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Flame structure in a compact inlet/scramjet combustor[1] MIRKO GAMBA, VICTOR A. MILLER, M. GODFREY MUNGAL, RONALD K. HANSON, Stanford University — OH PLIF is used to investigate the flame structure in an inlet/scramjet combustor model tested in the Stanford 6-Inch expansion tube. The model is characterized by a compression inlet that generates a shock train confined within the constant area combustor. The inlet flow is maintained at $M = 2.8$, $p = 40kPa$ and $T \sim 1250K$. Hydrogen is injected through a single transverse injector at equivalence ratios up to 0.44. Optical access along the combustor allows flow imaging on orthogonal planes. Global effects of fuel injection are quantified by wall-pressure measurements with oxidizing and non-oxidizing freestreams. It is found that mass addition alone does not significantly impact the flowfield. Fuel injection and combustion effects manifest well downstream even under conditions where combustion is stabilized at the injector. The general flame structure in the near-field of the jet shares many similarities with isolated transverse jets. Similarly, in spite of the shock train, the flame structure in the wake region behaves as an undisturbed shear layer where a laminar-like structure typical of low-speed nonpremixed combustion is observed. Finally, the results suggest that the shock train may favor flame stability and anchoring at the shock reflection points.

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