THE EFFECTS OF BTD ORIENTATION ON INJURY PREDICTIONS

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A BTD (Blast Test Device), consisting of a PVC cylinder reinforced with steel ribs measuring 32 cm diameter and 92 cm in height, was placed in a Blast Tube to determine the pressure field on a surrogate when subjected to a blast wave with initial peak nominal overpressures of 10, 20, and 40 psi and approximate durations of 50, 80, and 90 ms, respectively. The BTD was instrumented with eight pressure transducers mounted at 45° intervals throughout the circumference of the BTD. Using the different combinations of the pressure sensors, injury predictions were made at several angles relative to the initial blast wave. This angle, referred to as angle of attack, is derived from the transducer angle on the BTD labelled as the "chest" to the blast direction. Three types of injury predictions were made from the BTD pressure traces: the ASII value, the normalised work and the survivability percentage according to the Axelsson-Yelverton, Stuhmiller and Bowen models, respectively. These injury predictions were then compared to equivalent simulated results derived from a CFD tool, whereby some fluctuations were noted in the simulated results but remained within the experimental range and the same injury levels. It was found that the ASII values did not show a strong dependence with respect to angle of attack, whereas the calculated normalised work and associated injury predictions varied strongly with peak pressure and thus angle of attack. The experimental values were noted to be smaller at low angles of attack and higher at larger angles of attack, when compared to the values calculated using the simulation. The Bowen survivability percentages, calculated in the free-field without a BTD to limit pressure reflections, remained consistent for both the simulated and experimental results.