Lecture F21 Mud: Airfoil Polars, Quiz Review
(34 respondents)

1. **How is % camber defined?** (2 students)
   Example: 8% camber means that the maximum camber line height is $0.08c$ high, where c is the airfoil's chord.

2. **On a NACA 4-digit airfoil, what if the camber is a fraction of a percent?** (1 student)
   There's no standard notation for this. One lame attempt I've seen: An airfoil with a 2.5% camber was given as a NACA (2.5)415, which is midway between a 2415 and 3415. Such fractional specs on 4-digit airfoils are rarely used.

3. **Typo in notes handed out:** $V_{\max}/V_{\min} = C_{L_{\max}}/C_{L_{\min}}$ **?** (2 students)
   Yep, it's a typo. It should be
   $$\frac{V_{\max}}{V_{\min}} = \sqrt{\frac{C_{L_{\max}}}{C_{L_{\min}}}}$$
   The posted notes have been fixed.

4. **How would we calculate** $\partial\phi/\partial n$**?** (2 students)
   The relation
   $$\frac{\partial \phi}{\partial n} \;=\; 0$$
   or $\vec{V} \cdot \hat{n} = 0$ is a boundary condition imposed at a wall. How exactly this is done depends on the method used to solve the governing Laplace's equation $\nabla^2\phi = 0$. In a panel method, we determine both u and v at the surface as a superposition of the freestream u_∞ and v_∞, plus the velocity contributions from all the panels with their strengths γ_j. Then we require
   $$\vec{V} \cdot \hat{n} \;\equiv\; u n_x + v n_y \;=\; 0$$
   which becomes one of the equation rows in the big matrix system to be solved.

5. **What is the Helmholtz Equation** $D\xi/Dt = 0$**?** (1 student)
   See F14.

6. **Still don't understand circulation.** (1 student)
   Try reviewing F11, F16, F18. Also Anderson 2.13 .

7. **How did you get** $\Gamma = \gamma\,\ell$**?** (1 student)
   The vortex sheet strength γ is defined as "circulation per length". See F18.

8. **What do we need to know about lifting cylinders?** (1 student)
   Here's a list of relevant things which I can think of: Superposition, surface velocity and pressure, circulation, d'Alembert Paradox, Kutta-Joukowsky Theorem, ideal versus real flow. There may be a few others in the notes which I missed here.

9. **Will we need to do any numerical analysis of** c_ℓ**,** c_d **graphs?** (1 student)
   I expect to you be able to pick numbers off a graphs and to apply equations involving c_ℓ and c_d, such as $L' = \frac{1}{2}\rho V_\infty^2\, c\, c_\ell$, etc.

10. **Can you give us a table for all the sources, vortices, etc.?** (1 student)
    Anderson Table 3.1, page 232.

11. **What are the objectives in Unified Fluids?** (1 student)
    See "Learning Objectives" link in Fluids section of UE website.

12. **How do you keep all these concepts straight? Experience?** (1 student)
    Yeah, pretty much. Eventually even new and complex things become familiar and natural if you work with them long enough.

13. **Will you be around this week for questions?** (2 students)
    Yep, but my schedule is flaky at this point. Try knocking on my door.

14. **No mud** (19 students)