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Laboratory-scale blast testing of materials using air-shock loading FORREST SVINGALA, MATTHEW BISS, MICHAEL HARGATHER, GARY SETTLES — The deformation of materials due to near-field explosions is a complex topic with many military and anti-terrorism applications. Typical explosive blast testing is conducted on large ballistic ranges using several kilograms of explosives, at a high cost, and with limited instrumentation. We have developed a range of experimental techniques for performing explosive blast research in the laboratory using gram-range explosive charges. Here we present recent measurements of the deformation of aluminum panels subjected to a range of explosive blast impulses. Through an explosive characterization procedure the blast impulse produced by a charge is known a priori. Our approach then couples the known explosion energy to the aluminum panels via shock wave propagation through the air. Time-resolved three-dimensional motion of the panel surface response is directly measured via stereoscopic high-speed digital image correlation. The data are used to compare material deformation characteristics to explosive loading parameters. These laboratory techniques can be used for validation of computational simulations and to develop high-strain rate material strength models. Ultimately results from these gram-range tests can be scaled to predict full-scale blast response characteristics.

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