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Sensitivity and Uncertainty in Detonation Shock Dynamics Parameterization CARLOS CHIQUETE, MARK SHORT, SCOTT JACKSON, WX-9 : Shock and Detonation Physics, Los Alamos National Laboratory — Detonation shock dynamics (DSD) is the timing component of an advanced programmed burn model of detonation propagation in high explosives (HE). In DSD theory, the detonation-driving zone is replaced with a propagating surface in which the surface normal velocity is a function of the local surface curvature, the so-called $D_n - \kappa$ relation for the HE. This relation is calibrated by assuming a functional form relating D_n and κ, and then fitting the function parameters via minimization of a weighted error function of residuals based on shock-shape curves and a diameter effect curve. In general, for a given HE, the greater the available shock-shape data at different rate-stick radii, the less the uncertainty in the DSD fit. For a wide range of HEs, however, no shock shape data is available, and DSD calibrations must be based on diameter effect data alone. With this limited data, potentially large variations in the DSD parameters can occur that fit the diameter effect curve to within a given residual error. We explore uncertainty issues in DSD parameterization when limited calibration data is available and the implications of the resulting sensitivities in timing, highlighting differences between ideal, insensitive and non-ideal HEs such as Cyclotol, IMX-104 and ANFO.

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