Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Flame structure analysis and flame stabilization in a turbulent swirling spray flame[1] DANYAL MOHADDES, WENWEN XIE, MATTHIAS IHME, Stanford University — The quantitative prediction of the flow and combustion dynamics within highly turbulent environments encountered in modern aviation gas turbine engines remains an important challenge for the numerical combustion community. The use of large eddy simulation (LES) has become well-established for the analysis of such flows. Although a multitude of modelling approaches exist for combustion chemistry with known limitations in accuracy and computational cost, specific effects of a combustion model on a given simulation cannot be known a-priori. In this study, a turbulent swirling n-dodecane spray flame at ambient pressure is investigated using LES employing the Lagrangian point-particle approach for the liquid phase and the gas-phase reaction chemistry is described using finite-rate chemistry. Comparisons with experiments are performed to assess the accuracy of the simulation and physical submodels. The flame structure is analyzed and effects of the combustion model on the spray are examined.

[1]National Science and Engineering Research Council of Canada

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Date submitted: 22 Nov 2019 Electronic form version 1.4