EXTERNAL BLAST INGRESS INTO STRUCTURES

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An analysis of blast ingress into structures from the nearby external Detonation of a conventional-scale munition is presented. The work pertains to generic studies which could represent explosive munition attack against a bunker, armored fighting vehicle (AFV), or possibly civilian structure, where in all cases the warhead is presumed to hit externally nearby to an ingress aperture. The intent of the study was to assess what manner of near-miss scenario may still lead to blast incapacitation of personnel within the protective structure. Related work in this area has usually been limited to nuclear-scale blast conditions or semi-empirical treatments of the problem. In the current approach, full-scale tests and computational fluid dynamic (CFD) modeling studies were completed to assess the details of the blast-flow physics including the highly dynamic in-flow conditions and intrusion of Detonation products.

Emphasis is given to analyses of a blast trial series designed as a fully axi-symmetric target encounter to ease CFD modeling and interpretation. The tests involved well-defined external detonations near an aperture at one end of an otherwise closed cylindrical target structure. The target structure was roughly modeled after the dimensions of an AFV, and the charges were simulated blast-effect warheads of about 3kg charge size. Parameters considered included charge type (high-explosive and fuel-air explosive), charge stand-off and aperture size. Test diagnostics included internal and external blast pressures, high-speed cinematography of fireball entry, and internal temperatures. Some limited results are also described for blast effects from actual assault-weapon warheads including shaped-charges, and for scenarios where the external blast flow was perpendicular to, rather than in-line with, the entry aperture.