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THE EVALUATION OF A COMMERCIAL WATER TANK BARRIER SYSTEM FOR MITIGATION OF EXPLOSIVES FRAGMENTATION AND BLAST

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Until Insensitive Munitions programmes deliver long term reductions in munition vulnerability, the Defence Ordnance Safety Group (DOSG) has been investigating ways of reducing the Maximum Credible Event (MCE) for potential explosives accidents involving conventional HE munitions. Whilst elsewhere in the Ministry of Defence (MoD) work is being undertaken to deliver benefits through improved packaging of individual munitions, DOSG has been interested in reducing the MCE through isolation of both stacks of munitions or individual larger munitions. This type of unitisation requires effective and practical mitigation solutions.

The potential of water for mitigation of explosives effects has been known for a considerable time. This paper will describe work undertaken by DOSG on the evaluation of the effectiveness of a commercial water barrier product in order to prevent propagation of the explosives event between individuals or stacks of munitions. The technical assessment involved computer simulation, ballistic and munition proof trials as well as practical handling and demonstration trials.

Computer simulation, using AUTODYN 2D, examined both the effectiveness of water to reduce primary fragment velocities, the shock attenuation through the barrier walls and the water plus potential combined shock and fragmentation effects. The tank wall material comprises an outer polyethylene layer and a thicker, internal foamed polyethylene layer and this required materials characterisation to develop a suitable "material model" for the AUTODYN simulations.

Simulation was followed by ballistic performance trials, in which various projectile masses, shapes and materials, were fired from a modified 30mm cannon at velocities of up to 2000m/s.

Finally, the tanks were tested for effectiveness for preventing propagation of event between 155mm HE shells, Mk 24 Heavyweight Torpedoes and 1000lb aircraft bombs.