

## Internship proposal

### Simulation of interacting Coandă-effect actuators for active flow control

**Supervisors:** Francesco Romanò / Antoine Dazin

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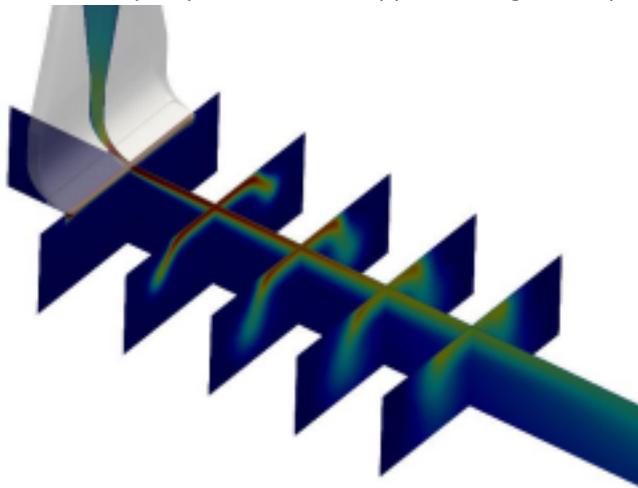
**Location:** ENSAM Lille, 8 Boulevard Louis XIV, 59046 Lille

**Duration:** 6 months

**Level:** M2

**Expected skills and knowledge:** fluid mechanics, numerical simulations (OpenFOAM preferred)

**Subject:** The Coandă effect will be used to inject momentum near a wall on which the actuator is flush mounted (see figure). The resulting jet will be used to control the flow in an axial compressor and, in particular, to postpone or even suppress dangerous spike instabilities.



**Velocity Magnitude inside a single Flow Actuator**

Previous stages M2 focused on the numerical simulations of a single injector, explaining the critical features of the jet flow. An ongoing project initiated during the last stage M2 did also realize a parametric mesher that can be used to perform automatic generation of multiple injectors side by side, either mounted on a flat plate or on a cylindrical carter. Thanks to such recent advancements, we intend to carry out a study aimed at understanding the physics of interacting jets, exploring eventual flow instabilities and characterizing the major differences expected between a jet in free flow and a jet blowing into a boundary layer flow.

**Team:** This internship is developed within the framework of the active flow control applied to axial compressors of aircraft engines. As one of the most active research topics in the lab, the numerical simulations performed during this internship are going to be discussed with the team of Associate and Full Professors involved in the European project ACONIT at ENSAM (Antoine Dazin, Pierric Joseph and Francesco Romanò). This will make sure that all the experience of the turbomachinery flow control team at ENSAM will serve to the understanding and optimizing of selected multiple actuator configurations.

#### **Preliminary organization of the work:**

- Bibliographical study, especially about Coandă effect and boundary layer interaction.
- Contribution to simulation plan.
- Realization of simulations and analysis of the results.
- Participation to scientific papers in collaboration with other colleagues performing the experiments.