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Turbulent Deflagrated Flame Interaction with a Fluidic Jet Flow for Deflagration-to-Detonation Flame Acceleration JESSICA CHAMBERS, JOSEPH MCGARRY, KAREEM AHMED, Propulsion & Energy Research Laboratory, Mechanical & Aerospace Engineering, University of Central Florida — Detonation is a high energetic mode of pressure gain combustion. Detonation combustion exploits the pressure rise to augment high flow momentum and thermodynamic cycle efficiencies. The driving mechanism of deflagrated flame acceleration to detonation is turbulence generation and induction. A fluidic jet is an innovative method for the production of turbulence intensities and flame acceleration. Compared to traditional obstacles, the jet reduces the pressure losses and heat soak effects while providing turbulence generation control. The investigation characterizes the turbulent flame-flow interactions. The focus of the study is on classifying the turbulent flame dynamics and the temporal evolution of turbulent flame regime. The turbulent flame-flow interactions are experimentally studied using a LEGO Detonation facility. Advanced high-speed laser diagnostics, particle image velocimetry (PIV), planar laser induced florescence (PLIF), and Schlieren imaging are used in analyzing the physics of the interaction and flame acceleration. Higher turbulence induction is observed within the turbulent flame after contact with the jet, leading to increased flame burning rates. The interaction with the fluidic jet results in turbulent flame transition from the thin reaction zones to the broken reaction regime.

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