QUANTIFYING THE ENERGY BALANCE OF A HIGH EXPLOSIVE BLAST EVENT AND THE RESPONSE OF ARMOUR STEEL.

Steven Toppi[1], Brodie McDonald[1], Long Nguyen[1]

[1]*Defence Science and Technology Group, 506 Lorimer St, Fishermans Bend, Melbourne, Australia.*

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ABSTRACT

During a blast event, the chemical potential energy of a high explosive material is converted into kinetic energy and internal energy, both within the detonation product and surrounding media. This paper presents a quantitative evaluation of the energy balance resulting from the detonation of a cylindrical charge of plastic explosive at various stand-off distances (SODs).

The response of an armour steel target to this charge was characterised using an explosive bulge die (EBD) experiment at three SODs in the near to mid field blast regimes. These experiments provided insight into the effect of SOD on deformation response and were used to validate an Arbitrary Lagrange-Eularian (ALE) numerical simulation model of the experimental setup. With a validated model, it was possible to add and remove the interaction between the armour steel and each energy component of the blast in order to evaluate their contribution to target deformation. With a better understanding of how each of these energy components relate to target response, protection systems can be further optimised by mitigating the key energy components for the expected SOD during operation.