P69 Reconstruction of Blast Loading on Vehicles

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Abstract:

The Defense Advanced Research Projects Agency (DARPA) has developed and fielded a small blast detecting sensor that is worn by troops in the field. The blast gauges are typically used in sets of 3 with 1 each on the head, shoulder, and chest to provide pressure exposure and acceleration at each location. The gauge triggers when it detects a pressure in excess of 4 PSI overpressure and records the pressure waveform from 2 milliseconds prior to arrival to 18 milliseconds after arrival. It is capable of recording multiple events and can be downloaded to a computer in the field. Thus a quick field determination can be made as to the status of exposure to the individual.

Applied Research Associates has been contracted by DARPA to reconstruct IED (and other blast) events to more precisely define the loads to which personnel were exposed. With the better definition of the loads, more meaningful correlations can be established between injury suffered and blast exposure(s). This paper deals with the methods used to reconstruct an entire free-field blast scene around a vehicle, with possibly several personnel, and describe the total blast load to all personnel in the scene. Blast gauge data along with situational intelligence data are used in high-fidelity 3D hydrodynamic simulations to reconstruct the blast field. Typically, the charge size, charge location, personnel location, and scene details are not known and are part of the reconstruction parameters.

The results of the reconstruction provide pressure time histories at more than 100 locations on each person in the scene. Such detailed blast loading information can be used to calculate acceleration and subsequent motion as well as correlation with detailed injuries suffered.

Output from our reconstructions include color coded peak pressure distribution on each person in the scene, peak pressure loads on the ground in the vicinity of the detonation and animations of the event showing shock propagation and reflections and engulfment of personnel by the shock.

Notes: