HUMAN TRAVEL DISTANCE DUE TO AN EXPLOSIVE

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An analytical model was developed to provide a quantitative predictive tool for horizontal distance travelled by a human or surrogate as a function of the standoff distance and mass of explosive, as in a Vehicle-Borne Improvised Explosive Device (VBIED). The initial velocity is based on the reflected impulse from a hemispherical blast. The launch angle is determined based on the angle from an average human's standing centre of gravity to the height of burst, and the coefficient of drag is assumed to be equivalent to that of a skydiver. This model was compared to experiments using 50 and 100 kg of TNT at standoff distances ranging from 2 to 6 m, representative of VBIED scenarios. For further comparison, full-scale experiments were also conducted at DRDC Suffield, Canada, with equivalent size explosives in a passenger vehicle, mimicking VBIEDs often encountered in asymmetric warfare or terrorist attacks. The trials involved human surrogates, in the form of steel mannequins, built with an equivalent total weight, shape and projected area of a human wearing an EOD Ensemble, i.e., 106 kg (233 lbs.). Results indicate a correlation between the final distances travelled to the scaled distance for free-field experiments (the scaled distance is defined as initial standoff distance divided by the mass of explosive to the one-third power). Moreover, several reference trials were also conducted whereby an anthropomorphic test mannequin (Hybrid II – Automotive crash test dummy) wearing the Med-Eng EOD 9 Ensemble were placed next to the steel mannequin producing validating results.