Abstract Submitted
for the SHOCK19 Meeting of
The American Physical Society

Simulating the Propulsive Capability of Explosives Loaded with Inert and Reactive Materials QUENTIN PONTALIER, McGill University, JASON LOISEAU, Royal Military College of Canada, AARON LONGBOTTOM, Fluid Gravity Engineering Ltd., DAVID L. FROST, McGill University — Diluting high explosives with inert particles typically reduces metal-acceleration ability (AA). Previous experimental results using glass and steel particles embedded in C4 or nitromethane at 5–80% mass fraction showed an up to 43% reduction in flyer velocity compared to an equal volume of base explosive. However, the addition of large fractions of inert particles modifies the scaling of flyer velocity with charge mass, so the diluted explosive may become relatively more efficient at large M/C. Alternatively, the addition of small mass fractions ($< 20\%$) of micrometric aluminum particles in nitromethane generally improved AA over an equal volume of base explosive. Reaction onset occurred within a few microseconds and exhibited enough exothermicity to overcome losses from heating and accelerating the particles. In the present study, numerical simulations of these configurations were performed using the EDEN multi-phase hydrocode. The acceleration, heating, compressibility, and reaction of the particles are quantified to better explain the partition of energy between the detonation products, accelerated flyer, and particles for these non-ideal systems.

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Date submitted: 27 Feb 2019 Electronic form version 1.4