

Theory of Oblique Detonations and Application to Propulsion

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Abstract

The oblique detonation, a combustion process initiated by an oblique shock, arises in most supersonic combustion applications including, most notably, the oblique detonation wave engine and the ram accelerator. Additionally, it is the generic two-dimensional compressible shocked reacting flow; consequently, its basic research value is inherent. The outstanding theoretical questions are also the fundamental practical questions: e.g. what conditions are necessary for steady solutions, what is the dependency of the steady propagation speed on the ambient condition, what is the susceptibility of the system to instability, and what is the behavior of the system in unsteady operation. A related topic which transcends all questions is the ability to describe these phenomena computationally. At this early stage, these issues are most clearly addressed with simple models. This talk will review the application of such models to oblique detonations and discuss their future relevance.