Title of the PhD research project
Contribution to the study of combustion noise in aircraft engines

Type of position / offer
PhD

Duration
3 years

Description of the offer

The institution

IU CMT-Motores Térmicos (Research Institute of Thermal Engines), Universitat Politècnica de València, Valencia, Spain is the institution offering the position.

Throughout the years, CMT-Motores Térmicos has established itself as a serious and reliable centre dedicated to research in internal combustion engines. Its state-of-the-art experimental facilities and high-profile professors and researchers have attracted many contracts from European and national public funds, as well as from the international industry. CMT praises itself for leading innovative research aimed at finding new solutions to problems related to thermal engines, in particular to those posed by the new emissions regulations and to noise control. Research at CMT-Motores Térmicos is centred on 4 main topics, all related to the thermal and fluid dynamic processes in thermal engines: Injection/Combustion, Turbo-charging, Noise Control and Thermal Management.

Project details

While there is a clear trend to electrification in the powertrains used in road transport, the air transport is still principally powered by internal combustion engines based on gas turbines. As it is expected that aircraft traffic will double over the next 15 years, its unwanted effects need consideration. Among these, aircraft noise is a major concern due to its impact on the environment and on the health and quality of life of people exposed. The reduction of aircraft noise from other sources has made noise contributions from the engine core increasingly important. Therefore, the development of low-noise aircraft engines requires the identification and analysis of noise sources contributing to engine core-noise, among which direct combustion noise, originated by the unsteady combustion, plays a major role. In this project, direct combustion noise will be analyzed by means of an essentially computational approach, but with some experimental activities to support the computational work. The main objective of this project is the development and validation of computational procedures for assessing direct combustion noise in combustors of gas turbine engines and therefore, to improve the understanding and limit the relevance of phenomena associated with flow instabilities giving rise to noise sources.
Since the numerical simulation of turbulent combustion in generic and realistic gas-turbine combustors by using conventional CFD tools is extremely costly due to the computational complexity that means the use of multiple specialized flow solvers, an accurate and efficient prediction of the flow field in combustors is only achievable through the use of highly parallelized, High Performance Computing (HPC) tools. Therefore, a computational methodology based on the use of well-established benchmarks and of reference computational solutions based on the previous experience of Noise Control team is proposed. Additionally, the capabilities of a specific facility (model of GT combustor) will be enhanced, and a methodology

for the characterization of the internal sound field generated by sources of direct combustion noise will be developed, including from single-point pressure measurement to flow visualization. As a result, a data base of the combustor acoustics at different operation conditions will be generated.

Candidate profile

The candidate should have a graduation title equivalent to an MSc, preferably in aeronautical or mechanical engineering, (a title in mathematics / physics or acoustics may also be considered), enabling him/her to pursue PhD studies. He/she should have a solid background in fluid mechanics and ideally combustion and /or acoustics, and more importantly in computational fluid dynamics. Familiarity with Linux / HPC environments, as well as some experience in programming and using open source codes such as OpenFOAM will be highly valued. The candidate has to be highly motivated and be prepared to work with autonomy. Fluency in English is necessary.

Application procedure

Interested candidates should send by e-mail the following documents to Prof. Alberto Broatch (abroatch@mot.upv.es).

(1) An updated CV
(2) A personal statement outlining motivation, interest in the topic and eligibility
(3) Academic records
(4) (Optional) Publication list/reference letters

Scholarship details

The scholarship is supported by the Spanish Ministry of Science and Innovation and is awarded in the frame of the national project "*Contribution to sustainable aviation through numerical optimization of lean combustors for quieter and cleaner next generation aircraft engines* (QUILECOM)".

June 2020