POLYTECHNIQUE MONTRÉAL

LE GÉNIE EN PREMIÈRE CLASSE

PhD studies in Montréal (Québec, Canada)
Fire resistance of composite material for aircraft engine applications

The use of materials based on lightweight composite and aluminum, although common in other parts of the aircraft, remains a challenge around the engines because of the fire resistance prescribed by certification requirements. The present project focuses on the use of such materials for the manufacturing of fan cases and bypass ducts for turbofan aircraft engines.

This collaborative research project was initiated by Pratt & Whitney Canada and will investigate fireproofing strategies to enable lightweight material systems to successfully pass certification tests. Fundamental understanding of the physical processes involved will be acquired through small-scale tests in controlled conditions and the failure modes will be characterized. From these results, a prediction model will be built and the best material systems investigated will be used for full-scale certification tests. At Polytechnique Montréal, the academic supervision team will include Prof. Etienne Robert (combustion, modeling), Prof. Martin Levesque (mechanical testing, modeling), Prof. Louis Laberge Lebel (composites) and Prof. Annie Ross (acoustics).

Description of positions

Three graduate student positions are available within this project, two PhD and one MSc. The research activities planned for each of these positions are:

1. **Experimental** characterisation of composite materials under flame environment (PhD position). Development of a novel test rig to allow for the mechanical characterisation of samples while material properties degrade under flame attack. This position requires aptitudes for laboratory work and a strong background in fluid mechanics, chemistry or physics.
2. **Modeling** of the mechanical properties of composite structures in reactive atmospheres (PhD position). Programing and simulation experience is a strong asset for this position.
3. **Material system** selection and sample fabrication in collaboration with industrial partners (MSc position). Exceptional candidates for this position will be considered for a PhD.

Qualifications

The required background for these positions is a Master of Science (MSc or equivalent) for the PhDs and a Bachelor of Science (BSc or equivalent) for the MSc. Candidates with diplomas in mechanical, physical, chemical or material engineering will be preferred. Excellent communication skills in technical English (both oral and written) are essential for

all positions. The selection process will be made on the basis of academic merit, language skills and publication record. The applicants must be strongly motivated for graduate studies and be able to work independently towards the objectives of the project.

Application

Individuals interested in joining the project should send:

1. Brief curriculum vitea along with their transcripts;
2. An example of technical writing in English where the applicant is the main author (paper, report or master thesis for example).
3. A list of publications where one section is devoted to articles accepted/published in international refereed journals and one other section where all the other communications (conferences, books, papers not written in English, etc.) are listed;
4. A one-page letter explaining for which position is the application, the expertise of the candidate and relevant contributions to research.

Applications should be sent by email to Prof. Etienne Robert: etienne.robert@polymtl.ca

Incomplete or non-conform applications will not be considered. The applications received will be evaluated as they arrive, starting on October 15th 2015, for a project start in the first half of 2016.

About Polytechnique Montréal

Founded in 1873, Polytechnique Montréal is one Canada's top engineering teaching and research institutions and first in Québec for the size of its student body and the scope of its research activities.