FLOW BLOCKAGE AND ITS EFFECT ON MINIMUM INCIDENT OVERPRESSURES FOR OVERTURNING VEHICLES IN A LARGE BLAST SIMULATOR

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The HULL hydrocode was used to make two-dimensional calculations of a non-decaying shock wave striking a right circular cylinder on the axis of a cylindrical shock tunnel. The area and length of the target were chosen to approximate a 21, ton truck carrying an S-280 Electrical Equipment Shelter, The diameter of the shock tunnel was varied to produce different blockage ratios (the ratio of target area presented to the flow to the cross-sectional area of the tunnel). Calculations were made for overpressures of 5, 10, and 20 psi, and blockage ratios of 30, 20, 10 and 2 percent. Calculations were also made to model a 2-D shock tube experiment, and calculated pressures were compared with measured pressures. The agreement was good. The results of the calculations for the cylindrical target and tunnel were used to provide force versus time acting upon the front, rear and side of the target. The change in translation force versus blockage ratio was calculated. The same relative change in drag force versus blockage ratio was assumed to apply for the truck shelter combination, an armored personnel carrier, and a tank. Overturning calculations were performed using a single-degree-of-freedom model, and the percent change in the limiting incident overpressures and the ground ranges for overturning were computed versus blockage ratio. The results provide some basis for deciding what blockage ratio is acceptable for overturning experiments in a large blast simulator.