NETWORKED, RECONFIGURABLE SCATTERABLE MUNITION-FIELDS FOR COUNTERMOBILITY

Ms. Lynne Rider
TACOM-ARDEC
Picatinny Arsenal, NJ

Dr. Thomas W. Altshuler
Defense Advanced Research Projects Agency
Arlington, VA

In order to revolutionize countermobility for the Objective Force, a paradigm shift in the types of technologies employed, and the concept of operations for, future obstacle systems is necessary. Given the spectrum of military operations expected, obstacle systems must be versatile enough to assure robustness against an adversary that is dismounted or employing an array of vehicles ranging from light all terrain vehicles to tanks. To achieve this level of robustness, the future obstacle system must achieve high lethality by means of a full system approach. The future obstacle system will be an intelligent, networked, precision emplaced scatterable munition field that can be deployed on-demand using real situational awareness of the adversary's movement. Under a program initiated at the Defense Advance Research Projects Agency (DARPA) with close interaction with the Anti-Personnel Landmine Alternative Team at TACOM-ARDEC, Picatinny Arsenal, many of the critical technologies and underlying operational concepts are being developed for this future obstacle system. In addition, the DARPA/TACOM-ARDEC team is exploring opportunities to expand upon the research being performed within the Self-Healing Minefield Program to achieve the networked, reconfigurable, scatterable munition field that can be emplaced organically and provide a robust obstacle to the full spectrum ground-combat threat targets.

In the original concept, the Self-Healing Minefield (SHM) utilizes Volcano sized anti-vehicle munitions capable of forming an ad-hoc network, detecting both mounted and dismounted breaching activities, and moving across varied terrain to counter any perceived vulnerability in the obstacle. Work began during the spring of 2000 to develop the key enabling technologies required for the successful execution of a Self-Healing Minefield. Varied approaches to communications and networking, healing algorithms, and mobility were selected for a two-year development phase. The communications development has focused on autonomous network formulation, scaleable to 1000 units, and jam resistant communications between munitions. The healing algorithms are required to determine breach activities due to either mounted or dismounted enemy troops. Therefore deletion of any munition from the network or movement from an original location is detected. The munition mobility has been demonstrated using varying techniques that cause the munition to hop into a breached lane. The hopping motion was chosen over tracked or wheeled options due to variable complex terrain and timelines anticipated for an operational system. The current SHM program goal permits 10 seconds from breach detection to breach healing. Each of these sub-systems has been demonstrated both individually and fully integrated into a system of ten munitions. The program will demonstrate system scalability to 100 munitions in an operational environment in the spring of 2003.

To assure that the Self-Healing Minefield maintains or improves overall effectiveness on the battlefield, the warhead needs to employ state-of-the-art technology as well. A significant advance in relative warhead performance is necessary to maintain, or even reduce, the size of the munition relative to the Volcano mine while adding the mobility, communications and intelligence to the munition. This is achieved by exploiting both an advanced multipoint initiation approach coupled with the increased capabilities provided by the intelligence and mobility of the munitions. In addition, the on-board intelligence and multipoint initiation of the warhead can be leveraged to expand the overall set of targets that can be engaged by the munition-field. Basically, the munition could autonomously determine the engagement mode from direct target sensing and self-select a lethality mode ranging from bottom penetration to bounding fragmentation.

Although the current system has been designed for a Volcano dispenser, an opportunity to reduce the munition package to accommodate alternative delivery systems is being explored. This

opportunity, although high risk technically, may be possible as a result of the successful accomplishments of the Self-Healing Minefield program and the potential for continued reduction in volume of all the critical components required for the munition. An example of a potential emplacement system is the 120 mm mortar. Recent work by TACOM-ARDEC at Picatinny Arsenal indicates that up to six of these reduced size scatterable munitions could be delivered by a single 120 mm mortar cartridge, the XM984, to ranges of 11 km. Exploiting the rapid firing rates of the 120 mm mortar and the organic nature of the system for both the Interim Brigade Combat Team and the Objective Force, a scatterable munition-field with similar capability to the previously described Self-Healing Minefield could be emplaced by a Unit of Action only when and where necessary for full organic countermobility. This results in a significant reduction in the logistical requirements for obstacle systems.

The intelligent, on-demand scatterable antivehicle munition could potentially be expanded even further. By exploiting the bounding lethality mechanism, the munition-field could dynamically transform into a time-dependent area denial system to dismounted adversaries. By transforming part or all the munitions within the field into bounding-fragmentation munitions the effects of a DPICM type weapon could be emulated. This would provide wide area countermobility for dismounts, where the emplacement time and the activation time are different assuring increased control of both the area and time covered by the munition-field, relative to DPICM. By including this mode for engaging the adversary, a single type of scatterable munition can provide dynamically controlled full spectrum countermobility. In essence a networked, reconfigurable, scatterable muntion-field could result in a single system for all countermobility requirements.