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DoD has Made Great Progress in Live Training Capabilities

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By Frank DiGiovanni

The U.S. Department of Defense's initiative to better enable joint operations, modernize its training and test ranges, and protect its military ranges and operating areas from all manner of encroachment issues is on track. Much has been done collaboratively in an open, transparent and incentivized process with the military departments, joint commands and agencies, academia, and importantly, industry. However, one area that would benefit from a focused DoD and industry partnership is live instrumented training.

Although our forces are the best trained in the world, technological impediments arising from initiatives, such as the fielding of advanced "smart" and "brilliant" weaponry, net-centric data strategies, near real-time intelligence, surveillance and reconnaissance integration, multi-national and integrated U.S government operations, low observables, space and information operations, and other operational trends, are driving the need to refresh the technologies that support training so that we can sustain our training superiority. We need industry to play a key role, as we work to address these impediments. In this article, I will lay out several areas where significant progress is being made and where I would invite industry to join me and my other colleagues across the department to develop,

build, and field solutions to these live training impediments.

Dramatic Advances

One initiative that has yielded great benefits is training transformation. We have sustained training capability development momentum by viewing transformation as a process and not an end state. The decision of the senior leadership to build upon the first training revolution of the military departments' creation and building of combat training centers, to provide realistic combat training against a credible opposing force, with common ground truth (integrated, live training range instrumentation) and high quality feedback, has proven to be sound. With each and every day, the DoD training enterprise is growing its capability and environment to globally distribute training, exercises and missions rehearsals to forces prior to their employment in a theater of operations. This live, virtual and constructive environment is not yet developed to the degree that we posit is possible, and we are addressing the solution sets from both a policy and technology perspective.

We have a number of policy initiatives underway to improve the department's already world-class training programs. We are presently coordinating a revision to the overarching DoD directive on "Military Training" (DoDD 1322.18) which directs the senior training advocate on the secretary's staff, the under secretary of Defense for Personnel and Readiness:

- To develop policy for and oversee joint architectures and standards for integrating live, virtual, and constructive (LVC) environments to create training conditions that resemble actual operations.
- To foster and direct embedded training and distributed learning as a first alternative to addressing training requirements for new defense technology projects and acquisition programs. Major defense acquisition programs such as the Future Combat Systems and the Ground and Mounted Soldier Systems have made training a key "performance parameter" (KPP).

We have also successfully advocated for a change to the chairman's Joint Capabilities Integration and Development System (JCIDS). This change directs capabilities documents sponsors to analyze the need to establish a KPP that addresses life cycle system training capabilities. It is "selectable" but requires staffing rationale be provided during the JCIDS coordination process for the selection or non-selection of a system training KPP by the document's sponsor.

We are increasing our focus on the integration of live range instrumentation architectures and standards the services are pursuing that can be leveraged to facilitate joint training. Programs in this category include the Army's Common Training Instrumentation Architecture, the USMC's Range Modernization/Transformation program, and the Air Force/Navy/Marine Corps P5 instrumentation system. The P5 system is developing a new range instrumentation waveform, leveraging DARPA's (Defense Advanced Research Projects Agency) Tactical Targeting Network Technology program and a new advanced datalink transceiver, based upon the Joint Tactical Radio System. We are also pushing hard for the inclusion of live, range instrumentation in F-35 and F-22 training programs. We have made good progress with the F-35 program and continue to work with the

F-22 program.

To enable live training and improve the integration of live training with virtual and constructive training capabilities, we are advocating a new requirement to develop an open, net-centric interoperable, standard across the military training enterprise. The framework for this standard is nearing completion and a working prototype that demonstrates key functions has been successfully tested. The standard will leverage emerging concepts such as service-oriented architectures, the semantic Web and Web ontology language, with the goal of achieving seamless interoperability in the training and testing live, virtual and constructive (LVC) environment. The first instantiation of this overarching construct will be the Live Air Training Network (LATN) Standard, scheduled for release in the Fall of 2008.

We have partnered with the Marine Corps to submit a Joint Capabilities Document (JCD)—Joint Live Virtual and Constructive—training environment (JLVC-TE) into the Joint Staff's JCIDS process. JLVC-TE describes the overall vision, integrating perspectives, and training shortfalls requiring mitigation in the JLVC-TE. Its objective is to provide an overarching definition of DoD's joint training enterprise, so that the services and joint organizations can use it as a foundational document during the development of their individual JCIDS training capabilities documents, and map their respective LVC integration efforts back to the joint training enterprise.

On the training technologies side of the house we are working several initiatives, foremost among them is the Joint National Training Capability (JNTC).

A key operating construct for the JNTC is the leveraging of existing service range instrumentation capabilities. JNTC focuses its investments in integrating capabilities that serve to seamlessly merge service systems into a common training and debriefing picture. This approach conserves limited JNTC funding yet effectively fills the "interoperability gap" between individual service systems, facilitating a single, joint training "game board." However, JNTC, like the services, continues to wrestle with security and cross domain information sharing; interactive, networked live, virtual and constructive training capabilities; processing and data throughput capacities; and platform interface issues.

To mitigate a portion of these shortfalls, JNTC is leveraging the Training and Test Enabling Architecture (TENA) developed by the test community. TENA enables interoperability among ranges, facilities, and simulations. Another great stride is JNTC's Joint Training and Experimentation Network (JTEN) which provides the capability to connect and distribute range data generated by live instrumentation and virtual and constructive entities. This network globally and persistently connects sites, allowing seamless training in a common operational environment. An example of JTEN's utility is JNTC's support to exercise Terminal Fury 07/Global Lightning 07, which networked training occurring simultaneously in three countries (United States, Japan and Korea). On the international side this capability has been extended to Australia's Joint Combined Training Capability via their Defence Training and Experimentation Network, and to NATO's Joint Warfare Center in Norway.

Technological Impediments

Despite these advances, technological impediments remain that inhibit our ability to

train live as realistically and with the fidelity we would like. It is in these areas that provide the biggest challenges for both industry and the defense department.

One of our biggest technology challenges is the need for a real-time, flexible, multi-level security system. Training involving fifth-generation aircraft, information and space operations, intelligence, surveillance, reconnaissance integration down to the tactical level, and multi-national and interagency operations are but a few of the drivers. In parallel with the development of a technology solution is the complementary need to develop appropriate, cross-domain, information-sharing policies. Solving the technology piece would certainly address the requirement to appropriately protect sensitive data, with classified information being neatly packaged in multiple independent levels. The department will also have to address policies that would enable information sharing to the extent that differently classified capabilities can be integrated in a meaningful and constructive way, thereby enabling effective training.

Another area where live training technology is lacking is in the area of weapon systems that employ advanced sensors and smart/directed energy weapons. Traditional ranges utilize “cold” targets and environs that are not threat representative—lacking clutter and the correct electromagnetic, infrared and/or visual signature. The use of embedded training capabilities to artificially stimulate sensors and facilitate smart weapon employment is needed. Additionally, on-board feedback technologies are needed to provide task appropriate sensor and weapons training that facilitates safe, non-intrusive use of urban areas, civil infrastructure, and other neutral entities. Finally, as the sophistication of sensors and weapons increases, more and more of this training will need to migrate to virtual training devices.

Another technological impediment which has hampered effective training is the ability to provide real-time, virtual, weapons feedback for live air-to-ground and ground-to-air interactions. Current range instrumentation capabilities consist of an aircraft mounted pod that serves as both an aircraft tracking system and a detector for ground laser engagements from the Army’s Multiple Integrated Laser Engagement System (MILES), mounted on air defense “Stingers.” Issues that need to be resolved to improve ground-to-air training fidelity are: aircraft masking (if the engagement occurs from the side opposite of where the pod is mounted), accounting for infrared countermeasures from the aircraft, and the aircraft’s own heat signature. From the air-to-ground perspective, air weapon simulations need to be of sufficient fidelity, and consistent system training pairing between the shooter to the right target is needed to accurately provide feedback to ground forces on aerial weapon effectiveness.

Air-to-air weapon simulations suffer from issues similar to the air-to-ground weapon simulations. Security, countermeasure effects, insufficient instrumentation system access to the aircraft navigation and weapon systems, target pairing and insufficient fidelity of weapon simulations, all contribute to training fidelity shortfalls in this area. Additional effort is needed to address: multi-level security, instrumentation processing power that achieves outcomes that match the aircraft weapon system’s outcomes, autonomous target position data that adjudicates outcomes for launch and leave weapons, and better synchronization of aircraft operational flight program

updates with training system updates.

Technological solutions are also needed to provide training feedback for new weapon systems which utilize low observable capabilities. Today's threat system surrogates are primarily designed to provide feedback on metal targets using traditional countermeasures. As the proliferation of low observable weapon systems increase, our threat training capabilities need to keep pace, assisting operators with training feedback on situational awareness, radar cross section management, and threat avoidance.

Improved training capability in support of net-centric operations is also needed. The fusion of near real-time intelligence, surveillance and reconnaissance data with operations, net-centric based decision-making, machine-to-machine linkages, fused sensor situational and targeting systems, the proliferation of unmanned sensor and weapons platforms, among other net-centric innovations, all demand a robust training capability to fully realize the potential of this emerging capability. Heartening are industry initiatives such as the Network Centric Operations Industry Consortium that are exploring the development of nonproprietary, common instrumentation interfaces and functionality.

Finally, the global war on terrorism is driving a new focus on live training capabilities technology in the area of soft skills or non-kinetic operations. Advanced live training capabilities needed in this area include:

- Visualization tools in support of information warfare, particularly the first, second and third order effects of psychological operations
- Civil affairs decision support tools
- Interactive cultural, relationshipand empathy building tools
- Situational combat contracting and acquisition
- Dealing effectively with culture-specific high concern/low trust situations
- Teaching and applying governance
- Commerce/economic stimulation
- Agriculture
- Public works

Some potential solutions sets include the leveraging of virtual environments such as "Second Life," and further refinement of the USMC's Immersive Infantry Trainer—a live/virtual immersive training environment for infantry forces, which is envisioned to eventually have advanced flight simulator-like fidelity to virtually train ground forces. This concept was first conceived by General James Mattis, U.S. Marine Corps. A first-generation system was fielded at Camp Pendleton and a second is being installed at Quantico, Va.

We invite industry to partner with us to find solutions to these live training challenges. Our men and women, who go in harm's way on behalf of our nation, are grateful to industry for its many prior contributions and solutions to their training and operational environment. They look to us to increase the pace of filling the gaps and seams; it is our obligation, duty and honor to do so.

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