

**VACANCY:**  
**PhD thesis**  
**at ECOLE CENTRALE DE LYON**  
**(and ISAE-SupAéro)**

**Context**

The Laboratoire de Mécanique des Fluides et d'Acoustique (LMFA) is a CNRS/Education Nationale research facility located nearby Lyon at the Ecole Centrale de Lyon (ECL) whereas the Département d'Aérodynamie, Energétique et Propulsion (DAEP) is a Research facility located at ISAE- SupAéro a leading Engineering School in Aeronautics and Astronautics. In the framework of the recently approved European Project TurbonoiseBB, about broadband noise generation by turbomachine fans and OGV's, these institutes offer the possibility of a Phd fellowship in the field of aeroacoustics, unsteady aerodynamics and turbulence and High Performance Computing. The project relies on a close co-operation with Europe's leading engine and airplane manufacturers, research institutes in the field of aeronautics and aerospace and some of Europe's best Universities.

The project is devoted to the application of advanced simulation and analysis tools to a dataset provided by a large scale fan rig test to be conducted shortly after kick-off in the Anecom Research facility, that is one the world largest fan rigs. The objective is two-fold:

1. test new simulation and measurement techniques on an industrially relevant and well-documented test case;
2. use these tools to design and assess noise reduction devices.

Various aerodynamic noise generation mechanisms associated with the Fan/OGV stage of modern ultra high by-pass ratio engines, such as rotor trailing edge, rotor/stator interaction and fan tip/ turbulent boundary layer interaction will be carefully screened in this project.

**Job description**

The main objective of this Phd thesis is to carry out a complete unsteady compressible fan-OGV simulation whose output is accurate enough to be fed into aeroacoustic prediction tools such as LEE-codes or classical acoustic analogies. A second computation will be focused on the noise reduction assessment of an innovative OGV with modified vanes that will be designed by an industrial partner. The generated dataset will not only be compared to available experimental data but will also help to improve existing semi-analytical models that can predict broadband noise radiation from RANS computed turbomachinery flows.

The Phd-candidate will therefore also be strongly involved in the cooperative work of the EU project. She/He will also use both advanced measurement and post-processing techniques to get a better understanding of the underlying physics and to provide good comparison data with the accompanying experiment.

**Requirements**

Applicants who are expected to have completed their Master of Science (or equivalent) in a field related to the PhD topic, should have a good background in fluid mechanics, applied mathematics and unsteady CFD methods. Special skills in unsteady aerodynamics, aeroacoustics and turbulence are expected to allow a prompt start.

Beside these requirements, it would be useful if the applicants were familiar with the physics of turbomachines. Of course, the applicants should speak English fluently and some knowledge in French would be useful.

**Location:** mostly Lyon

**Duration:** 3 years, starting in Fall 2016.

**Salary:** about 2+ k€/month gross income (~ 1.5+ k€ net income) by C-Innov (Subsidiary of ECL)

**Phd Registration:** Ecole Doctorale MEGA via ECL and possible cotutelle (joint supervision) with ISAE.

**Job application:**

Applicants, who are expected to have completed their Master of Science (or equivalent) in a field related to the PhD topic, should send a CV, 2 recommendations letters, a list of the courses they attended as well as the scores they obtained to:

Prof. Marc JACOB(\*) or Prof. Michel ROGER,  
or Prof. Stéphane MOREAU  
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