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Influence of Standing Acoustic Waves on Combustion of Alternative Fuels SOPHONIAS TESHOME, ALEC PEZESHKIAN, OWEN SMITH, ANN KARAGOZIAN, UCLA — The present experimental study focuses on exposure of single burning fuel droplets to external acoustical excitation created in a cylindrical waveguide bounded by two loudspeakers. This configuration creates a relatively symmetric acoustic field whereby standing waves may be created, forming a pressure node (PN) or antinode (PAN) within the waveguide. A range of alternative liquid fuels is considered in these experiments, including ethanol, methanol, white gasoline, JP-8, and blends of JP-8 and liquid synthetic fuel. Droplet burning rates, flame characteristics, and their dependence on the position of the droplet relative to the PN and PAN are quantified. In some cases, large scale acoustic forcing is observed to cause flame deflection so strong that the effective acoustic radiation force appears to approach the magnitude of the buoyant force acting on the flames. Flame orientation is observed to change abruptly as the droplet position is moved from one side to the other relative to the PN or PAN, consistent with theory,[1] although for very large amplitude acoustic forcing, the magnitude of the acoustic acceleration can exceed theoretical predictions. Variations in burning rates for a range of fuels and excitation conditions relevant to engine systems are quantified.

[1]Tanabe, et al., **Proc. Comb. Inst.** 30, p. 1957-1964, 2005

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