RESEARCH PROGRAMME FOR SAFE FIELD STORAGE OF AMMUNITION AND EXPLOSIVES

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The safe field storage of ammunition and explosives (A&E) in out-of-area conditions is a subject of interest in The Netherlands since 1995. A research programme was started to develop adequate guidelines for field storage based on state-of-the-art knowledge. In 1998 this resulted in a preliminary advice in the form of quantity-distances (Q-Ds) to prevent for sympathetic reactions and to protect field conditions specific Exposed Sites. These Q-Ds formed also the basis of a new NATO AC/258 advice. However, it was acknowledged that the Q-Ds were probably too conservative. Together with the demand of Field Commanders to keep Q-Ds as short as possible and to supply protection with as few measures as possible, the NL/MoD decided in 2001 to start an additional research programme to validate and optimise the guidelines.

This research programme had the aim to get a better understanding of the sympathetic reaction phenomena and to model the interaction process of air blast with typical military field structures in order to calculate critical Q-Ds. The Netherlands participated in the UK/Australian Defence Trial 840 in Woomera, South-Australia, in which a 5 ton full-scale explosion trial was conducted on 7 October 2002. The charge stored in a 20ft ISO freight magazine consisted of 299 8” M106C1 artillery shells. To obtain data to validate and optimise the computer models, a fully instrumented test set up was prepared in the desert in Woomera, including a donor-acceptor configuration. In between the donor and the 4 acceptor magazines, in which live and inert munitions were stored, barriers made of Hesco Bastion Concertainers and a water-filled barrier were placed to assess their effectiveness in preventing sympathetic detonation. In addition, 13 Exposed Sites like a so-called MOGOS (mobile hospital) system, 2 command and control units, a high and a low observation post, a protective bunker, 3 tents, and 2 20ft temporary field accommodations for troops, were placed on site. Various instrumentation techniques were used to quantify the explosion effects and the structural response: normal speed video recordings, high speed filming, photography, blast measurements and structural displacement and acceleration measurements were taken. Prior to the test, numerical simulations of the barricade performance were made using Autodyn, and the structural response of the Exposed Sites was assessed using LS Dyna and TNO’s toolbox.

The paper will give an introduction into this research programme and present the highlights of the results.