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**Numerical and Experimental Study of Piloted Liquid Spray Flames** DORRIN JARRAHBASHI, YEJUN WANG, SALAR TAGHIZADEH, WARUNA KULATILAKA, Texas A&M University, TEXAS A&M UNIVERSITY TEAM — Liquid-fuel spray flames are the primary mode of energy conversion in many high-power-density practical combustion devices. A modified, flat-flame McKenna burner fitted with a direct-injection high-efficiency nebulizer is used to produce piloted liquid-methanol spray flames. A 3D computational model is developed which comprised of compressible continuous gas phase using URANS in conjunction with two-way coupled Eulerian-Lagrangian spray modeling approach along with a partially-stirred reactor combustion model. Model predictions of Hydroxyl (OH) and carbon monoxide (CO) in the radial and axial directions at different flame locations are compared with laser-based imaging measurements. OH profiles are obtained using nanosecond planar laser-induced fluorescence (PLIF) for characterizing the reaction zone and temperature, while 2D images of CO are obtained via two-photon laser-induced fluorescence (TPLIF) using femtosecond-duration laser pulses. The computational model predicts the general trends of OH, temperature and CO profiles well at certain heights above the burner surface. The sensitivity of the model to the droplet size distribution, pilot flame temperature, and the co-flow temperature are discussed.

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