Abstract Submitted
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A Multi-Component Model that Describes Weak Detonation in Blast Explosives[1] D. SCOTT STEWART, BLAINE ASAY, JOHN BDZIL, University of Illinois, Urbana, IL, JOSEPH FOSTER, Air Force Research Laboratory, Armament Directorate, Eglin Air Force Base, FL, ALBERTO HERNÁNDEZ, University of Illinois, Urbana, IL, DAVID LAMBERT, Air Force Research Laboratory, Armament Directorate, Eglin Air Force Base, FL — Recently our group proposed a conceptual, multi-component model of an explosive material that admits weak (sonic) detonation. The weak detonation has the property that its propagation speed and wave structure is a function of the reaction rate of decomposition of reactants to products. The simplest version of the model assumes that a blast explosive has three components, reactants, intermediates and products. For many cases of interest this model is applicable if the first step is an endothermic reaction to intermediates followed by an exothermic reaction to products. Analysis shows that the properties of the weak detonation depend on the ratio of the first and second reaction rates. The decomposition steps, each can be endothermic or exothermic, but the overall reaction must be exothermic. We present both a theoretical and an engineering analysis of a typical explosive in this class and demonstrate by means of accompanying numerical simulations, that a three component reactive flow model that has a fast exothermic step to intermediates, followed by a slower endothermic step to final products produces weak detonation.

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