Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Blast-Induced Pressure Fields Beneath a Military Helmet for Non-Lethal Threats DAVID MOTT, DOUGLAS SCHWER, THEODORE YOUNG, Naval Research Laboratory, JEFFREY LEVINE, JEAN-PHILIPPE DIONNE, ARIS MAKRIS, Allen-Vanguard Corp. (Med-Eng Systems), GRAHAM HUBLER, Naval Research Laboratory — Coordinated experiments and numerical simulations investigated the pressure field surrounding a head with a helmet subjected to a blast wave typical of injurious but non-lethal threats. Experiments were conducted with C4 explosive charges ranging from 0.75 kg to 5 kg, and two anthropomorphic test mannequins (Hybrid III) located 3 m from the explosive. Experimental diagnostics included pressure sensors mounted at selected locations around each mannequin's head and in the free-field. Numerical modeling was done using a two-step approach. First, the blast and ground reflection were computed using a multi-component, reacting flow model. Second, the results were used to specify the boundary conditions for a three-dimensional unsteady simulation of the head-helmet complex subjected to a blast wave. The helmet was shown to provide protection against primary blast injury both in computations and experiments. The simulations indicate that pressure waves entering the gap between the helmet and head focus on the side of the head away from the blast and produce pressures comparable to that experienced on unprotected surfaces subjected to the blast.

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Date submitted: 01 Aug 2008 Electronic form version 1.4