REPRESENTATION OF ASYMMETRIC AIRBLAST FROM CASED EXPLOSIVES USING AN EQUIVALENT EXPLOSIVE WEIGHT FIELD

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Engineering-level models for predicting airblast from munitions often model the explosive source as a sphere of reference explosive for which free-air airblast parameters are commonly known. Casing effects, airblast performance of the specific explosive type, and sometimes even ground effects are crudely accounted for by changing the weight of the explosive sphere. Representation of a complex explosive source as a single-value equivalent explosive weight (EEW) brings great simplicity and practicality for predicting airblast environments in the context of engineering-level tools which require fast run-times and rather unsophisticated user input. Conversely though, it has been demonstrated through experiments (especially the AFRL blastpad) that single-value EEW representations can yield significant errors when used for cased munitions, non-ideal explosive fills, or other explosive devices which produce highly asymmetric airblast pressure fields. For applications such as these, an explosive source model capable of approximating proper asymmetric airblast phenomena is highly desirable.

Asymmetric airblast source models have been pursued with varying degrees of success and complexity. Generally, existing asymmetric airblast models utilize numerical simulations or empirical data sets to predict airblast parameters or waveforms at ranges and azimuths of interest for a specific explosive device. Thus, the methods tend to be computationally or experimentally costly, and often are only applicable to a specific charge or munition. In this paper, a more simple approach is explored, with the hope that it might bring predictive accuracy improvements to simple engineering tools, and be extensible to a "class" of explosive devices (rather than only a specific one). In particular, the utility of using measured airblast parameters from an AFRL blastpad experiment to generate an "EEW field" for a class of explosive device was examined. Measured airblast parameters from a blastpad experiment of a generic cased explosive cylinder were studied, and a determination of EEW was made at each measurement location. These EEW's were then used to produce a contour, or field, of EEW's for the cased cylinder. Scaling was then applied to the distances, and a simple normalization scheme to the EEW magnitudes, to produce a normalized EEW field which might then be applicable to the class of explosive charge. This paper describes this approach for asymmetric airblast source modeling, and comment is made on the strengths and weaknesses of the modeling approach.