Ignition-and-Growth Modeling of
NASA Standard Detonator and a Linear Shaped Charge

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Abstract

The main objective of this study is to quantitatively investigate the ignition and shock sensitivity of NASA Standard Detonator (NSD) and the shock wave propagation of a linear shaped charge (LSC) after being shocked by NSD flyer plate. This combined explosive train was modeled as a coupled Arbitrary Lagrangian-Eulerian (ALE) model with LS-DYNA hydro code. An ignition-and-growth (I&G) reactive model based on unreacted and reacted Jones-Wilkins-Lee (JWL) equations of state was used to simulate the shock initiation. Various NSD-to-LSC stand-off distances were analyzed to calculate the shock initiation (or failure to initiate) and detonation wave propagation along the shaped charge. Simulation results were verified by experimental data which included VISAR tests for NSD flyer plate velocity measurement and an aluminum target severance test for LSC performance verification. Parameters used for the analysis were obtained from various published data or by using CHEETAH thermo-chemical code.

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