DEVELOPMENT OF A MODEL TO PREDICT EFFECTIVENESS OF AIR-DELIVERED EMBEDDED MUNITIONS AGAINST HARDENED STRUCTURES

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The weapon-target interaction being considered in this paper involves penetration and embedment into a hardened structural concrete element protecting a high-value internal volume. This concrete element might be either soil or air-backed. Most weaponeering and effectiveness methodologies for conventional air-to-surface weapons dictate complete or partial perforation into a vulnerable space before the onset of lethal shock damage. However, recent testing at Eglin Air Force Base (AFB), Florida has shown that this assumption is incorrect. Beginning in 2004, the 46th Test Wing Chicken Little Office at Eglin AFB partnered with the Defense Threat Reduction Agency at Fort Belvoir, Virginia and the Air Force Research Laboratory, Munitions Directorate at Eglin AFB, to investigate the phenomenon further over a three-year period. During 2004, 6 live tests were conducted with a full scale 250-lb class penetrating warhead, filled with approximately 40 lbs of non-ideal explosive, and 15 computer-simulated detonations were completed using ARA's version of Second-order Hydrodynamic Automatic Mesh Refinement Code (SHAMRC) – analysis confirmed that lethal damage from air shock can be achieved from a warhead that does not perforate the protective concrete element. However, test data and model results have indicated that the degree of lethality is highly contingent upon explosive fill material and offset distance from the interior space. During 2005, this joint projected completed 4 additional full scale tests using a statically-emplaced 1000-lb class penetrating weapon with approximately 250 lbs of non-ideal explosive, along with 18 additional supporting SHAMRC numerical calculations. The final year of testing and analysis is underway to complete a new weaponeering and effectiveness methodology. Required elements of this new methodology include a fast-running empirical explosive source model with additional terms to account for focused shock fronts observed in both the test data and the numerical calculation results.