DESIGN AND CHARACTERISATION OF AN EXPLOSIVE TEST VEHICLE TO SIMULATE BLAST AND FRAGMENTATION THREATS IN THE NEAR FIELD

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AWE has a requirement to understand the threats from explosive devices to containment structures at scaled distances down to 0.35 m/kg$^{1/3}$, a region where the effects of geometry are significant. In this near-field range the greatest threat is often from the fragments generated from the explosive casing.

Safety demonstration and substantiation of containment design requires validated evidence of the system's response to expected threats; and therefore accurate definition of those threats. In response to these requirements, a suite of simple, cost effective, explosive test devices have been designed to provide characteristic blast and fragment threats at the distances of interest. The resultant devices can not only be used to validate calculational prediction methodologies but can also be used to test proposed mitigation schemes without recourse to fielding more complex and costly trials.

The development and characterisation of the test vehicle known as 'Lucy' has been performed through computational assessments and highly diagnosed explosive trials. Case expansion and fracture along with fragment sizes, velocities and rotation rates have been measured with high speed photography, Doppler radar velocimetry and fragment soft capture. 3D scanning of steel witness plates has assessed the threats from an un-mitigated device and the performance of a variety of mitigation schemes.

The use of such test devices, and the validation capabilities they have provided, has proved invaluable in AWE's pursuit of a capability to underwrite the performance of near-field protection schemes to high levels of confidence through calculational assessment alone.