock waves travel along with any supersonic aircraft. The do not appear only when the "sound barrier" is broken. The term "sound barrier" is really a misnomer. It's possible to go through it without all that much fuss. Just gotta know how.

7. **No mud** (4 students)