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Improved Reactive Flow Modeling of the LX-17 Double Shock Experiments[1] THOMAS J. REHAGEN, PETER VITELLO, Lawrence Livermore Natl Lab — Over driven double shock experiments provide a measurement of the properties of the reaction product states of the insensitive high explosive LX-17 (92.5% TATB and 7.5% Kel-F by weight). These experiments used two flyer materials mounted on the end of a projectile to send an initial shock through the LX-17, followed by a second shock of a higher magnitude into the detonation products. In the experiments, the explosive was initially driven by the flyer plate to pressures above the Chapman-Jouguet state. The particle velocity history was recorded by Photonic Doppler Velocimetry (PDV) probes pointing at an aluminum foil coated LiF window. The PDV data shows a sharp initial shock and decay, followed by a rounded second shock. Here, the experimental results are compared to 2D and 3D Cheetah reactive flow modeling. Our default Cheetah reactive flow model fails to accurately reproduce the decay of the first shock or the curvature or strength of the second shock. A new model is proposed in which the carbon condensate produced in the reaction zone is controlled by a kinetic rate. This allows the carbon condensate to be initially out of chemical equilibrium with the product gas. This new model reproduces the initial detonation peak and decay, and matches the curvature of the second shock, however, it still over-predicts the strength of the second shock.

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Thomas J. Rehagen
Lawrence Livermore Natl Lab

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