Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Numerical investigation of 3D effects on a 2D dominated flow[1]

DANIEL REESE, University of Wisconsin, CHRISTOPHER WEBER, Lawrence Livermore National Laboratory — A nominally two-dimensional interface, unstable to the Rayleigh-Taylor or Richtmyer-Meshkov instability, will become three-dimensional at high Reynolds numbers due to the growth of background noise and 3D effects like vortex stretching. This three-dimensionality changes macroscopic features, such as the perturbation growth rate and mixing, as it enhances turbulent dissipation. In this study a 2D perturbation with small-scale, 3D fluctuations is modeled using the hydrodynamics code Miranda. A Mach 1.95 shockwave accelerates a helium/SF6 interface, similar to the experiments of Motl et al. [1], to explore the regime where a 2D dominated flow will experience 3D turbulent effects. We report on the structure and growth of the post-shocked interface, as well as mixing measurements and energy spectra. These metrics are compared against 2D simulations to probe the influence of three-dimensionality on the evolution of the RMI.

[1] Motl et al., "Experimental Validation of a Richtmyer-Meshkov Scaling Law Over Large Density Ratio and Shock Strength Ranges" Phys. Fluids (2009)

[1]Part of this work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

Daniel Reese
University of Wisconsin

Date submitted: 31 Jul 2014 Electronic form version 1.4