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Abstract #XXX *(to be filled by the organizers)*
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Unsteady Thermal Throat Position under Acoustic Forcing

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Abstract

The internal acoustic behavior induced by the thermal throat is nowadays unclear, though required to study pressure oscillations issues in dual-mode scramjet [1]. The present work investigates transient acoustical phenomena inside a realistic ramjet shape nozzle. Specifically, the acoustic response of the thermal throat is studied by an inlet harmonic velocity forcing. Firstly, the unsteady position of the thermal throat as a function of the observed acoustic oscillations is analyzed. Secondly, an analytical model is developed to describe the thermal throat position. To model the impedance, a thermal throat position is required [2]. Sinusoidal velocity waves within the range of 50 Hz to 500 Hz are considered. In the frequency range, the position response can be split into a mean and a fluctuating position. The analysis of the thermal throat position shows a linear correlation between the incident wave intensity and the magnitude oscillation of the thermal throat position. Moreover, the mean position of the thermal throat, in the same frequency range, is moving upstream for high-intensity incident waves (see Figure 1). At higher frequencies, the previous behavior is no more valid. The present study is a first step to lay the basic elements to develop a reduced-order model for oscillated flow induced by the thermal throat.

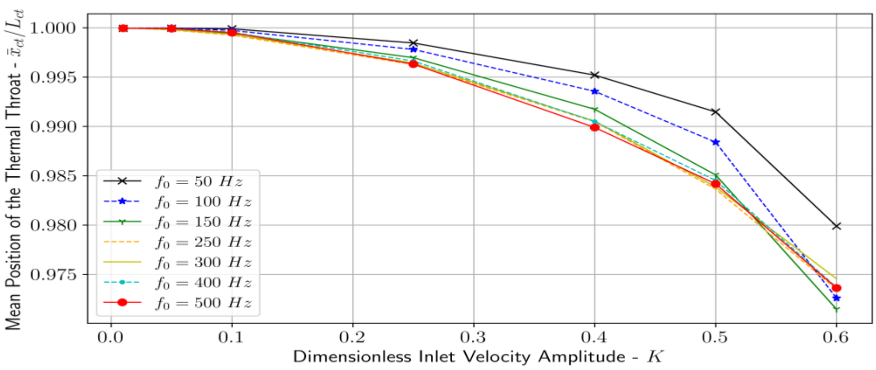

Figure 1 Evolution of the mean position of the thermal throat in response to several incident intensities (K) and frequencies (f_0)

References

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