THE ESCAPE OF BLAST FROM FRAGMENTING MUNITIONS CASINGS

M.D. Hutchinson
(presented by R. A Cheesman)

Hydrodynamics Department, Atomic Weapons Establishment
AWE Aldermaston, Reading, Berkshire, RG7 4PR, U.K

ABSTRACT

Researchers in the fields of explosives safety or effects often need to estimate the impulse delivered by blast escaping from the fragmenting casings of exploding munitions, relative to the blast impulse from the same explosive charge uncased. Even for free-field conditions, researchers currently depend for such estimates on formulae which either are not soundly derived (e.g. that of E.M. Fisher), or are simply fits to available experimental data. However, a sound analytical formula can be derived, using as its basis the physical assumptions of R.W. Gurney, which are already the basis for other well-known and useful approximations in this field.

Furthermore, this new formula can be extended in application to the common situation where the casing fragments before it reaches a high radius of expansion, thus allowing more blast impulse to escape. Drawing on recent work by A.B. Crowley, this can be achieved by including a dependency on the ratio of casing yield stress and explosive product gases internal pressure. An extended set of formulae incorporating this sensitivity to explosive and casing properties are shown to be consistent, at least qualitatively, with recent experimental data from researchers at BAE Systems. The derivations in this paper will be reported by the author in greater detail in the International Journal of Impact Engineering[1]