

LOAD-BASED HAZARD LEVELS OF COMMON BREACHING CHARGES IN COMPLEX ENVIRONMENTS

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ABSTRACT

Field test data of breaching charges and observations of resulting effects on the breacher personnel in the early 2000s indicated that the safe standoff distance equations being used by the breaching community were flawed for interior detonations. New equations or charts were needed which more accurately accounted for the effects of reflection, diffraction, and charge geometry. The objective of the effort reported herein was to develop and validate a tool which could be used operationally to determine safe standoff positions as a function of charge size and type as well as configuration of the surrounding structure.

To meet the stated objective, Applied Research Associates, Inc. (ARA) performed three-dimensional high-fidelity hydrodynamics simulations of four different standard breaching charges. Simulations were done with SHAMRC: Second-order Hydrodynamic Automatic Mesh Refinement Code. ARA also conducted new blast tests with these charges to evaluate, improve and validate the SHAMRC models. Once adequate data fits were achieved with SHAMRC, the results were used to evaluate and improve a fast-running engineering model, Bomb-in-a-Box (BIAB), which had been developed initially by ARA for the Defense Threat Reduction Agency (DTRA). BIAB's capabilities were expanded to model p breaching charges in nonrectangular enclosures. The BIAB model was ultimately capable of matching the SHAMRC model on the order of 10%-20% for both compact charges and long, extended charges. BIAB was then used to perform several thousand parametric calculations to produce pressure contours in rectangular, cross-shaped, L-shaped and T-shaped building interiors for net explosive weights ranging from 0.025 lbs to 0.4 lbs. These contours were used to create safe exposure charts for use by breachers in the field.

The new BIAB was then reprogrammed for the U.S. Department of Defense (DoD) as BreachSafe, an application for Android smart phones which has replaced the charts.