

Lecture F2 Mud: Hydrostatics

(42 respondents)

1. **Is C_p in Fluids related to the c_p in Thermo, such as in $U = c_p\Delta T$?** (1 student)
This is a notation coincidence. They are completely unrelated.
2. **How do p_∞ , V_∞ , etc. all relate? What's static and dynamic p?** (3 students)
See the Lab-7 Lecture Notes and Mud.
3. **Why does area vary as size² ?** (1 student)
This is just a matter of geometry. If both the length and width double, then the product length×width quadruples.
4. **Not clear what C_p really is. It's not intuitive.** (4 students)
 C_p is one example of a *dimensionless quantity*, which we always seek when analyzing physical situations. C_L is another example. These dimensionless quantities are always the most general and simplest way to describe and quantify a problem. For example, a full-size airplane and a wind tunnel model at the same angle of attack will have different pressures and lifts, but their C_p 's and C_L 's will be the same if only a few conditions are met, such as the Re and Ma are the same. This allows direct comparisons between the aircraft and the model. We will get to this in much more detail in lecture F5.
5. **Is there lift on the whole fuselage, or just the middle part between the wings?** (1 student)
On most aircraft the bulk of the fuselage lift is on the part between the wings. The front and back of the fuselage carry very little lift.
6. **Why does $dp/dy = \rho g$?** (1 student)
Actually, $dp/dy = -\rho g$ if y is opposite to gravity as in the class example. This is just the outcome of the $dx dy dz$ -volume analysis, where the pressure (buoyancy) force on the volume was set equal and opposite to the gravity force on the mass in the volume.
7. **What do you mean by "displaced" fluid?** (1 student)
It's the non-existent fluid that occupies the volume of the body. Or, it's the fluid that got pushed aside when the body was placed in the fluid.
8. **In the Hydrostatic Equation, is ρ the density of the fluid or the body?** (1 student)
Of the fluid.
9. **Does the buoyancy of an air balloon underwater change as you push it deeper?** (1 student)
If the volume of the balloon does not change (e.g. if the balloon was a rigid glass sphere), the buoyancy force will stay the same. However, a rubber balloon will shrink in volume as you go deeper due to the increasing ambient pressure at the balloon. So its buoyancy force will decrease with depth.
10. **What's the difference between solid and hollow bodies in a fluid?** (1 student)
None. The fluid behavior is unaffected by what's inside the body.
11. **No mud** (23 students)