AN APPROACH TO THE PROBLEM OF BLAST WAVE CLEARING ON FINITE STRUCTURES USING EMPIRICAL PROCEDURES BASED ON NUMERICAL SIMULATIONS

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When a blast wave impinges on a finite structure that is oriented in the direction of the blast, reflected pressures are produced on its surface. These pressures do not persist because the presence of the structure boundaries allow a relief wave to propagate inwards from the edges. This phenomenon is referred to as diffraction loading or blast wave clearing.

The main difficulties associated with diffraction loading are the uncertainty concerning the time it takes for the reflected pressure to decrease across the whole of the surface (the clearing time), and the level to which the pressure subsequently reduces. The resulting average specific impulse on the front face of the structure depends on the magnitude of these two important, though sometimes not precisely known, pieces of information.

Current guidance suggests that the reflected pressure reduces to the sum of the incident pressure plus the dynamic pressure multiplied by a suitable drag coefficient. This assumption does not allow the possibility that the pressure might fall below incident during the positive phase. Comparison with small scale experiments suggests that this approach results in a slight overprediction of the average specific impulse.

The aim of this paper is to demonstrate a possible approach to this and other similar problems by using Computational Fluid Dynamics techniques to analyse a large number of combinations of scaled stand-off and scaled structure size, then interpolating the results to find a solution for the general case.