APPLICATION OF CLASSIC CASING EFFECTS FORMULAE TO BLASTPAD EXPERIMENTAL RESULTS

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Airblast environments from cased explosive charges are often estimated through the use of various formulae which provide an equivalent bare explosive weight to represent the cased explosive. These formulae are typically based upon energy partitioning considerations which attempt to account for the kinetic energy of casing fragments and detonation gases. This assumes that remaining explosive energy is available to produce airblast. The equivalent bare explosive weight of the cased explosive is then the weight of the explosive containing that remaining energy. This further assumes that the airblast from the cased explosive will be adequately represented by a bare sphere of that explosive weight. Historically, much debate has taken place regarding the optimum coefficients and form for these formulae. Another point of contention includes the overall sufficiency for estimating airblast pressures for cased explosives.

In this paper, classic formulae from the public literature are applied to measured airblast pressure waveforms from three series of experiments conducted upon the AFRL blastpad. Explosive charges for the blastpad experiments involved end-detonated steel-cased cylinders of pentolite having three different case mass-to-explosive mass ratios (lightly-cased to very heavily-cased). Approximately thirty-two airblast pressure measurements were obtained at various angles and azimuths for each experiment. Three replicate experiments were conducted for each type of cased charge. An analysis was then undertaken where the formulae were applied to the cased explosives from the blastpad experiments. The corresponding airblast peak pressures, peak impulses, and time-of-arrivals were then generated for the resulting equivalent bare explosive weights. Airblast parameters derived from the application of the formulae were directly compared to the measured airblast parameters to assess the predictive performance of each formula. Comments pertaining to the strengths and weaknesses of the various formulae and the limitations of this predictive approach are included in the paper.