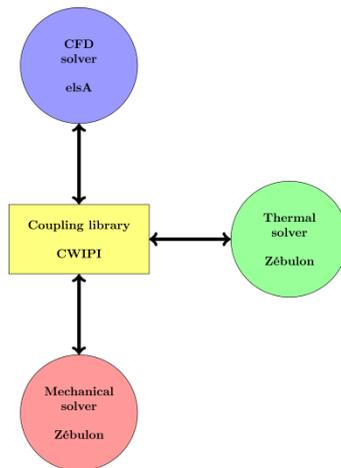# TRANSIENT FLUID-STRUCTURE AEROTHERMAL COUPLING

Rocco MORETTI

(2016 – 2019)

Industrial Partner: ONERA
Supervisors: F. Feyel, M. Errera

- Steady aerothermal coupling
- Transient aerothermal coupling
- Stability and precision of the aerothermal coupling
- Taking into account the structural deformation and the face-face radiation.
- Simulation of life expectancy

Abstract:

In the field of the scientific calculation, more and more important needs regarding reliable multidisciplinary simulations are expressed by the industry, the engineers and the researchers. This thesis joins in this frame to study the transient aerothermal interactions between a body and a fluid flowing over or through it.

ONERA recently developed successful methodologies of aerothermal coupling based on Robin-Robin condition. They were already the object of realistic applications and their satisfactory behavior was already identified. Works are currently in progress to spread the features of these methods to transient fluid-structure aerothermal coupling (Safran request in particular). It is however necessary further the knowledge of these phenomena. The objective of this work is to study the most successful methodologies to analyze strong transient thermal interactions and apply them to industrial configurations. This aspect is indeed essential to approach problems of life expectancy.

An in-depth study will be led at first on steady-state thermal fluid-structure interaction. In a later phase, we shall investigate transient phenomena by including problems to low Mach, face-face radiation and structural deformation.

The objective is to be able to define a reliable and efficient strategy applicable to configurations "off vein". The methodology will be tested in the end on industrial cases with the objective to realize simulations of life expectancy. The priority is given during this thesis to the development of physical models and digital methods. Tools envisaged first and foremost in this thesis are established by ONERA software coupled via the library CWIPI.