

Abstract Submitted
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A Generalised Gruneisen Equation of State for Non-Reacted Explosives WILLIAM BELFIELD, BRIAN LAMBOURN, Atomic Weapons Establishment — A condition for compatibility between the non-reacted (NR) and detonation products (DP) equations of state (EOS) in a reactive burn model is that the two EOS surfaces in pressure – specific volume – specific internal energy space should not cross. Crossovers can lead to hydrocode calculation failures or non-physical results. At any specific volume for a Mie-Gruneisen EOS, pressure is linear in specific internal energy, with a slope equal to the Gruneisen Gamma divided by the specific volume. This causes a problem when both EOS are of Mie-Gruneisen form, as experiments suggest that the Gruneisen Gamma for the NR EOS is greater than for the DP EOS, which inevitably leads to a crossover at positive pressures. Equally there is a problem when a Mie-Gruneisen NR EOS is combined with tabular data from a chemical equilibrium DP EOS, in which Gruneisen Gamma varies with pressure at each specific volume. This work describes a new Generalised Gruneisen form for an NR EOS, in which Gruneisen Gamma varies with entropy as well as specific volume. It is shown that the new EOS has the potential to avoid the crossover with the detonation products EOS, whether this is of Mie-Gruneisen or chemical equilibrium form.

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