# Investigating the Acoustic Flame Interaction with the Effects of Magnetic Field and Plasma

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Combustion instability is a serious issue that occurs in aeronautical engines causing damage to the engine due to heat release rate fluctuations. Understanding how acoustics interact with flames make finding a solution for this problem possible. The purpose of this project is to test how a flame reacts to acoustic perturbations of the flow and then applying various methods to limit their effect. The novelty of this research is determining the acoustics effect by observing flame transformation from M-shape to V-shape. A frequency generator was used to emit 16-208 Hz waves. The amplitudes were increased until the acoustic forcing transformed flame shape. Two equivalence ratios (ER), 0.9 and 0.8, of the flame were tested with temperatures of 2100K and 2000K respectively. Plasma and a magnetic field were applied to the flame to determine their effect on the acoustic flame interaction. Results show that the flame is more stable at low frequencies when acoustic forcing is applied. It was also found that the 0.9 ER flame is more stable than the 0.8 ER flame. The application of plasma did not stabilize the flame, while the application of a uniform magnetic field made the flame less stable when running acoustics. In conclusion, clear data about acoustics' effect on the flame shape was obtained in frequencies from 16 to 208 Hz. It was also determined that the hotter the flame is the more stable it becomes. This study will be helpful in the future development of control systems for combustion instabilities in engines.