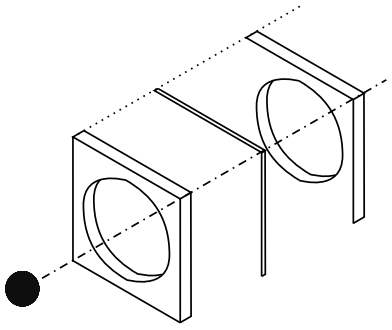
2 Experimental procedure

Two explosive compounds are used here to examine a range of blast parameters: Pentaerythritol tetranitrate (PETN) is a common and well-documented secondary explosive [11] and triacetone triperoxide (TATP) is a primary explosive recently linked to terrorist activities [12]. These explosives were previously studied

Gra r nge e p os e st sc ng



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The graph of deflection versus peak overpressure, Figure 4a, shows that most of the data for a given explosive compound lie along a single line, with the exception of one PETN test. This outlying point, however, collapses with the other data when deflection is plotted as a function of impulse, Figure 4b. This single test, conducted with a 15% larger charge mass than the others, reveals the importance of mass scaling and the use of explosive impulse as the controlling blast parameter.

4 Conclusions and future work

Laboratory-scale gram-range blast testing of materials can be safely and successfully performed. The experiments are highly repeatable and are amenable to instrumentation yielding blast overpressure loading and resulting witness-plate deflection. The dynamic and permanent deformation of a witness plate can be estimated, based on these results, if the explosive blast parameters are known. Before performing materials tests, however, the explosives being used require optical characterization in terms of their shock wave Mach number versus radius profiles in order to understand the variation of overpressure, duration, and impulse that they produce.

The most important parameter for gram-range blast testing appears to be the explosive impulse. The assumption of a triangular overpressure profile is a first approximation, but it is insu□cient to accurately estimate and model the explosive blast loading of different explosive compounds.

Future work needs to reconcile the deflection vs. impulse curves of PETN and TATP, which currently do not collapse upon a single line. The di□erence between these curves could potentially be eliminated by computing the impulse from the actual pressure decay profile instead of the linear-decay assumption [14]. The decay parameter varies with distance from the charge center and initial attempts to scale using it have failed.

Once a better scaling approach has been identified, more testing is planned using the same explosive compounds over a wider range of charge mas

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