

The material response of thin Aluminium plates under near simultaneous Triple Impacts: A Finite Element Analysis

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Protection VS Fragments
The accurate quantification of the fragment impact resistance of materials is critical for the proper designing of protective equipment.



Explosions are complex threats comprised of two main parts: The Blast and the Fragments.

THE EXPLOSION

The Fragments

The fragments generated from explosions is the most frequent cause of death in modern warfare. Fragments travel long after the blast is attenuated.

The Blast

The Blast is a rapid expansion of gases that can be devastating to personnel, vehicles and structures. <image>

Standardized Tests

Current standards simplify the threat of multiple impacting fragments with a single impactor.

The Triple Impact Test

A near simultaneous Triple impact test using NATOS STANAG 1.102g FSPs, can simulate a dense cluster fragment impact with specific characteristics: Fragment velocity, Dispersion between impacts.



ALUMINIUM PLATES

Experimental: Single VS Triple Impact Tests on 15L K29 Fabrics







Wax Residual Velocity @ 340m/s Impacting velocity

Discrete Mesoscale - 15layers dry Fabric









CONCLUSIONS

The relative energy absorption capacity of the aluminium greatly depends on the projectile velocity, as expected. By altering the time intervals between impacting projectiles, the energy absorption can drop by up to 15%.

Maximum energy absorption is observed approximately at 20µs time interval between impacts.

Energy distribution varies over time, which in turn may result in much higher residual projectile velocity of one the three impacting projectiles which must be investigated further.

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