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Modeling Shock Train Leading Edge Detection in Dual-Mode Scramjets FOLUSO LADEINDE, ZHIPENG LOU, State Univ of NY- Stony Brook, WENHAI LI, TTC Technologies, Inc. Centereach, NY — The objective of this study is to accurately model the detection of shock train leading edge (STLE) in dual-mode scramjet (DMSJ) engines intended for hypersonic flight in air-breathing propulsion systems. The associated vehicles have applications in military warfare and intelligence, and there is commercial interest as well. Shock trains are of interest because they play a significant role in the inability of a DMSJ engine to develop the required propulsive force. The experimental approach to STLE detection has received some attention; as have numerical calculations. However, virtually all of the numerical work focus on mechanically- (i.e., pressure-) generated shock trains, which are much easier to model relative to the phenomenon in the real system where the shock trains are generated by combustion. A focus on combustion, as in the present studies, enables the investigation of the effects of equivalence ratio, which, together with the Mach number, constitutes an important parameter determining mode transition. The various numerical approaches implemented in our work will be reported, with result comparisons to experimental data. The development of an STLE detection procedure in an a priori manner will also be discussed.

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