

## **Project title / job position title**

PhD Position, Numerical investigation of soot formation in aero engine combustors

## **Context and Mission**

The design of modern combustion systems needs to address challenges in aspects related to global efficiency, reduction of pollutant emissions, major flexibility of operation and reduction of thermo-acoustic instabilities. The use of numerical simulations as a tool for design is growing in the last decade as more computing power is becoming available. The proposed project is focused on the development of physical models and advanced numerical simulations of turbulent flames under conditions of interest for gas turbines. The main objective of the project is to develop a modelling strategy using CFD simulations for the prediction of soot in terms of chemical evolution and particle formation in conditions relevant to aero engine operation. The model developments are based on the use of detailed chemical kinetics for kerosene surrogates, and advanced combustion and spray models validated with reference experiments. It includes the development of efficient algorithms for the coupling of soot particles with gas phase dynamics allowing the use of large-scale applications with high computational efficiency.

The research team that the applicant will be involved is the Propulsion Technologies Group at CASE Department of BSC. The team is a multidisciplinary group with researchers from all disciplines and with strong background in Computational Fluid Dynamics (CFD). The team is involved in many EU and industrial projects related to this topic, where the successful activities and the publications on highly ranked scientific journals give the proved expertise. The applicant will be based at BSC, but will also interact with the project partners <https://estimate-project.eu>.

## **Key Duties**

The candidate will be focused on the study of soot formation from DNS and LES perspectives, and the integration of the soot models in the context of flamelet methods. The work departs from the validation of the turbulent combustion model at conditions representative of aero engine operation up to the simulation of spray flames with soot in complex geometries. The project is defined in order to use high-fidelity numerical simulations to predict complex fluid phenomena in modern and new generation combustion systems. It takes place in the context of a scientific and industrial framework aiming to enhance the accuracy, flexibility, user decision and applicability of numerical tools for industrial design.

## **Requirements**

### ***Education***

The candidate should hold an Engineering Degree in Aerospace, Aeronautics or Mechanical Engineering with interest in turbulence and combustion.

### ***Essential knowledge***

General knowledge on fluid mechanics, LES, numerical methods, combustion chemistry are expected.

### ***Additional knowledge***

Computational skills and parallel programming for HPC are not necessary, but will be considered an asset.

### ***Competences***

- Ability to work independently and make decisions
- Fluency in English is essential, Spanish is welcome.

## **Application**

The application should include:

- CV english, motivation letter and 2 support letters
- Starting date: 01/09/2021 - 30/09/2021
- Deadline: 15/08/2021
- <https://www.bsc.es/join-us/job-opportunities/26921caseptr1>

## **Contact**

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