Computational Comparisons for Several Tritonal and Solid Fuel Air Explosive Weapons

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ABSTRACT

Three-dimensional hydrocode calculations for a Tritonal (80% TNT, 20% aluminum) filled large cased weapon, and a 1000-lb Solid Fuel Air Explosive (SFAE) filled device have been completed for a tunnel geometry. The SFAE mixture in both cases is composed of aluminum flakes coated with Viton, a fluorine compound surrounding a PBX-112 core. The ratio of solid fuel to explosive in each case was 2.6:1. The computational model for the aluminum flakes includes convective heating and cooling, a Reynolds number based drag interaction with the surrounding gas, and a burn model incorporating the oxygen concentration in the surrounding region, as well as the particle area and temperature.

The results of the comparisons indicate Solid Fuel Air Explosives offer the possibility of significantly higher impulses. The calculations also indicate that, as the SFAE devices require atmospheric oxygen for complete reaction, the device performance can be strongly influenced by the surrounding geometry.

The comparisons show that late time behavior of the aluminum burn does not cube-root scale and is a function of the particulate heating and mixing with oxygen. The comparison with the large weapon indicates that the SFAE device produces higher impulses throughout the tunnel system. Results are limited to partially contained systems and should not be extrapolated or scaled to free air detonations or different size scales.