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CRITICAL INFLUENCES ON T&E:
*New Systems, Policies, Business Operations*

*FEATURED CAPABILITY*

**The Need for Speed: Automotive Directorate**
**Aberdeen Test Center (ATC), Aberdeen Proving Ground (APG), Maryland**

## TECHNICAL PAPER ABSTRACTS:

# Strategic Planning for DoD-Wide Test Resources: Stewards of the DoD Test Infrastructure

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*In September 2005, the Under Secretary of Defense (Acquisition, Technology and Logistics [AT&L]) approved the Calendar Year 2005* "Strategic Plan for DoD Test and Evaluation Resources," *a comprehensive investment plan for test and evaluation (T&E) capabilities within the Department of Defense through the year 2022. This plan is the product of the newly established Defense Test Resource Management Center, which was established by Congress to oversee T&E capabilities prioritization and resourcing. The Strategic Plan is designed to provide a roadmap for programming and budgeting in transforming the T&E infrastructure to meet the future needs of the department.*

# Air Force Test & Evaluation Enterprise: Continuing the Journey

**David C. Bond**
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*The U.S. military of the future will face a battlefield with no clear lines of demarcation, asymmetrical or irregular threats and unpredictable adversaries. To meet these challenges, national defense leaders have begun transforming how to fight in the 21st century. A previous paper co-written by this author detailed one such proposal for transforming the way test and evaluation (T&E) is conducted in the Air Force.[1] It was based on a vision to develop a more agile, integrated and seamless T&E process to deliver warfighting capabilities to the user. While no decision was made in 2003 to adopt the approach outlined in that paper, senior defense leaders maintain that the need for transformation continues to be part of the fundamental vision for the U.S. military.[2] This vision has driven an Air Force T&E strategy focused on an integrated approach with emphasis on delivering warfighting capability in a faster, more cost-effective manner: hence, creation of the Air Force Test and Evaluation Enterprise and an Enterprise Roadmap to serve as a guide into the future. This paper discusses the Enterprise transformation underway in the Air Force T&E community, its purpose, processes and future expectations.*

*continued…*

# Universally Applying Enhanced Seamless Verification Testing

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*Program managers define success as on time and on budget during program development, but it is system performance that bestows program credibility. System testing is invaluable. During the shift from a peaceful to a wartime atmosphere, it becomes necessary to break down and accelerate the traditional test and evaluation process, thus accommodating the rapid response and urgent fielding needed to equip combat forces. Applied successfully during the development phase of one Air Force program, seamless verification testing should expand to the other Services to increase program credibility.*

# Testing Net-Centric Systems-of-Systems: Applying Lessons Learned from Distributed Simulation Testing

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*This paper explores the similarities and differences between High-Level Architecture federations and Global Information Grid environments, noting that, conceptually, there is significant overlap in services and operations. Hence, an approach to testing network-centric systems is formed by drawing upon successful past experiences testing federations of simulations. This paper outlines how the MITRE Corporation-developed Simulation Infrastructure Test Harness (SITH) tool can be adapted to leverage applicable test procedures from the simulation world and used to explore the concept of a test scripting language to support the special test needs of net-centric systems-of-systems. For this new test scripting language, this paper recommends leveraging net-centric computing standards such as Web Services Definition Language and Business Process Execution Language for Web Services. Finally, this paper puts forth the recommendation that the modified SITH-like application be considered not only for interoperability testing of small groups of services, but also for performance and behavior testing of large, open-ended service groups that begin to approximate the openness and complexity of an Internet-like GIG.*

*continued…*

# Testing in a Joint Environment: Where We Are and Where We Are Going

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*The Director, Operational Test and Evaluation (DOT&E), recently completed a Roadmap, "Testing in a Joint Environment," to meet the needs of testing future weapons systems in a realistic joint mission environment. The Roadmap outlines challenges in (1) test infrastructure and standards; (2) methods and processes (M&Ps); and (3) policy.[1] Subsequently, DOT&E directed the Joint Test and Evaluation Methodology (JTEM) Joint Feasibility Study to propose a methodology for testing in a realistic joint mission environment, which will be validated in a Joint Test and Evaluation Project. The JTEM team used the already planned Multi-Service Distributed Event (MSDE) as a risk reduction to understand current abilities to conduct testing in a joint environment. This paper first presents background on the Roadmap and MSDE. The paper then discusses MSDE results and how the JTEM team is using those results to define a way ahead for resolving issues, as well as developing improved M&Ps for testing in a joint environment. The paper concludes with a discussion on the overall concept for testing the proposed M&Ps.*

# A Look Back at Operational Testing in the U.S. Air Force

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*For more than three decades, the Air Force Operational Test and Evaluation Center has been the U.S. Air Force's focal point for operational test and evaluation (OT&E). Before its establishment, however, the Air Force and its predecessors in the U.S. Army tried various ways to do (or not to do) OT&E.*

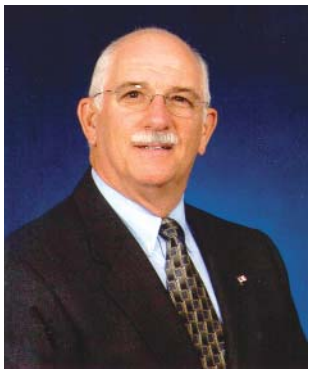
For the past few months, I have been asked numerous times, "Who will be ITEA's new Executive Director?" The evaluation and selection process took a little longer than the Search Committee or the Executive Committee (EXCOM) originally planned. But that is okay, because we could not be happier with the results. It is with great pleasure that I announce the new Executive Director of ITEA is Ms. Lori Tremmel Freeman. Ms. Freeman began on May 30th and has quickly gained the confidence and appreciation of the ITEA staff and EXCOM. She attended Test Week 2006, where many in the test and evaluation (T&E) community had the opportunity to meet her. Ms. Freeman will be in attendance at upcoming ITEA events, where each of you will also have the opportunity to meet her as well.

Let me tell you a little bit about Ms. Freeman. She received a bachelor of science degree in management sciences from Lock Haven University in Pennsylvania, and went on to earn a master's degree in business administration with a marketing minor from Indiana University of Pennsylvania. After completing her graduate studies, Ms. Freeman relocated to the Washington, D.C., metropolitan area in 1988. There, she immediately initiated an 18-year career in not-for-profit association management, working for the National Association of the Remodeling Industry, the American Public Health Association, the Society of Nuclear Medicine and the Association for the Advancement of Medical Instrumentation.

Throughout her tenure in association management, Ms. Freeman has contributed widely in senior managerial roles with membership development, creation of new benefits and services, fiscal management, event planning, publications sales, information technology and database development, and strategic planning. She has also actively served as a facilitator and collaborator of volunteer leadership and committee participation.

In her new role as Executive Director of ITEA, she is looking forward to working on a number of important organizational initiatives, including: leading an effort to metamorphose the ITEA strategic plan into an actionable business implementation plan; streamlining business operations to improve efficiencies; and improving channels of communication with ITEA chapters to reinvigorate participation and encourage dialog and information exchange.

As you can see, Ms. Freeman comes to ITEA with a wealth of experience in non-profit association management and leadership. One area where Ms. Freeman has considerable experience and talent is in the development and implementation of certification and accreditation programs. It is my goal that ITEA, in providing leading education and training opportunities for the T&E community, can become the leader in documenting the qualifications of its membership to assist them in their professional growth and development.



*Robert T. Fuller*

As I have noted, Ms. Freeman, along with many members of ITEA, including the EXCOM, attended the ITEA co-sponsored Test Week recently held in Huntsville, Alabama. This event gave her a great initial view of ITEA members and corporate sponsors in action. Additionally, it also opened a window on many of the important issues and current activities challenging the T&E community today. Her recent experience with the medical instrumentation community has given her a great baseline understanding about much of what ITEA's members are confronting on a daily basis.

As the Association continues with this year's events, Ms. Freeman will lead a small working group to complete ITEA's Strategic Implementation Plan. This plan will outline and prioritize ITEA's focus areas and define how the Association can best serve the needs of its individual and corporate members over the next five years.

Remember to plan early for this year's ITEA events! You can find them listed in the "Coming Events" on the back cover of this *ITEA Journal*, as well as in the advertisements within this issue for each event (see the "Information for Advertisers" for page numbers). Please note the 2006 Annual Technology Review, August 7-10, 2006, in Cambridge, Massachusetts, as well as the Annual ITEA International Symposium, October 30–November 2, 2006, in Lake Buena Vista, Florida. Hope to see you there. ❑

# Imperatives for T&E Change Must Come From Within

**Brian M. Simmons**

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***"The future ain't what it used to be."*** *—Yogi Berra*

Okay, I borrowed a line from Yogi Berra because of its particular relevance to today's stance and balance of test and evaluation (T&E).

While that sentiment is not new, the demands for change in test and evaluation (T&E) occurring right now are significant. And, the future for T&E will emerge to be quite different than previously predicted. Why? Consider these significant examples: (1) The systems acquisition and associated T&E process has changed during wartime and is unlikely to return to the traditional process when the war is over; (2) Business transformation demands more efficiency in T&E processes *now*; and (3) Networked testing requires the testers to rely on each other as opposed to staying in traditional Service, local test range or developmental test (DT)/operational test (OT) domains.

Each of these changes causes discomfort to those with extensive T&E experience. Yet each change is undeniably happening, and every tester or evaluator I have ever met has had the same primary mission: to get the best equipment fielded for the warfighters.

*Brian M. Simmons*

How, then, do we execute our primary mission as the urgency to rapidly field solutions for the war in Iraq and Afghanistan continues to grow? How do we accomplish this in the face of dramatically lowered budget forecasts, and as our revered independence is reduced in recognition that no stand-alone test range or organization can go it alone and still meet the requirements for tomorrow's systems-of-systems networked T&E requirements? Well, the imperatives for T&E change ***must come from within***. T&E leadership down to the lowest levels must drive the process, business, cultural and organizational changes required to meet these demands.

These changes cannot be met by procedural adjustments or by increased reimbursements from weapons programs. Nor can they be met solely by technology innovation or by increasing investments. The Office of the Secretary of Defense (OSD) will provide the necessary policy framework, budget numbers and requisite support; but the onus is on the leaders in the field to transform ***now*** to a more flexible, responsive and efficient T&E capability to support the warfighter—today's and tomorrow's. Much progress in the Army is already underway.

## Acquisition and T&E

T&E information has, for decades, provided the necessary information that milestone decision authorities need in order to determine which weapons systems get fielded when, and to whom. This is still true, with a notable exception that, at least for the Army, the traditional customer base (the Program Managers [PMs]/Program Executive Offices [PEOs]) is shifting also to include direct requests from users in the theater of war.

To respond to these theater requests, the Army Test and Evaluation Command (ATEC) has established a Forward Operational Assessment (FOA) team in Iraq comprising military operational testers ***and*** civilian developmental testers. Now on its fifth rotation, the subject matter expertise resident in this team is able to directly relay materiel needs from the fight to the test ranges. Further, this team has the ability to conduct limited testing in theater, which is typically augmented by more extensive stateside T&E.

Is this OT/DT FOA type of teaming a template for the future? Perhaps. At a minimum, it is demonstrative of how the combined T&E resources in ATEC can reconfigure on short notice to provide meaningful weapons performance information to an Army at war. But to a greater extent, it demonstrates what can be accomplished by combining OT and DT test resources where the action is, where the sol-

diers are and where the new equipment is. It is immaterial which organization provides which resources to do this. What matters is that it is helping the Army. It is not an overstatement to say that ATEC's initiative to deploy a FOA team and to adopt a rapid T&E process has saved lives. And this success has been decidedly dependent on OT and DT expertise working seamlessly and continuously side-by-side.

Expedient acquisition to address user requests in theater does cause major concerns, such as limited safety and performance testing before fielding, little to no OT and, often, fielding without ***any*** testing. Without accompanied PM/PEO sponsorship, equipment can be fielded without the training and logistics support to keep it usable. Some of this discomfort on the part of the T&E community is surely also felt within the acquisition community. But the shift in the traditional customer base to now include the user in the field has caused us to modify the T&E processes. While we desire a much more robust T&E process for equipment urgently needed in theater, we have shown both the agility to respond, as well as the talent to assist in the design and proof of solutions, making the return to the days of a slower-paced, deliberate acquisition and sequential DT/OT process an unlikely future.

## Business transformation

In the Army, the newest efficiency and quality program is Lean 6 Sigma. It is a mandatory endeavor for every Army major command. But Lean 6 Sigma is only the latest tool. Full cost visibility and employment of business approaches to T&E have been recurring themes from Congress and OSD for years. The demand to identify and reduce costs is here to stay.

Army funds must now cover personnel and equipment for the current war, make the current force modular, re-station troops stateside from around the globe, execute the Base Realignment and Closure (BRAC) initiative, and modernize future weapons systems while also recapitalizing the equipment worn out in Iraq. And, the top line for all Army funding is projected to be reduced dramatically in the 2008-2013 time frame. Future T&E resources surely will differ from those of the past decade.

So, how does T&E adapt, especially since T&E workload in the Army is approaching its highest levels ever? The demand for testing while the war continues will not likely abate. I would offer that uniform accounting principles, increased reliance on contractor personnel and resourcing only those missions and facilities that demonstrate customer demand can significantly reduce T&E costs.

The National Defense Authorization Act of 2003 requires precise accounting for all direct and indirect test costs at the Major Range and Test Facility Bases. Standard definitions of test versus test support functions are in place across ATEC's test ranges. Standard definitions of which functions can be reimbursed by customers vice those functions covered by institutional funds drive the financial allocation process beginning this fiscal year. Additionally, we have undertaken an internal endeavor to track ***every*** dollar provided to our ranges and ***every*** hour worked.

We are also nearing standardization across all test ranges in civilian/contractor personnel ratios, in institutional/reimbursement funding ratios and in test/test overhead ratios. The goal is twofold: (1) to identify all labor costs, facility costs and other costs associated with executing the T&E mission; and (2) to consistently provide resources to the test ranges per industrial norms driven by workload demand. By the end of Fiscal Year 2006, we will have one complete year's worth of data available to drive command decisions regarding what labor is resourced; what facilities will be modernized, sustained or mothballed; and what missions may be affordable or unaffordable depending on budget changes. The Lean 6 Sigma methodology is in place ***now*** for the Army's DT ranges.

## Networked T&E

Acquiring the weapons and equipment to provide a networked joint fighting force requires T&E from all Services. The materiel under test will have different Service owners brought together in some type of live/virtual/constructive event, and the network interfaces must enable a common understanding of the system's performance and the test events. This means that all Services must have a common data language, connectivity and integrated range control, even though geographically distributed. So, at a minimum, DT ranges must be able to interoperate across range and Service boundaries. There is an expectation also that the quality and repeatability of all testing meets a consistently high standard, given the high costs that will be associated with these complex tests. There is no margin for a test execution error, for these types of tests and joint test protocols will be required.

In the Army's Future Combat Systems (FCS) technical field test planning, the live experimental events are planned to occur at White Sands Missile Range, New Mexico, but all Army DT test ranges will support remotely via a distributed network. The larger DT and OT tests also are planned to occur at White Sands, thereby taking advantage of available resources, both on-site and distributed. With the Evaluation Brigade Combat Team also onsite, the networked experiments, DT, OT and training will share available resources and minimize both cost and time. This scenario requires not only a seamless DT/OT sharing of

resources, but also a seamless testing/training partnership. This is the likely template for the future of how T&E fits into networked systems acquisition.

## Conclusion

All of these points can only be accomplished if driven by today's, not tomorrow's, T&E leaders. For each Army initiative I have addressed, substantial resistance has already been overcome en route to implementation. Our T&E mission focus cannot be solely on meeting budget reductions, complying with efficiency initiatives or looking out for local interests. The focus of T&E for the future must recognize what ***all*** test organizations bring to bear on common problems. No matter which T&E organization is involved, partnerships with others is ***the*** key to that organization's future relevance. What ***is*** important is not which test organization is in charge of which test event, it is how well the various T&E resources of an organization are combined with others to execute the requisite T&E. It is not just the testing of networks that needs our attention—it is the networking of the testers and their test resources as well. This is where the leaders of T&E must focus. ❑

***BRIAN M. SIMMONS*** *is the deputy to the commander and technical director, U.S. Army Developmental Test Command (DTC), Aberdeen Proving Ground (APG), Maryland. He was appointed to the Senior Executive Service and assumed his present position in 1998. He has management responsibility for DTC's test and technology mission and all associated resources. He is responsible for planning, executing and reporting 1,700 tests supporting more than 400 weapons programs annually—with a total budget of $2 billion and a workforce of 7,000 employees—and ensuring operational readiness of the Army's developmental test range infrastructure. Simmons began his career in 1980 at the U.S. Army Ballistic Research Laboratory in the armor/anti-armor field. As an operations research analyst at the U.S. Army Materiel Systems Analysis Activity from 1984 to 1988, he served as a test design and evaluation coordinator for infantry anti-armor weapons. In 1988, he transferred to Headquarters, U.S. Army Test and Evaluation Command. He worked at Headquarters, Department of the Army, from 1996 to 1997, within the Assistant Secretary of the Army for Research, Development and Acquisition as the deputy director for Plans, Programs and Resources. He holds an associate of arts degree from Harford Community College, a bachelor of science degree from the University of Maryland and a master of science degree from The Johns Hopkins University. He is a Harvard University Senior Executive Fellow, a 1998 graduate of the U.S. Army War College and a certified member of the Army Acquisition Corps.*

# Multiple Independent Levels of Security:
## *The Changing Face of Range Information Management in the 21st Century*

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Imagine a test scenario where an aircraft is flying toward a target on a test range, and a millimeter-wave radar is illuminating the aircraft's low-observable profile as the aircraft launches a highly classified air-to-surface missile, which homes in on the target. Meanwhile, across the range, a coalition training exercise is underway, with an Airborne Warning and Control System (AWACS) aircraft using the test aircraft as a target of opportunity to vector German and British aircraft for a defensive counter-air intercept mission. Range controllers are simultaneously monitoring both events for safety and quality of data, providing real-time feedback such as achievement of test mission parameters and real-time kill notification. Information classified at multiple security levels (unclassified, Secret, NATO Secret, and Top Secret/Special Access Required) flows seamlessly to and from assets on the range, being used and processed by platforms at the levels for which the platforms are cleared.

Sounds far-fetched? Hardly. Range events and capabilities are already being designed to support just such a scenario. As the Global Information Grid becomes a reality, it is becoming less and less feasible to isolate a system under test, or a training participant, from the information-rich environment in which it operates. At issue is how Department of Defense ranges can effectively control and manage information across multiple access levels without compromising security, diminishing operational realism, or escalating the cost or complexity of effective range operations.

Ranges have traditionally taken the "system high" approach to data handling when multiple classification levels are involved, immediately classifying all data at the highest level of any data involved and requiring all participants to operate at that level. While such an approach mitigates the need for complex multiple security level processing, it can restrict the participation of systems and warfighters that cannot access data at the highest level.

Seamlessly sharing data among participants with different clearance levels is clearly a high-priority goal of operational system and range infrastructure developers. The increased demand to train and fight with coalition partners, using a mixture of "white-world" and highly classified weapons and information, has led the operational community to grapple with how to implement "multiple independent levels of security" (MILS) to share data among warfighters possessing various clearance levels.

A variety of MILS solutions have been considered in recent years. The optimum approach to MILS is the implementation of Multilevel Security (MLS), in which a single processing device is designed to segment and route data to the appropriate end user at each node in the network. Chipsets and devices have been developed to facilitate a true MLS network topology, but accreditation of MLS systems has proven elusive, largely due to design costs and

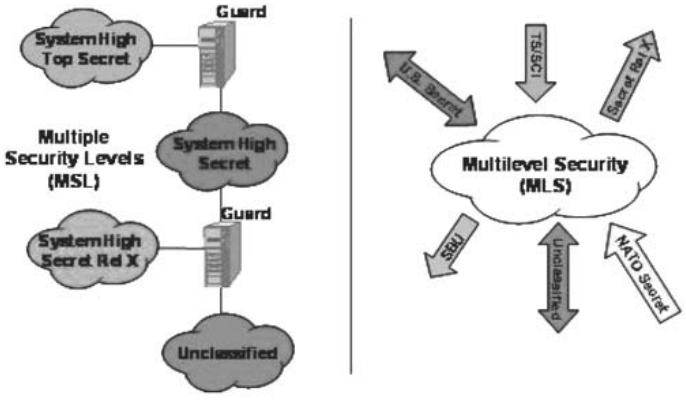


*Figure 1. Multiple Security Levels (MSL) versus Multilevel Security (MLS)*

the intensive testing required to verify the fidelity of MLS devices.

Due to the difficulty of implementing and accrediting MLS, many organizations have adopted a Multiple Security Levels (MSL) approach *(see left side of Figure 1)*. In the MSL approach, security point solutions, such as guards and firewalls, are placed in the system architecture to connect two or more security domains in the "system high" mode of operation. The advantage of this strategy is that "system high" operation is a relatively straightforward security implementation that has been used for many years. As a result, an MSL system can extensively utilize commercial off-the-shelf technology and offers less developmental and accreditation risk. On the downside, the MSL approach may degrade performance and may require the replication of hardware, software, staff and processes in each domain to accomplish the security gateway function at each classification level. Because the "system high" domains may not be entirely independent of each other, one or more guards may be needed to control the flow of any information between the domains.

An example of an MSL system that uses multiple single levels of security could include a "trusted guard" processor that sorts information by security level and routes it to an individual process where only that level of data (or lower) is handled. While the "payload data"—the key pieces of information to be passed over the network—are black (or encrypted), the header data remain red (or unclassified), and they contain information about the security level of the payload data. A similar topology simply uses different encryption keys to represent the different levels of security in a network. When messages are passed over the network, any message for which a participant does not have the appropriate key is rejected.

This improved approach allows for network message handling across different security layers; however, it invariably has critical limitations. One of those limitations is that any data, once introduced to a higher security level, are not readily downgraded to a lower level without human intervention. Second, it requires duplicate hardware components, often at multiple nodes, to be effective. This increases the cost of operation for computer platforms, cabling, maintenance and staffing. In contrast, an MLS system solution *(right side of Figure 1)* offers additional security functionality and assurance and requires little or no replication of hardware, software and processes. However, the cost of an MLS system may still be significantly higher than the cost of an MSL system, due to reliance on complex government off-the-shelf technology and management of increased developmental and accreditation risks.

Current MLS systems are custom, single-use designs that utilize very specific security protocols. To make MLS solutions practical for the test and evaluation community, new MLS technologies must be developed. Central to this effort must be a single security processor capable of handling and parsing data from multiple sources at different classification levels. This requires an advanced authentication and verification protocol that ensures information is distributed only to those with appropriate access. It also requires advanced intrusion detection algorithms to prevent unauthorized access or masquerading as an authorized user. Encryption and decryption will be central to all of these processes, and the processor must be able to account for multiple encryption schemes that may be employed at all levels of classification. On top of this, all of these functions must be implemented in such a way as to minimize processing delays, ideally in real time.

Regardless of the technological approach to MILS that is ultimately used, it is clear that ranges must adapt to this emerging requirement. Coordinated coalition warfare means sharing the right data with the right people at the right level. To test systems and train the forces to operate in this environment, the range community needs to position itself to take advantage of emerging MILS techniques and solutions as they become available. ❑

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