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DEPARTAMENTO DE INGENIERÍA MECÁNICA

CHARLA

"Numerical investigation of flame dynamics, emissions and extreme events in aero-engine combustors"

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FECHA : 13 de septiembre 2018.

Hora : 12:00 hrs.

Lugar : Salón de Honor.

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Numerical investigation of flame dynamics, emissions and extreme events in aero-engine combustors

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The prediction of emissions and combustor operation ad adverse conditions, such as close to the lean blow out limits, is one of the main challenges for the development of new combustion technologies able to reduce the environmental impact of aero-engines. Both fundamental studies and investigations in lab-scale flames and model combustors give important contributions to the development of clean technologies, improving the understanding of the multi-scale phenomena that usually characterize turbulent spray flames.

Laminar flame studies of single kerosene droplets are discussed with a focus on droplet evaporation and autoignition at engine relevant conditions and their implication for the development of lean burn technologies. Then, Large Eddy Simulations (LES), with Conditional Moment Closure (CMC) combustion model, of turbulent spray flames close to blow-off are presented, pointing out the physical mechanisms leading to local extinctions and the model requirements for a reliable prediction of the blow-off event in spray flames. The modelling of soot in the context of LES-CMC is also introduced and an example of LES-CMC prediction of soot in a model combustor is presented. Recent applications of the LES-CMC approach to the prediction of the forced response of non-premixed flames is also discussed. Finally, the modelling and prediction of indirect noise in realistic engines are introduced with a focus on both entropy and compositional noise.

Acknowledgements. The research leading to this work was partly funded by Rolls-Royce plc. Dr A. Giusti would like to thank Prof. E. Mastorakos, Prof. A.P. Dowling, Dr Luca Magri, Dr J.A.M. Sidey , Dr H. Zhang, Dr G. Borghesi, and Mr M.P. Sitte for the contribution, useful discussions and support during this research.