THE BLAST WAVE RESULTING FROM AN ACCIDENTAL EXPLOSION IN AN AMMUNITION MAGAZINE

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An ammunition center is a farm of magazines each containing a certain amount of ammunition ("capacity") which is characterized by its high explosive equivalent. For economical reasons it is desired to maximize the capacity of the magazine within a given area of the center, but this has to be done in keeping with safety criteria. In the present study we present a computational study of the blast wave produced by a hypothetical explosion in a "donor" magazine. We investigate both the free field blast and the loading on neighboring ("acceptor") magazines. Our objective is to determine the details of the directional pressure field around the magazine, in order to establish the required safety criteria for an ammunition center. We employ the multi-material processor of the MSC.Dytran 3D hydrocode, which allows us to model a typical magazine having an earth cover and access openings. The blast wave emanating from the magazine is calculated to a distance of about 100 meters and the pressure field is determined for selected locations around the magazine and on the acceptor magazines. The results of these calculations are compared with scaled down field tests with a geometrical scaling ratio of 1:20 carried out by another institute. Our pre-shot numerical predictions showed a good agreement with the test results: within 10% of the specific impulse, and within 30% of the peak pressures. Two significant results were established: (1) the peak free field over-pressure is about one third of the over-pressure that would have been created by the same charge as a hemi-spherical bare explosive, and (2) although the blast wave propagates faster in the direction normal to the openings, it evolves into an almost uniform strength on a circle centered around the magazine at a distance of about 70 meters.