



Institut Supérieur de l'Aéronautique et de l'Espace

## RESEARCH MASTER INTERNSHIP

Département Aérodynamique, Energétique et Propulsion

Supervisor : Vincent CHAPIN

Location : ISAE campus ENSICA

Tel. : +33 5 61 33 91 66

E-mail. : [Vincent.Chapin@isae.fr](mailto:Vincent.Chapin@isae.fr)

### INTERNSHIP DESCRIPTION

Domain : Aerodynamics, Propulsion

Title : **FLOW REGIMES AROUND AN AIRFOIL**

Flow control is an important research field today for aeronautic companies to develop new aircraft able to respect environmental policy. To define new fluidic control strategies for future aircraft, it is necessary to characterize the flow dynamic around airfoil profile as a function of the angle of attack and of the Reynolds number corresponding to the entire flight domain.

Objective: in this context, the objective of this stage will be to study and characterize the different flow regime by using the numerical tools of the department. We will use the different modelling issues (DNS, RANS, URANS, ...) to identify flow regimes and their dependence to numerical parameters and flow modelization level. Results will be compared to those of the literature (numerical and experimental one). A large variety of flow regimes has been identified by experimental tests. Frontiers between these regimes in the angle of attack and Reynolds number plane are not well known in separated flow conditions. We will try to put some light on these frontiers by using all results of the literature and our simulations. This will also clarify the good practices in term of numerical parameters, and meshes for each modelization level used.

If we have time, we will try to apply the identified good practices on a reference test case of the flow control around an airfoil profile.

This master may be followed by a PhD Thesis on the study of feedback loop control of typical flow configurations through pulsed jets.

Wu, J. & al., *Post stall flow control on an airfoil by local unsteady forcing*, *J.Fluid Mech.* **371**, pp. 21-58, 1998.

Methods:

100 % Theoretical Research

100 % Applied Research

100 % Experimental Research

Possibility to go on a Ph.D.:

Yes

No

### APPLICANT PROFILE

Knowledge and required level:

Fluid Mechanics, Unsteady flows, Numerical Flow Simulation  
Langages/Systèmes Unix, MATLAB, C++

Applications should be sent by e-mail to the supervisor.