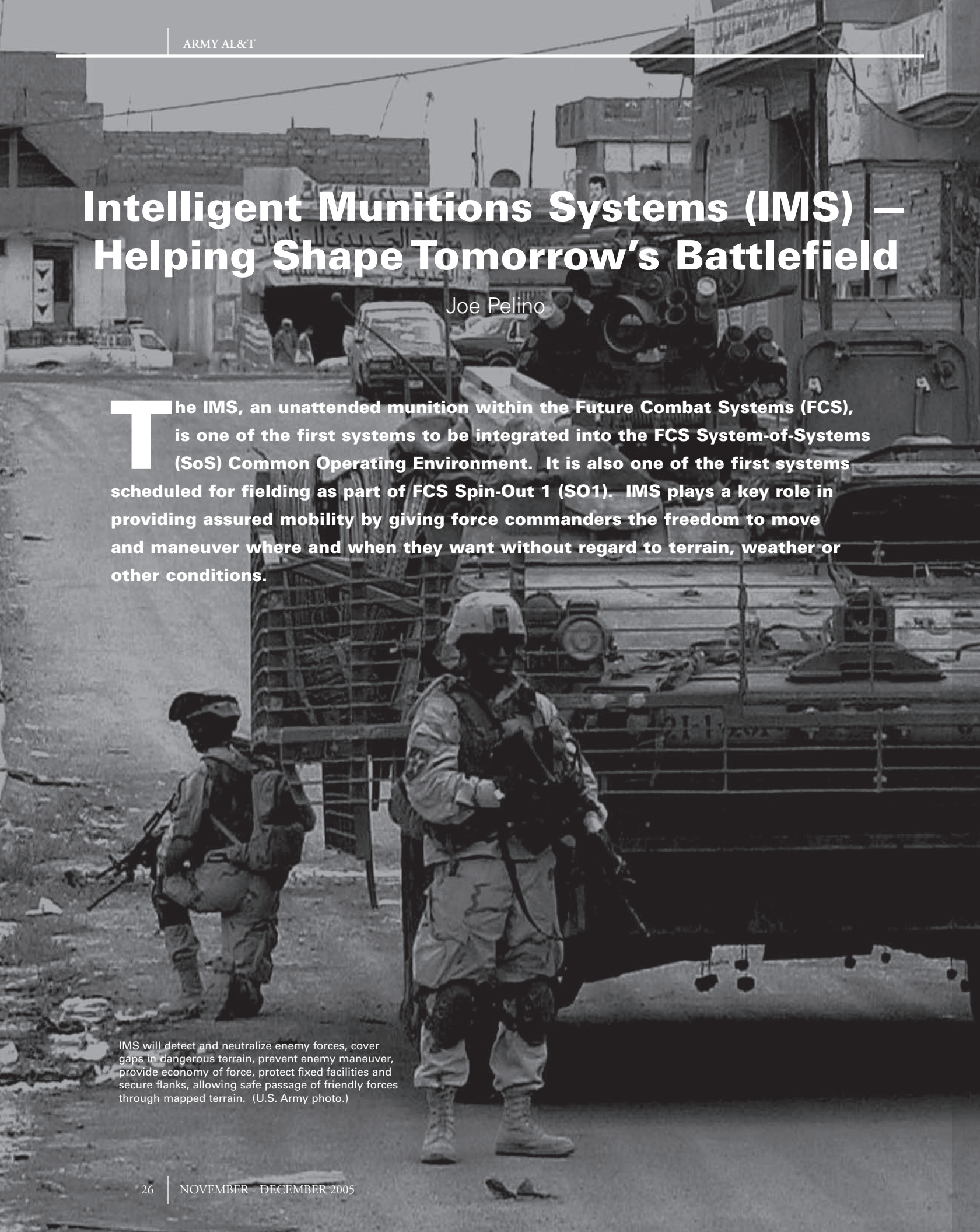
Intelligent Munitions Systems (IMS) – Helping Shape Tomorrow's Battlefield

Joe Pelino

The IMS, an unattended munition within the Future Combat Systems (FCS), is one of the first systems to be integrated into the FCS System-of-Systems (SoS) Common Operating Environment. It is also one of the first systems scheduled for fielding as part of FCS Spin-Out 1 (SO1). IMS plays a key role in providing assured mobility by giving force commanders the freedom to move and maneuver where and when they want without regard to terrain, weather or other conditions.



IMS will detect and neutralize enemy forces, cover gaps in dangerous terrain, prevent enemy maneuver, provide economy of force, protect fixed facilities and secure flanks, allowing safe passage of friendly forces through mapped terrain. (U.S. Army photo.)

IMS is a system of munitions, sensors and communication devices that can implement obstacle intent and attack targets, either autonomously or with man-in-the-loop control. When fielded, it will detect and neutralize enemy forces, cover gaps in dangerous terrain, prevent enemy maneuver, provide economy of force, protect fixed facilities and secure flanks, allow for movement of friendly forces and provide for immediate selective engagement. The fully networked munition allows for a scalable response and provides ultimate flexibility for hand or remote emplacement on the dynamic battlefield. Thanks to the IMS Integrated Product Team's (IPT's) resourcefulness, One Team members from the Army, the Lead Systems Integrator (LSI) and industry will provide advanced warfighting technology and overmatching capabilities that will be in our Soldiers' hands before the decade's end.

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IMS' ability to detect, classify, identify, track and engage selected targets fits into the FCS concept of providing our Soldiers with an SoS that uses advanced communications and technologies to integrate the Soldier with families of manned and unmanned platforms and sensors.

Evolutionary Acquisition

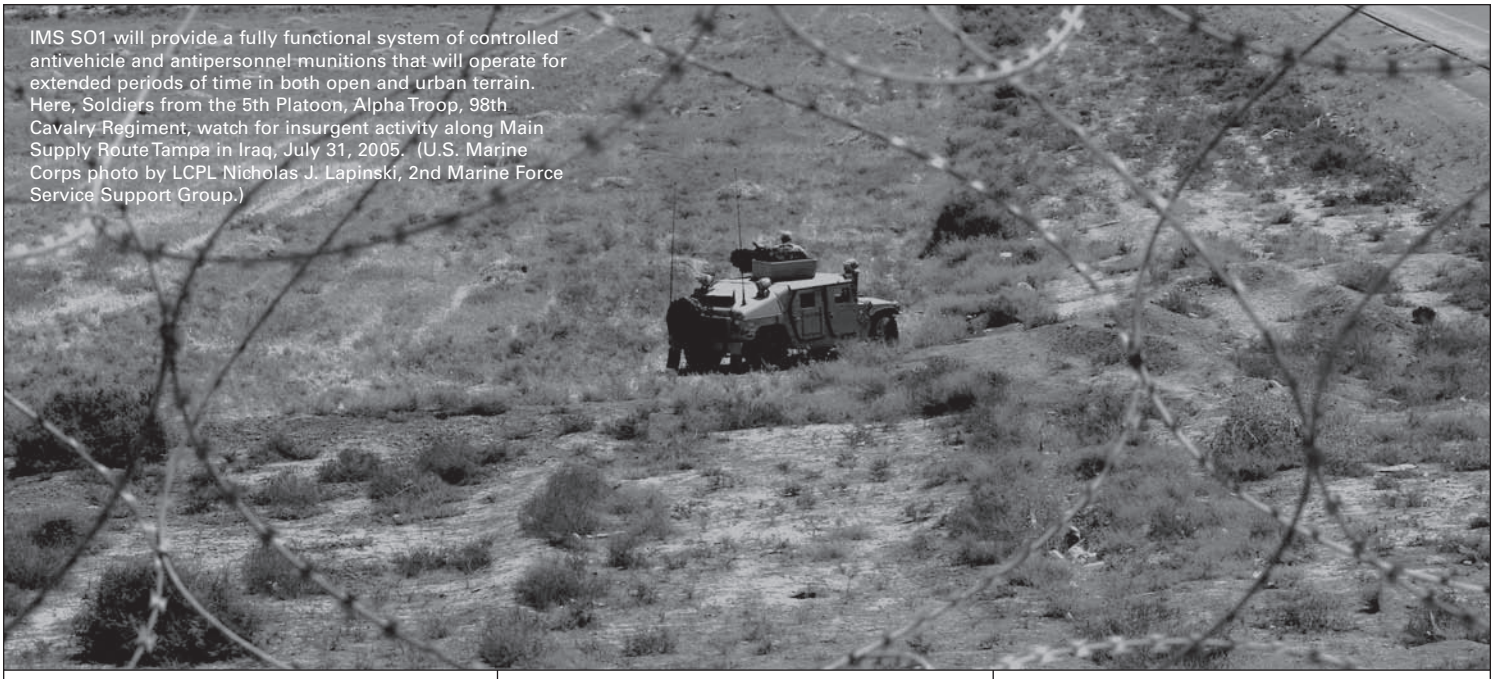
Originally, IMS was a "deferred system" to be fielded as part of the Full Operational Capability. Because the technology is now considered to be vital to the program, IMS is one of the "tip-of-the-spear" systems, and first increment fielding has been accelerated to 2009. To accommodate a more aggressive development schedule, the Project Manager Close Combat Systems (PM CCS) has adopted an evolutionary acquisition strategy that employs an incremental approach. As defined in the *Defense Acquisition Guidebook*, evolutionary acquisition is the preferred DOD strategy for rapid acquisition of mature technology for users. An evolutionary approach delivers capability in increments, recognizing in advance the need for future capability improvements. The objective is to balance needs and available capability with resources, and to put capability into the hands of users quickly. The strategy's success depends on consistent and continuous definition of requirements and the maturation of technologies that lead to disciplined development and production of systems that provide increasing capability toward a materiel concept.

To meet the threshold requirements stated in the FCS Operational Requirements Document (ORD), IMS development is currently divided into three increments, or SOs. SO1 will provide a fully functional system of controlled antivehicle munitions that provide the following capabilities:

- Operate man-in-the-loop or autonomously with Current Force battle command and the extension to the Current Force Network.
- Operate for extended time periods in both open and urban terrain.
- Include a module that allows mechanical dispensing of a 35-meter-diameter obstacle or precision hand emplacement of individual components.
- Able to detect and engage enemy vehicles and personnel.
- Allow friendly forces to traverse emplaced and digitally self-mapped fields (safe passage).
- Able to control Spider munitions (antipersonnel, nonlethal and initiate demolitions).

The two follow-on increments support SOs 3 and 4 and the full unit of action (UA). These increments will add capabilities that include scalable effects, the ability to dispense IMS components from manned and unmanned ground vehicles, remote delivery via non-line-of-sight means and other enhancements that are enabled by developing the FCS battle command

In the near future, Current Force unmanned aerial vehicles and other sensors will be augmented by IMS sensors and communication devices to enhance combatant commanders' SA and provide a common operating picture. Here, 3rd Infantry Division Soldiers prepare a Raven for a surveillance flight near Tikrit, Iraq. (U.S. Army photo by PFC Matthew Acosta.)



IMS SO1 will provide a fully functional system of controlled antivehicle and antipersonnel munitions that will operate for extended periods of time in both open and urban terrain. Here, Soldiers from the 5th Platoon, Alpha Troop, 98th Cavalry Regiment, watch for insurgent activity along Main Supply Route Tampa in Iraq, July 31, 2005. (U.S. Marine Corps photo by LCPL Nicholas J. Lapinski, 2nd Marine Force Service Support Group.)

network. As a network node, IMS will seamlessly feed situational awareness (SA) information to the common operating picture and will enable networked fires and effects.

National Landmine Policy (NLP)

In discussing why IMS was accelerated to become a part of SO1, PM CCS COL John L. Koster remarked, "I think what pushed us to the front of the SO line was the National Landmine Policy. Every step of the way, the IPT synchronized its efforts to ensure that the IMS meets both SO1 and the policy's requirements simultaneously."

The NLP Koster refers to was announced in February 2004, and it requires the United States to end the use of non-self-destructing landmines by Dec. 31, 2010. PM CCS — the Nation's "principal" in landmine technology and acquisition — leads this mission.

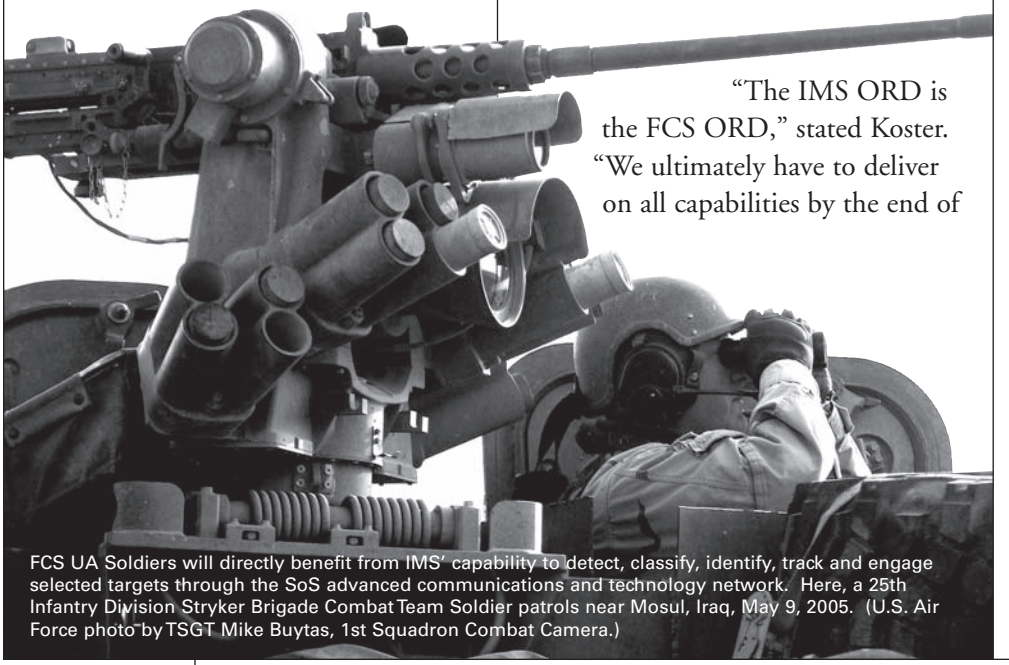
The existing incremental development approach worked in their favor to facilitate the tight NLP deadline.

"The IMS ORD is the FCS ORD," stated Koster. "We ultimately have to deliver on all capabilities by the end of the process. The incremental approach allows us to set aside explicit performance requirements to deliver a working system that replaces persistent, non-self-destructing landmines and meets policy deadlines."

By synchronizing the system to the capability that supports the NLP, the IMS team eliminated a design iteration in the development process, allowing the system to be among the first FCS subsystems to be fielded in SO1.

Aggressive Acquisition Approach

The tight timeline to meet the NLP directive made it clear that ordinary acquisition methods were too limiting. In response, PM CCS adopted an aggressive acquisition attitude and chartered an IPT for this acquisition. Membership selection — which was driven by program objectives, user needs, product quality and fast, low-cost acquisition — was based on a first-time DOD-wide review of facilities, warfighters, peacekeepers, ultra-modern high-tech laboratories (both federal and private), capable contractors, government and business executives and user experts in product evaluation and use.



FCS UA Soldiers will directly benefit from IMS' capability to detect, classify, identify, track and engage selected targets through the SoS advanced communications and technology network. Here, a 25th Infantry Division Stryker Brigade Combat Team Soldier patrols near Mosul, Iraq, May 9, 2005. (U.S. Air Force photo by TSGT Mike Buytas, 1st Squadron Combat Camera.)

The nonparochial member selection concept enriched the acquisition process because members had limited background in traditional military or functional methods. This was particularly evident in the ability to reduce the Concept and Technology Development (CTD) acquisition life-cycle phase by 6 months.

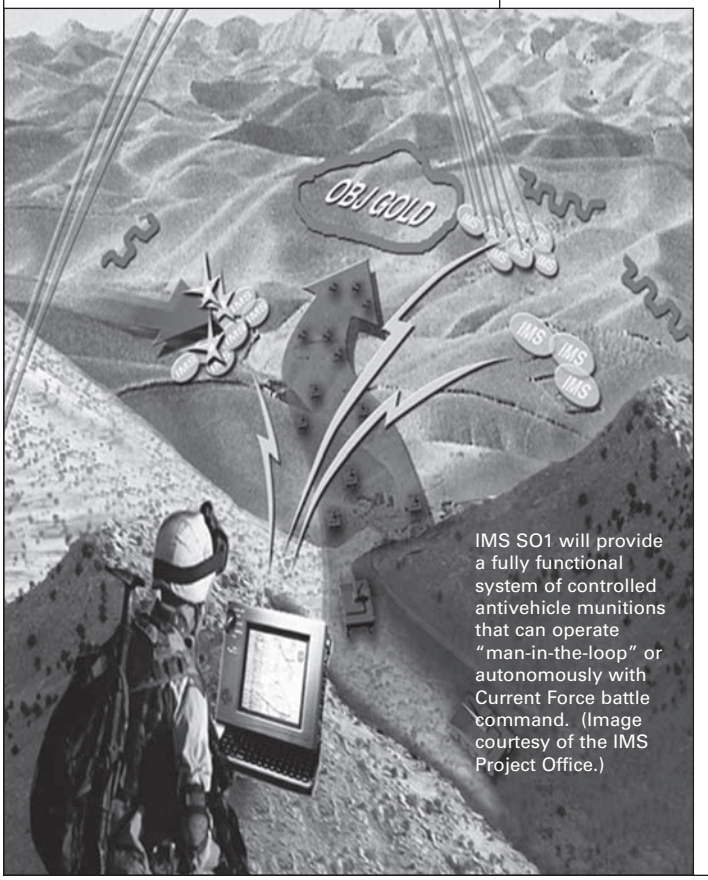
The IMS team also took cues from legacy systems, leveraging and incorporating their technology to help attain FCS ORD and NLP compliance. For example, the Spider, which was originally developed to provide alternatives to antipersonnel landmines in Korea, will incorporate both lethal and nonlethal systems.

Modeling and Simulation (M&S)

At the same time the Army determined IMS would be the replacement capability for the persistent antitank mines, it was also slated for FCS SO1. Now, more than ever, it was imperative that the IMS team maintain, if not exceed, its aggressive schedule. By leveraging the capabilities of M&S and the Comprehensive Munition and Sensor Simulator (CMS2), the IMS team found greater opportunities to expedite the process.

CMS2 is a munition and sensor simulator that models terrain, weather and environmental effects. Integrated into an Over Target Baseline simulation, CMS2 sensors detect, track and provide SA. Current sensors include magnetic, seismic and acoustic unmanned ground sensors, as well as both snapshot and full-motion infrared cameras.

As of July 2005, two companies have been awarded contracts to develop and demonstrate IMS design concepts: General Dynamics Advanced Information Systems and Textron Defense Systems. Rather than contractors developing their own run-time simulation baseline models for testing, the IMS team enlisted the Night Vision Labs from the U.S. Army Night Vision and Electronic Sensors Directorate, Fort Belvoir, VA, to create a single baseline model that housed both contractors' concepts without giving away competition-sensitive data to either company.



IMS SO1 will provide a fully functional system of controlled antivehicle munitions that can operate "man-in-the-loop" or autonomously with Current Force battle command. (Image courtesy of the IMS Project Office.)

"These generic models can be used in UA Maneuver Battle Lab locations and by the LSI to enhance procedure development," explained Doug Paul, IMS M&S IPT member. "Only this model's black boxes contain contractor-specific algorithms."

Already fully embedded with both the U.S. Army Training and Doctrine Command and the LSI, Night Vision Labs will assist the winning contractor with seamlessly integrating the contractor's design into Battle Lab and LSI environments.

Allocating this responsibility to Night Vision Labs team members freed up time for the contractors to create engineering models while concurrently using the generic models to develop and enhance procedures. This also contributed to reducing the CTD phase and allowed the program to get a head start on the next phase because both competing contractors are already modeled.

The life cycle's technical development phase culminated with a 4-week prototype assessment test. Both contractors' concepts demonstrated important capabilities such as SA, command and control and IMS warhead effectiveness. By FY06's second quarter, the IMS team will have down-selected to one supplier and then will move forward to achieving Initial Operational Capability by FY09.

To date, the IMS team has met many challenges in bringing Future Force capabilities to the Current Force on time and within budget. According to Koster, a cohesive IPT that includes Army, LSI, and industry members and an incremental approach toward meeting requirements by extensively using M&S have been the overriding reasons for the successes achieved up to this point.

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