

- *Define the cavitation phenomenon:*
 - *Incipience, types, effects, ...*
 - *Importance of cavitation nuclei – tensile strength of water*
 - *Express the cavitation occurrence in a flowing liquid in a non-dimensional way*
Draw typical C_p curves on suction and pressure sides of a foil and discuss cavitation occurrence
- *Static equilibrium of a gas bubble within a liquid (Blake/Laplace equation)*
 - *Critical pressure and critical bubble radius*
 - *Comment the case of nanobubbles and their stability*
 - *Solubility of gases in a liquid (Henry's law)*
- *Dynamics of a spherical cavitation bubble in an infinite liquid volume:*
 - *Establish Rayleigh and Rayleigh-Plesset equations with a careful list of hypotheses*
 - *Propose a way to solve the Rayleigh-Plesset equation (bubble radius vs time)*
- *Collapse of a spherical bubble in infinite liquid volume:*
 - *Express the collapse time (Rayleigh time) – Hypotheses ?*
 - *Discuss the role of viscosity, surface tension and non condensable gas*
 - *Establish the pressure field in the liquid phase during the collapse of a spherical bubble*
- *Dynamics of a cylindrical cavitation bubble (2D)*

- *Describe the collapse of a cavitation bubble in a non-uniform pressure field:*
 - *Case of gravity induced pressure gradient*
 - *Bubble collapse near a solid surface*
 - *Bubble collapse near a free surface*
 - *Bubble collapse inside a confined liquid volume (liquid drop, liquid jet)*
- *Describe the luminescence phenomenon*
- *Experimental setup to generate cavitation bubbles in a controlled manner*
 - *Describe the technique using a pulsed laser and relevant instrumentation to investigate the bubble dynamics and related physical phenomena*
- *Cavitation in flowing liquids: Leading edge cavitation*
 - *Describe the cavitation development on a hydrofoil*
 - *Discuss the transition from sheet to cloud cavitation*
 - *Estimation of the length of leading edge cavity using Rayleigh-Plesset equation (see exercise)*

- *Cavitation in vortices*
 - *The case of Karman vortices in the wake of a hydrofoil*
 - *Describe the alternate shedding of vortices in the wake of a bluff body*
 - *Effect of cavitation on shedding frequency (Strouhal number)*
 - *Tip vortex cavitation:*
 - *Establish the velocity and pressure fields in a vortex, using simple models (e.g. Rankine)*
 - *Discuss cavitation risk in a vortex flow*
 - *Describe the particular role of gas content on cavitation incipience and desinence*
 - *Propose mitigation techniques to prevent tip vortex cavitation in hydraulic machines*