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RECONSIDERATION OF THE EFFECT OF CASING ON SHOCK PRESSURE AND IMPULSE

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Abstract:
The presence of a steel casing significantly reduces the amount of shock pressure and impulse produced by a high explosive detonation. A case reduction factor is generally used to calculate the effective weight of bare explosive that represents the cased weapon. For decades, formulae for this factor with varying degrees of complexity have proliferated within the weapons effects community, each seeking to provide a more accurate representation than its predecessors. As a result, there is some measure of uncertainty if not outright confusion as to what is the preferred formula.

This paper brings together the available published historical data as well as the four most popular formulate available in the literature: Fano, Modified Fano, DAHS, and Fisher. More significantly, data from recent tests conducted by AFRL will be brought to bear on the subject so as to evaluate the relative accuracy of these formulae. The tests detonated cased C-4 charges along with a range of bare C-4 charges, within a non-responding steel structure. By comparing the result of the cased charge to the output from a wide range of bare charges, the equivalent bare charge can be reliably estimated; and by doing this over a number of gauges and for different case weight to charge weight ratios, additional credibility is gained.

The results show that at least one of the traditionally favored formulae is clearly inappropriate for moderately to heavily cased weapons, and the others each have shortcomings. A new formula is thus proposed as an alternative to the above, with a degree of simplicity and intuitive resonance that seems to better match both the test data as well as expected trends. Areas requiring future research are also highlighted.

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