Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Solving the Guderley Implosion Problem with a Gruneisen-Like Equation of State JENNIFER LILIEHOLM, EMMA SCHMIDT, SCOTT RAMSEY, ZACHARY BOYD, Los Alamos National Laboratory — The Guderley problem is a solution to the inviscid Euler Equations which models a strong shock originating at infinity in both space and time. This shock converges to the one-dimensional symmetric origin, where the resulting in?nite pressure causes a weaker diverging shock. The solutions to the converging and diverging shocks are self-similar, and thus the results can be scaled. This scaling means that the solutions are independent of unit choice, and can then be freely transformed across time, space, and material state. However, this requirement of self-similarity limits the equations of state (EoS) that can be used with the problem, because the EoS must exhibit scaling behavior as well. The Gruneisen equation of state is one such closure model that does not feature scaling properties. The EoS describes the behavior of crystalline solids, making it desirable for use in studies of shock propagation in solid materials. Our work endeavored to find coefficients for the Virial EoS (which consists of a power series expansion about the ideal gas in density) to approximate the Gruneisen EoS. This was done because Virial EoS is inherently scalable, and thus can be used to solve the Guderley problem. With our new form of the Virial EoS, we were able to solve the Guderley problem for a material with Gruneisen-like qualities.

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Date submitted: 28 Jul 2016 Electronic form version 1.4