INERT MATTER IN CLOSE-IN EXPLOSIVE LOADING: AN EXPERIMENTAL INVESTIGATION USING A PENDULUM

F.G.Hulton, L. Enstock
Defence Evaluation and Research Agency United Kingdom

In 1993 DERA started a programme to develop structures to resist large close-in explosions. In general the distance between charge and structure was less than four charge diameters, so the structure was normally well within the fire-ball. The charges were generally of explosives which had not been fully investigated, but were expected to be non-ideal. The response of the structures was expected (and intended) to be well outside the elastic range and also outside the range covered by available material models. It was therefore not possible to predict the loadings that would be imposed on the structures. Since the resistance-deflection characteristics of the target structures were also unknown, it was not possible to use the structural response to calculate an explosive loading except as "greater than" or "less than" another explosive loading. Under these circumstances the obvious procedure was to measure distant blast parameters and use these to attempt to predict close-in loading. This was done. However in a significant number of cases, where the structure was less than one metre from the charge, it appeared that blast parameters measured at a distance (5 metres or more from a charge of the order of 100kg) were not good predictors of structural response.

Similar results were reported by Peter J.Hubbard and Maurice Marshall [1] in their investigations of ammonium nitrate based explosives.

These observations led us to start an investigation into close-in loading. We started with a qualitative analysis based on our experimental observations and the physics of the problem. This led us to surmise that inert matter might play a significant part in the structural loading from some close-in explosions. We therefore started an experimental programme to investigate this.