



Institut Supérieur de l'Aéronautique et de l'Espace

RESEARCH MASTER INTERNSHIP

Département Aérodynamique, Energétique et Propulsion

Supervisor : V. G. CHAPIN

Location : ISAE campus ENSICA

Tel. : +33 5 61 33 91 66

E-mail. : Vincent.Chapin@isae.fr

INTERNSHIP DESCRIPTION

Domain : Aerodynamics, Propulsion

Title : **REDUCED-ORDER MODEL OF AN ACTUATOR FOR FLOW CONTROL NUMERICAL SIMULATIONS**

Subject

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 develop numerical methodologies for unsteady flows with relevant actuators modelling.

This master will consist to implement a new reduced-order model of an actuator in our numerical simulation tools. This work will be based on the model proposed by R. Mittal & L. Cattafesta. When the new model will be implemented and validated, it will be compared to the previous model and a complete model to be able to characterize the opportunity of this new reduced-order model on a reference configuration. Next, the new numerical tool will be used to characterize qualitatively and quantitatively, the aerodynamic performances of actuators (synthetic and pulsed jets, ...) for the flow control around a airfoil profile in a configuration we have experimental data (collaboration with J. Soria & V. Kitsios). Best configurations will be analysed in details to understand physical mechanisms in the actuator area and its coupling with the main flow.

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

Reference :

Raju, R. & al., Reduced-Order Models of Zero-Net Mass-Flux Jets for Large-Scale Flow Control Simulations, *AIAA paper 2008-6404*.

10 % Theoretical Research

80 % Applied Research

10 % 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.