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Multiphase blast interaction between heterogeneous explosives ROBERT RIPLEY, SYDNEY RYAN, Martec Limited, CHARLES M. JENKINS, Air Force Research Laboratory — Spherical charges loaded with micrometric metal powders feature explosively dispersed particle fields. The interaction phenomena of opposing multiphase flow fields from multiple charges depend on the charge spacing, loading configuration and particle morphology. For identical heterogeneous charges with a separation distance in the near field, the multiphase blast interaction includes particle-particle collision in the shocked air and impinging detonation products between the charges. Experiments recorded using high-speed framing cameras show the blast interaction process and resolve details of the multiphase structures. Hydrocode simulations are conducted using inelastic Lagrangian particle groups with a Direct Simulation Monte Carlo particle collision model. The numerical results distinguish the multiphase interaction layer and gas dynamic boundaries, with an emphasis on the particle laden Mach stem. The experimental results provide data for comparison to the interacting front velocities and Mach stem velocity. Modeling results for twin charges are shown to be different from a single heterogeneous blast reflection due to the stochastic and dissipative particle collisions. Remaining differences between the experimental and numerical results are discussed. The numerical results are further analyzed to assess particle fragmentation and potential for enhanced reaction in the interaction region between heterogeneous charges.

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