Introduction to Aeroelastic Instabilities with Jupyter Notebooks

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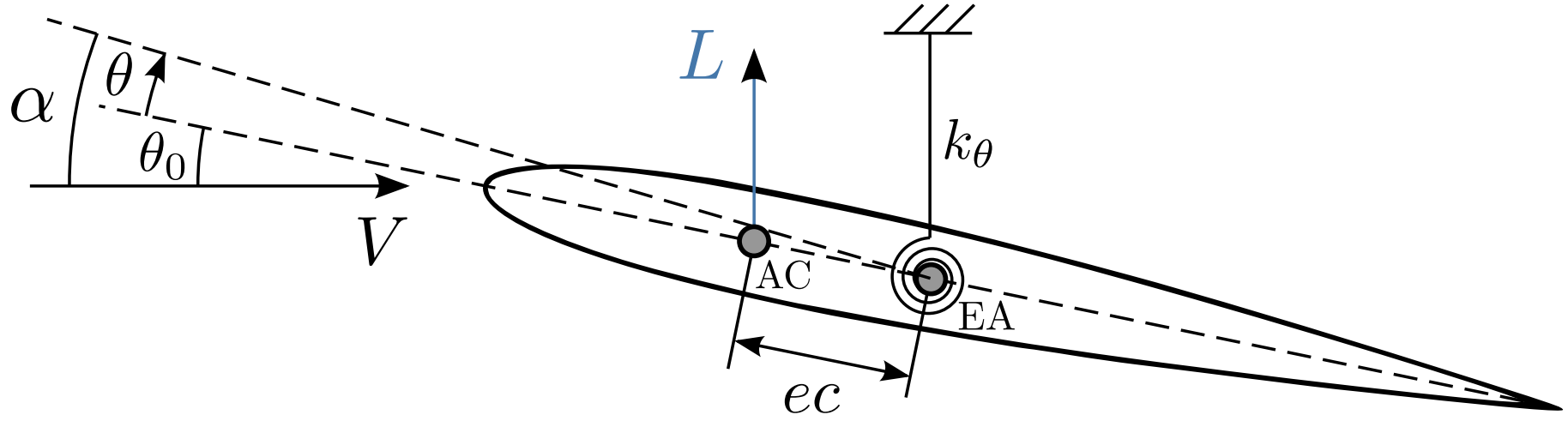
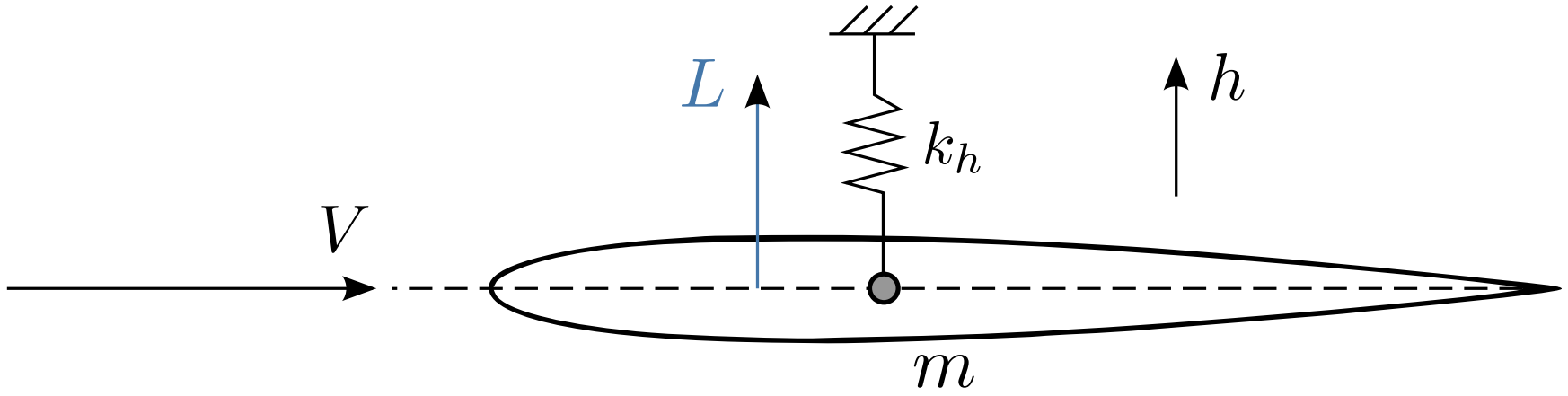
What we saw yesterday

- Typical section with pitch-only DOF
- Coupling between aerodynamic force and elastic displacement
- Torsional divergence: static problem, static instability!
- We did not care at all about mass and inertial forces



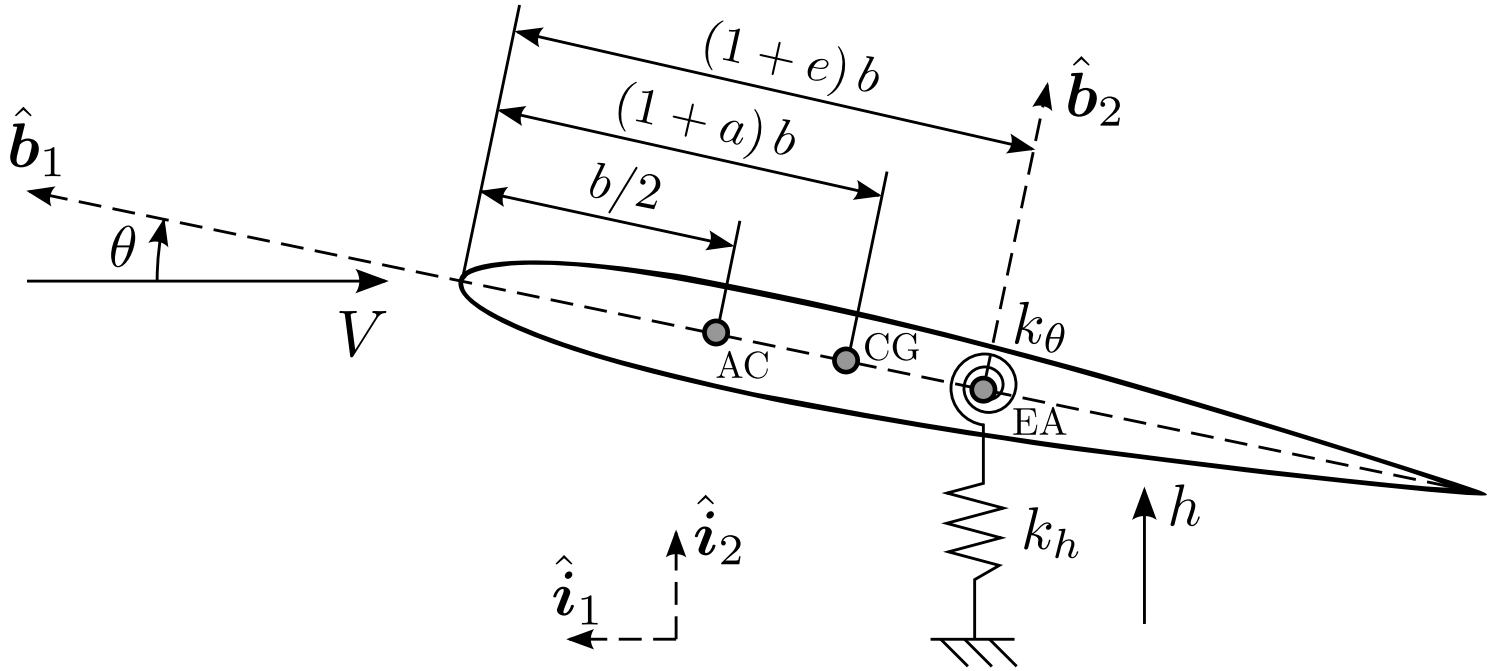
What we are going to see today

- Typical section with have-only DOF
- This time we set it in motion! No longer a static problem
- We do care about mass and inertial forces now
- What are the characteristics of the dynamic response of this system?



What we are going to see today

- Typical section with have-pitch DOFs
- Motion, multiple DOFs – things get more interesting now
- What are the characteristics of the dynamic response of this system and how do they compare to those of the heave-only model?

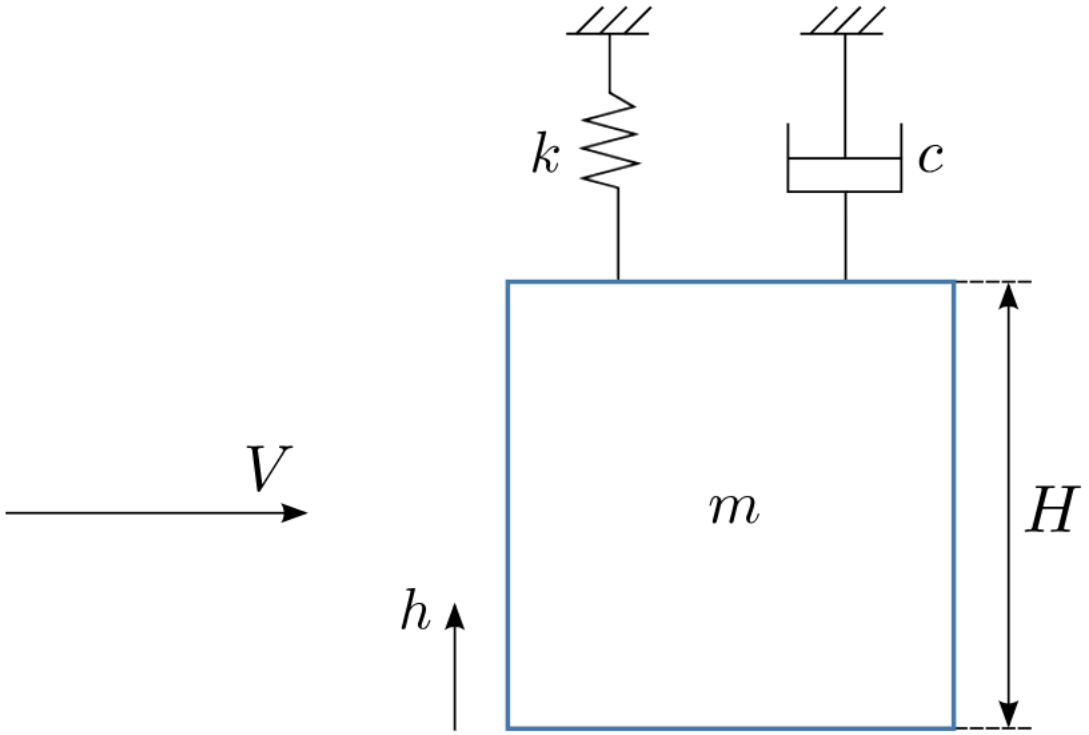


To the notebooks!

Let's code!

Take-home assignment

- The linear aeroelastic galloping oscillator



$$m\ddot{h} + \left(c + \frac{1}{2}\rho V H \frac{dc_{f_h}}{d\alpha}\right)\dot{h} + kh = 0$$

You will complete your own notebook and explore the stability of this system!