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A shocked gas cylinder as an example of Richtmyer-Meshkov transitional mixing ERIK VOLD, CHRIS TOMKINS, Los Alamos National Laboratory — Previously, simulations of Richtmyer-Meshkov (R-M) instability-driven mixing in a gas cylinder after passage of a shock (Ma = 1.2) were shown to agree with experimental data, and indicated there is an order of magnitude increase in post-shock mixing rates attributed to the increased gas interface area and slope steepening in the post-shock roll-up and formation of secondary instabilities (Vold and Tomkins, Bull. Am. Phys. Soc., DFD04, GP.007). We re-examine the results as an example of a general transition from instability to a fully mixed state, with large scales evolving to smaller scales via stretching and secondary instabilities, and subsequently to a fully (molecularly) mixed state. Three phases in the transition to mixing (similar to those identified in Zhang, et.al., Phys. Fluids 16(5) p.1203, 2004) are examined and relations between vorticity, shock deposited circulation, an evolving 'baroclinic circulation', and late time mixing are described. The stretching due to the circulation and secondary instabilities during late time mixing contributes to the increased interfacial area resulting in the enhanced molecular mixing observed in the simulations. The evolution to the final mixed state appears to be consistent with the assumption that small scales are resolved in the experiment, and thus, the experiment and simulations exemplify a resolved scale transition to a fully mixed state.

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