INVESTIGATING ALUMINIZED EXPLOSIVES IN OPEN AIR

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A series of calculations have been completed to aid in understanding key characteristics of metalized explosives in an open air environment. An issue that has been discussed is the metal size characteristics and how the particle shape and size contribute to both the initial pressure peaks and overall impulse. An important consideration to these performance calculations is how sensitive the models in our CFD code (SHAMRC) are to the input parameter of particle size distribution. Applied Research Associates (ARA) has completed several three dimensional calculations modeling this two phase flow with chemical reactions and thermal exchange to show that particle shape can have a significant effect on overall results. In addition, gauge characteristics are an important factor in measuring the data required to make these evaluations and will be discussed with respect to measuring flow in the near field. This study will help show how ARA's particle burn model captures the physics inherent in these calculations and tests.

These studies were completed to aid in the understanding of metalized explosive mixtures. By comparing measurements in the near and far field for TNT and Tritonal, ARA can help evaluate the additive's effectiveness and determine the optimum characteristics (size, shape, coatings) and percentage of the additive for a desired explosive result. ARA's particle burn routine takes into account the metal particulate size distribution, the physical properties of the metal such as burn rate and ignition temperature, and the effectiveness of oxidizers. This is a calculation study, with comparisons to test data, to examine the difference between metal burn percentages, energy release as a function of time, and pressure and impulse time histories for varying particle types. This work was completed to aid the Army Research Laboratory in the understanding of particle characteristics and energy exchange of these particles with the fluid in the near field test environment where data measurement is difficult.