Advanced Collaborative Environment for Developing and Testing System-of-Systems

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LTG Caldwell was the keynote speaker for the Army Test and Evaluation Command's Test Technology Symposium 2003 on June 25, 2003. His remarks to an audience of acquisition leaders and testers from the Army, Navy, Air Force and industry identified the concept by which we must develop and test our emerging system-of-systems through an advanced collaborative environment.

Networking and integrating the Army's "system-of-systems" is crucial to the success of future military operations. Because this concept is somewhat new to us, it is rewarding to see the entire defense community pulling together to make it happen. In June, I had the opportunity to address the *Army Test Technology Symposium 2003* to share my thoughts on our current acquisition programs and to see how the test and evaluation (T&E) community is preparing for new ways of doing business. Army testers, materiel developers, combat developers and industry technologists attended the symposium. Representatives from the Air Force and Navy acquisition agencies also shared their knowledge on distributed testing. Using modeling, simulation and networking technology tools, these agencies worked together to create realistic joint battlefield testing scenarios supported by data-sharing networks. These, in turn, supported tests and experiments at distributed geographic locations. Using the combined knowledge and tools from these agencies, we will develop, test and evaluate emerging weapons and communication systems that will fight together on future battlefields. This advanced collaborative environment will begin integrating the components and systems as they mature.

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Army Future Force

As the Army's lead agency for future force materiel acquisition, we must provide our troops in the field with affordable, world-class weapon systems and contracting services, years before any adversary can achieve comparable technological capability. We have quality people, a teamwork mindset and a drive for success that enables us to accomplish our mission. The Army's goal is to system engineer and field the unit of action (UA) as a unified entity, instead of treating the units as separate and individual platforms with separate development programs. By testing the combined capabilities of the system-of-systems and their enabling systems as a unit, we will be able to quantify and understand the astounding capabilities that a UA brings to the Future Force.

Change in Mindset

When I was project manager (PM) for the Abrams Main Battle Tank program, there was very little integration between the component development and T&E communities. We also had separate viewpoints and minimum interaction among programs, even when we were within the same program executive office (PEO) organization. Fortunately, things have changed for the better and we have forged a truly integrated team. No other nation in the world could have fielded the exceptional military capabilities that our U.S. forces in Iraq have demonstrated in a totally collaborative environment. However, we must err on the side of caution, as suggested by BG Marvin K. McNamara, Commanding General, U.S. Army Developmental Test Command. In his remarks at the June symposium concerning our joint efforts during *Operation Iraqi Freedom*, he stated "That was

great ... that was then ... this is now; we can't rest on our laurels." What Army leadership is requiring for the future force far exceeds our recent accomplishments in Iraq.

User/Developer Team Guidance

Considering how we are developing our new capabilities, there are two pieces of guidance I offer based upon my experience as a PM. *First*, never allow gaps to develop between the materiel and combat developers. The U.S. Army Training and Doctrine Command represents the user and must be there every step of the way. *Second*, find the best people for each job and go out and hire them, wherever they are. The Future Combat Systems (FCS) program is a great model for this concept because there has been unprecedented user, developer and T&E networking and integration from the program's outset. As the FCS program develops, I am convinced that the development process must be integrated smoothly and not handled as a completely separate process. The acquisition process must be a continuing team effort with full participation by the PM, materiel/combat developers and testers. The process must include integrated systems engineering.

FCS as the Model

We are in the late stages of source selection for FCS, with 23 procurement packages on the street. We will have nearly $15 billion in the research, development, test and evaluation phase — and will need every nickel to properly source FCS. There are many components and agencies involved requiring all of our networking and integration abilities to meet our milestones. Accordingly, FCS requires a lot of inspection, analysis and second guessing from all levels. The PM and the PEO will have the opportunity and the flexibility they need to illustrate the great benefits of the system-of-systems approach.

I envision the FCS program standing as the advanced collaborative environment model for years to come. To achieve this success, there are four major concepts that will be stressed during FCS development and testing:

- An Army unit dedicated solely to FCS combat and materiel development, testing and experimentation.
- Integration of testing and distributed testing.
- Use of a Lead Systems Integrator (LSI) approach.
- Design and testing in an advanced collaborative environment.

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We have received favorable comments from the developing contractors about these concepts and the FCS development approach. We shall continue to work creatively with them under this process. This means acquiring the people needed to get the job done right; involving the user in the design; and creating virtual models of the equipment, enabling modification as prototype components and systems are developed. A factor in selecting the Boeing Co. as LSI was its understanding and demonstrated capability in this type of development process. The collaborative effort will include a major role by our newly organized Research, Development and Engineering Command.

Commitment to Soldiers

We must ensure that our troops have the best that money and technology can provide in the shortest possible time. The Acquisition Corps is ensuring all weapons and systems delivered to the troops meet user specifications. Because we are in a research, development and test environment, we must recognize that no system will ever be 100-percent perfect, and know there will always be room for improvement. When you push the edge of technology and the operational environment, there will always be a "glitch" here and there. We have the obligation to get our systems as close as possible to what our warfighters and their operational commanders need, but as soon as we get them close to what they need, we must get it into their hands.

Army PEOs and PMs are effectively integrating testing into their programs as a continuing life-cycle process. Emerging systems and system components will be immersed