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The Impact of Density Ratio on the Primary Atomization of a Turbulent Liquid Jet in Crossflow[1] MARCUS HERRMANN, Arizona State University — Atomizing liquids by injecting them into crossflows is a common approach to generate fuel sprays in gas turbines and augmentors. Although correlations derived from experimental data exist for the jet penetration, predicting the drop size distribution resulting from the primary breakup of the liquid jet is a more challenging task. Furthermore, most correlations are derived from experimental data performed at ambient conditions, thereby not matching the density ratio found in most gas turbine applications. In this paper, we will study the impact of density ratio on the primary atomization of a turbulent liquid jet injected into a subsonic crossflow using detailed numerical simulations, leaving constant all other relevant characteristic numbers, i.e. jet and crossflow Weber numbers, Reynolds numbers, and momentum flux ratio. The influence of density ratio on the physical mechanisms causing the initial breakup of the jet, the resulting grid dependent/independent drop size distributions, and the jet penetration will be discussed.

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