BLAST AND DEBRIS IN THE NEAR FIELD - DIAGNOSTIC TECHNIQUES AND CALCULATIONAL TOOLS TO PREDICT COMBINED IMPULSIVE LOADING

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ABSTRACT

Measuring and understanding the pressure and impulse loading on structures in the near field is commonly hindered by the flash of the fireball and the poor survivability of electrical diagnostics. This is further complicated where the explosive is surrounded by a fragmenting case, granular mitigation or other material. The increase in momentum from accelerated debris is such that the overall loading experienced by nearby structures can be higher than that from a bare charge. For loading in the dynamic regime the full temporal loading function is required to couple with Single Degree of Freedom structural response calculations.

Test charges of 100 g PE4 surrounded by a spherical shell of granular sand have been fielded in a diagnostic array to develop the techniques to measure and differentiate the relative loading produced by a combination of air blast and high velocity debris.

Held impulse techniques have been refined by coupling free-flying momentum blocks with Doppler radar and other velocimetry techniques to gauge the initial acceleration of the masses. Side on and reflective piezoelectric pressure gauges alongside high speed video enable assessment of the relative arrival times of the air shock and debris. In addition, the particulation, velocity and density distribution of the expanding mitigant material has been recorded using pressure sensitive paper, penetrative Doppler radar techniques and laser obscuration methods.

EDEN hydrocode modeling proves a valuable tool for predicting the early time expansion and interaction between the explosive and the granular material however the jetting or dynamic fragmentation of these systems requires more comprehensive assessment.