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High fidelity simulation of liquid jet in an excited crossflow XIAOYI LI, Staff Research Engineer, United Technologies Research Center, MARIOS SOTERIOU, Fellow, United Technologies Research Center — Dynamic excitation of liquid jet in crossflow by externally oscillating the air stream has attracted much attention mainly due to its relevance to thermoacoustic instability mitigation. In this work, first principle high fidelity simulations of liquid jet atomization in an excited gaseous crossflow are performed using a dual-fluid Combined Level-Set and Volume Of Fluid (CLSVOF) interface capturing approach enhanced by a ghost fluid sharp interface treatment. Adaptive mesh refinement and Lagrangian algorithm for the smallest, spherical droplets are used to reduce the simulation cost. The simulations are validated against recently published experimental results. Mean features such as average jet penetration, volume flux and droplet size distribution and dynamic evolution of these quantities are studied. Proper Orthogonal Decomposition (POD) analyses of liquid surface features as well as detailed visualizations of the gaseous flow in the vicinity of the liquid column are performed. Detailed discussion of the impact of excitation on the physics of atomization is presented and the mechanisms by which excitation modifies the spray are identified.

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