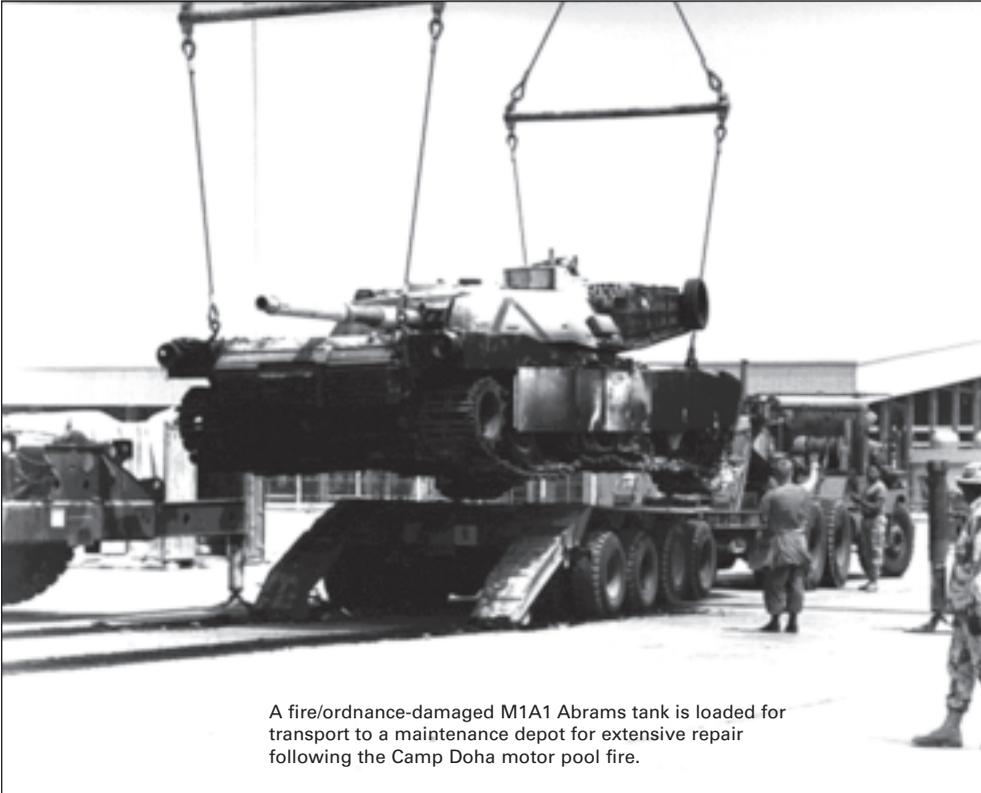


# Inensitive Munitions Provide Enhanced Survivability

Denny L. Cox and Cynthia Perazzo

**A** motor pool fire in the North Compound at Camp Doha, Kuwait, in July 1991 involved an M992 ammunition carrier loaded with 155mm artillery projectiles. An explosion spread the fire and caused massive secondary explosions. The resulting series of explosions and fires devastated vehicles and equipment and scattered unexploded ordnance and debris over much of the camp.

This article's photos depict scenes from the Camp Doha motor pool fire. If the munitions at Camp Doha had been insensitive, the damage extent and severity might have been limited.



A fire/ordnance-damaged M1A1 Abrams tank is loaded for transport to a maintenance depot for extensive repair following the Camp Doha motor pool fire.

PEO Ammo’s responsibilities include the life-cycle management of ammunition, which includes acquisition and its associated research and development, production, deployment, rework and demilitarization. PEO Ammo is also the Single Manager for Conventional Ammunition with attendant responsibilities for all services.

Integral to the production of ammunition is the integration of IM technologies that facilitate compliance with IM requirements. A wide variety of munitions provide the conventional lethality capability for the U.S. Army’s mortar, tank, artillery, mine, individual and crew-served munitions, and much of the capability for the U.S. Marine Corps and our allies. The acquisition programs and development efforts for these munitions are managed by the Project Manager (PM) for Combat Ammunition Systems, PM for Maneuver Ammunition Systems, PM Close Combat Systems and PM Joint Ser-

vices. Their associated development and acquisition schedules are closely managed to ensure that warfighters’ requirements are expeditiously met with the best-performing products possible within program constraints.

**IM Strategic Plan**

PEO Ammo developed an IM Strategic Plan to assess its munitions status, identify potential opportunities for and degree of IM improvement, prioritize improvement efforts and initiate actions to develop and execute detailed IM im-

provement plans. The plan is proceeding in two phases.

Insensitive munitions are conventional munitions that fulfill their performance requirements on demand but minimize collateral damage when they are exposed to unplanned stimuli including fires, shock and impact.

The Army lost more tanks in that one incident than it had during the entire 1991 war against Iraq. Forty-nine individuals were injured, 3 Soldiers were killed while clearing the area of damaged ordnance and 102 vehicles were either damaged or destroyed. Losses exceeded \$15 million in damaged or destroyed ammunition. If the munitions at Camp Doha had been “insensitive,” the damage extent and severity might have been limited.

**Minimizing Collateral Damage**

Insensitive munitions (IM) are conventional munitions that fulfill their performance requirements on demand but minimize collateral damage when they are exposed to unplanned stimuli including fires, shock and impact. The U.S. forces, along with our NATO allies, are actively pursuing IM technology that will protect our personnel, vehicles and platforms. IM does more than provide force protection — it is required for weapon system materiel release and fielding. IM requirements

are contained in *DoDD 5000.1, Chairman of the Joint Chiefs of Staff (CJCS) Instruction 3170.01D*, and *CJCS Manual 3170.01B*. The Joint Requirements Oversight Council (JROC) adjudicates all requests for waiver from IM requirements.

In April 2003, U.S. Army Program Executive Officer for Ammunition (PEO Ammo) BG Paul Izzo undertook the tasks of assessing the degree of IM compliance and identifying opportunities for IM improvements for its managed munitions for FYs 04-13. PEO Ammo’s IM vision is to develop and acquire munitions that enhance the survivability of logistical and tactical systems, reduce risk of injury to personnel and are potentially more cost-effective and efficient to transport, store and handle.

In phase one, PEO Ammo established an IM Integrated Product Team (IPT) to develop the IM Strategic Plan that focuses resource allocation on priority technology requirements. The IM IPT includes PEO Ammo and PM members with programmatic, logistical and technical expertise, as well as members with IM experience. This combination of functional domain knowledge ensures that all technical and programmatic aspects are properly evaluated. The IPT developed the approach, gathered the required data, conducted extensive data analyses, produced an automated management decision tool specific to this effort and developed conclusions and recommendations for a follow-on phase two effort.

IM test requirements were established for fast cook-off, slow cook-off, bullet impact, fragment impact and sympathetic detonation. Additionally, shaped-charge jet impact has received renewed emphasis because of ongoing operations in the Iraqi theater. To

prioritize various acquisition programs' needs, the IM IPT collected technical data to establish a baseline for all PEO Ammo munitions. Using this preliminary information, the IPT developed IM baseline characterizations for all munitions and identified opportunities to improve IM performance of individual munitions. IM subject matter experts (SMEs) within the IPT assessed future IM performance based on existing test data, when available, and engineering judgments when no test data exists.

The IPT also identified other essential characteristics to consider including the consequence of reaction for each munition in the six IM regimes, operational impact if the munition is fielded

PEO Ammo's responsibilities include the life-cycle management of ammunition, which includes acquisition and its associated research and development, production, deployment, rework and demilitarization.

with IM deficiencies and the relative ease with which IM technology could be exerted into existing munitions programs. Finally, the procurement magnitude for each weapon was considered to account for very large or small buys of weapons.

The IPT performed a "pair-wise" comparison of all IM prioritization criteria. Individual comparisons were then combined for each pair of criteria to develop a numerical score for each pair of characteristics. These scores were then ranked relative to each other to establish a hierarchy of prioritization characteristics. Each IPT member's input for the consequences of IM reaction and weapon procurement magnitude was compared and then scored.



In addition to 102 destroyed or damaged vehicles, 49 individuals and 3 Soldiers were killed in the Camp Doha motor pool fire. Losses exceeded \$15 million in damaged or destroyed ammunition.



Insensitive munitions would have limited the damage extent and severity experienced at Camp Doha.

concept was recently presented to the Functional Capabilities Board (FCB) with a recommendation that all military departments embrace this concept. Likewise, the FCB endorsed the concept for presentation to the Joint Capabilities Board and the JROC for the Joint Capabilities Integration and Development System.

Plan implementation will provide several IM benefits including:

- Warfighting efficiencies such as increased weapons throughput and improved sortie generation.
- Improved logistics link.
- Improved replenishment.
- Reduced real estate and lower hazard classification.
- Increased survivability resulting from minimized collateral damage and safer ammunition inventory.

PEO Ammo's forward-looking posture with respect to IM will increase crew survivability — a major consideration with lighter combat vehicles. The benefits from IM have applicability across service boundaries and platform configurations.

**DENNY L. COX** is an Ammunition Management SME and is an associate with Booz Allen Hamilton providing technical support to PEO Ammo.

**CYNTHIA PERAZZO** is a Program Management Engineer in PEO Ammo's Management Division. She holds a B.S. in engineering from Catholic University of America and a B.S. in physics from State University of New York-Plattsburg. She is pursuing an M.S. in management from the Florida Institute of Technology. Perazzo is Level III certified in systems planning, research, development and engineering and is an Army Acquisition Corps member.

A software model developed by the IPT, using commercially available products, calculated the inputs for all pair-wise analyses. This computer model then quantified scores for each munition identified for assessment, assigning a score based on its values for each IM prioritization criterion. The scores were ranked relative to one another, with the highest scores indicating munitions that should receive the highest consideration for transitioning to IM.

Subsequently, the results provided a first-cut analysis that was used by senior management to prioritize IM planning. If there were factors external to the IPT's analysis that necessitated movement within the list, or elimination altogether, those factors were incorporated into the model. Opportunities to leverage technology development from other services and significant changes in procurement schedules were two such external factors analyzed.

PEO Ammo developed an IM Strategic Plan to assess its munitions status, identify potential opportunities for and degree of IM improvement, prioritize improvement efforts and initiate actions to develop and execute detailed IM improvement plans.

Phase two will focus on developing technology programs that address IM solutions across all families of munitions. During phase one, the highest priority munitions will be identified and intermediate solutions, pending the development and maturation of some IM technologies, will be employed, especially in the area of rocket motor and propellant technology.

The IM Strategic Plan effort undertaken by PEO Ammo is significant because it was the first such undertaking by any organization to look at the whole munitions portfolio, rather than trying to manage and incorporate IM into each individual munition program. Phase one of PEO Ammo's IM Strategic Plan has been presented to Army and DOD leaders, and Army

IM Executive Agent BG Jeffrey A. Sorenson has endorsed the plan and directed other PEOs within the Army to proceed with similar initiatives. Additionally, the IM Strategic Plan