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Determination of the Velocity-Curvature Relationship for Unknown Detonation Front Shapes SCOTT JACKSON, MARK SHORT, Los Alamos National Laboratory — Detonation Shock Dynamics (DSD) is a surface propagation concept that replaces the detonation shock and reaction zone with a surface that evolves according to a specified normal-velocity evolution law. DSD is able to model detonation propagation when supplied with two components: the normal-detonation-velocity variation versus detonation surface curvature and the surface edge angle at the explosive-confiner interface. The velocity-curvature relationship is derived from experimental rate-stick data. Experimental front shapes can be fitted to an analytic equation with a similar characteristic shape and the detonation velocity-curvature relationship computed from that analytic expression. In some complex explosive-confiner configurations, an appropriate functional form for the detonation front shape may be difficult to construct. To address such situations, we numerically compute the velocity-curvature relationship directly from discrete experimental front-shape data with no assumptions of wave shape. The results are then compared to the analytic method for determining the velocity-curvature relationship. The possibilities and limitations of such an approach are discussed.

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