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Influence of Flow Gradients on Mach Stem Initiation of PBX-9502 LAWRENCE HULL, PHILLIP MILLER, ERIC MAS, Los Alamos National Laboratory, FOCUSED EXPERIMENTS TEAM — Recent experiments and theory explore the effect of flow gradients on reaction acceleration and stability in the pressure-enhanced region between colliding sub-detonative shock waves in PBX-9502. The experiments are designed to produce divergent curved incident shock waves that interact in a convergent irregular reflection, or "Mach stem", configuration. Although this flow is fundamentally unsteady, such a configuration does feature particle paths having a single shock wave that increases the pressure from zero to the wave-reflected enhanced pressure. Thus, the possibility of pre-shock desensitization is precluded in this interaction region. Diagnostics record arrival wave velocity, shape, and material velocity along the angled free surface face of a large wedge. The wedge is large enough to allow observation of the wave structure for distances much larger than the run-to-detonation derived from classical "Pop plot" data. The explosive driver system produces the incident shocks and allows some control of the flow gradients in the collision region. Further, the incident shocks are very weak and do not transition to detonation. The experiments discussed feature incident shock waves that would be expected to cause initiation in the Mach stem, based on the Pop plot. Results show that the introduction of pressure/velocity gradients in the reaction zone strongly influences the ability of the flow to build to a steady "CJ" detonation. As expected, the ability of the Mach stem to stabilize or accelerate is strongly influenced by the incident shock pressure.

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