

Simulations Test Army Future Combat Systems

BY MIKE CAST

As the U.S. Army proceeds with the development of the Future Combat Systems, program officials increasingly will be relying on sophisticated models and simulation to test the performance of the technology.

Much of this technology is being developed at the Army Test and Evaluation Command, and the Developmental Test Command. Engineers are attempting to model and test the performance of FCS as a network, or what the Army calls a "system of systems."

The FCS was conceived as a family of 18 combat vehicles, aircraft and weapon systems, all expected to operate and communicate with each other across the battlefield in a "seamless network."

The Army's challenge will be conducting tests that mirror this network-centric vision of combat operations.

The Developmental Test Command, or DTC, orchestrated a series of exercises to test FCS systems and providing the performance data Army evaluators need to ensure these systems are successful.

At the core of this effort is the Virtual Proving Ground, or VPG, an array of technologies and programs across DTC that

allow testers to model and simulate military systems as they would operate on the battlefield.

DTC conducted a series of four complex test exercises as part of the Virtual Proving Ground "synthetic environment integration testbed" (SEIT). The demonstrations were designed as "distributed" testing, meaning simultaneous test operations at various test centers operating under a common operational battlefield scenario. This allows Army evaluators to acquire performance data on a system of systems such as FCS.

The latest of these demonstrations, the "Distributed Test Event 4" (DTE 4), conducted in late August 2004, involved DTC test centers and other Army organizations, as well as Boeing and Science Applications International Corporation, the two corporations that serve as the system integrators for FCS development. They jointly developed the DTE 4 tactical scenario.

The demonstration involved participants at locations ranging from the Pacific Northwest to the southeastern United States.

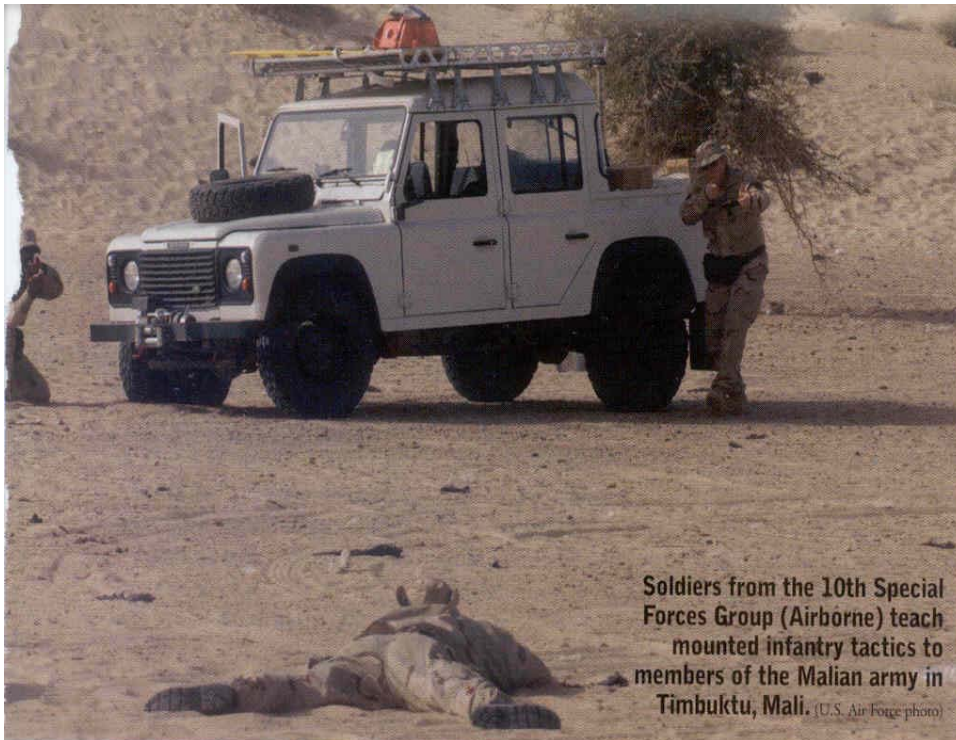
"A single operational scenario was published to all of the test centers, and each entity or environmental representation played a distinct role in the scenario," explained Tim Clardy, an engineer with DTC's Redstone Technical Test Center, in Alabama.

"The scenario ran for about 90 minutes and involved 140 interoperating computers spread out across the United States," he said. The exercise involved various combinations of weapon-system platforms and functions.

Army test centers and the lead system integrators were joined in the demonstration by the Training and Doctrine Command's Unit of Action Maneuver Battle Lab, which designed the mission for a combined-arms battalion. This process identified each of the individual tasks that a combined-arms battalion would need to execute for a specific mission.

The Night Vision and Electronic Sensors Directorate of the Army's Communications and Electronics Command provided modeling and simulation tools that represented unattended ground sensors, intelligent munitions systems and mines, as well as the Advanced Concepts Research Tool, a technology that represented the FCS reconnaissance and surveillance vehicle and its robotic components.

The task of orchestrating a complex test event across two or more test centers requires centralized command and control—everything from ensuring that actions start and stop on time to managing



Soldiers from the 10th Special Forces Group (Airborne) teach mounted infantry tactics to members of the Malian army in Timbuktu, Mali. (U.S. Air Force photo)

in Iraq. "Some countries don't want their contributions to become public knowledge," he said. For example, he noted, "if you think there is no Arab participation, you'd be mistaken."

Coalition special operators have been able to operate together in Iraq and Afghanistan for several reasons, Harrell said. First, he explained, Eastern European and Pacific SOF use the NATO standard for equipment and training, and second, the Central Command's special operators worked hard to achieve interoperability with their counterparts before deployment.

In Korea, joint training between U.S. and South Korean special operators plays a critical role, Clem said. "Common experiences are important," Clem said. "For us, jumping is a shared experience." The joint training helped South Korean SOF prepare for its deployment to Iraq, he said.

In trying to build an international standard for special operations forces, the United States must not leave the impression that it is seeking "to apply an American solution to international problems," Harrell said.

In other regional commands, the special operations emphasis is on preventing conflicts, rather than fighting them, said Army Col. Mark D. Rosengard, operations director of the Special Operations Command-Europe. "That requires willing and capable friends, a synergistic effort—a coalition," he said.

In Africa, Rosengard explained, special operators from the European Command are conducting a Pan-Sahel Initiative to help local military forces improve their capability to counter terrorists moving through their territories.

The Sahel is a vast desert area that stretches south from Tunisia to Nigeria and west from Chad to Mauritania. Because of the region's enormous size and small population, indigenous military forces have found it difficult to patrol borders and enforce laws. "The terrorists pretty much come and go at will," Rosengard said.

The Pan-Sahel Initiative is designed to help countries of the region—Mali, Chad and Mauritania—counter this problem. Currently, Green Berets from the 1st Battalion, 10th Special Forces Group (Airborne), based in Stuttgart, Germany, are teaching mounted infantry tactics to Malian soldiers at two locations, Timbuktu, Mali, and Nouakchott, Mauritania, he noted.

"If we can increase the operational reach of our friends in the region, it will have a significant impact in the global war on terrorism," Rosengard said.

In Latin America, special operators from the Southern Command have been working to overcome impediments to establishing effective multi-lateral security arrangements, said Army Col. James A. Camp-

bell, director of operations for Special Operations Command-South.

"Most of the democracies down South are very weak," Campbell said. He cited the example of Venezuela, whose president since 1999 has been Hugo Chavez, a former paratroop colonel and an admirer of Cuba's Fidel Castro. Chavez's presidency has been racked by a coup attempt, widespread strikes and a failed recall referendum in 2004.

On the other hand, Campbell said, Latin American countries have been good at developing ad hoc reactions in response to emerging crises. In 2004, after Haiti's government fell apart, nine Latin American countries contributed troops to an international peacekeeping force that helped restore a measure of order to the country, he said.

Campbell cited multi-national participation in the Joint Interagency Task Force South, which is located at Key West, Fla. JIATF-South, as it is called, is an international operation that is aimed

at countering the smuggling of drugs, illegal immigrants, terrorists and weapons in the Caribbean and Eastern Pacific. Led by the United States, it includes participants from 11 Latin American and European countries.

On any given day, Campbell said, 12 or more U.S. and allied ships and 15 or more aircraft are on patrol in the area, which covers approximately 42 million square miles. Such international participation has permitted SOUTHCOM to increase its interdiction of drugs despite cuts in the command's resources during the past several years, he said.

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the communications network that keeps test participants talking to each other.

For that purpose, DTC created an interrange control center, or IRCC. The *I. W* Cox Range Control Center, at White Sands Missile Range in New Mexico, was selected as the IRCC because it has the facilities and range-management experience suited to that role. Each test center participating in a distributed test interfaces with the IRCC.

All of DTC's distributed test events were designed to demonstrate a wide range of test capabilities for supporting a mix of live, virtual and constructive testing, all of which will be necessary for the development of FCS, said Rick Cozby, chief of the test management division at DTC.

He said DTE 4 is part of a continuous technology development program that began a decade ago when the Virtual Proving Ground was established to address the challenges of network-centric warfare.

Three basic types of simulation environments support testing, Cozby explained. A constructive simulation is "totally contained within a computer," he said. It could be done with mathematical formulas on paper, but it is totally simulated, and there are no live interactions or live elements. Virtual simulations contain a mix of live elements and computer-generated processes.

"You have some mechanism that allows a human to interact with the simulation," he said. For example, a virtual simulation for a Wolverine bridge armored vehicle might simply contain the front part of the cockpit with the actual controls and maybe a simulation of the bridge operation. "What you're trying to exercise in this case is a human interaction with the system," he added.

Live simulations occur when the actual system or part of a system is placed in a live environment designed to be as realistic as possible. "Our intent is to create a mixed virtual, live and constructive environment that we can immerse a component, system, or system of systems," Cozby said.

All tests involve simulation to some extent, he added. "Virtually everything we do in the test process is simulation." The Yuma Proving Ground, in Arizona, for example, is a simulated environment to test systems that will be operating in the desert.

The inter-range control center is instrumental in testing distributed capabilities, Cozby said. "One of the things that we discovered back in 1998 with some very early, primitive distributed tests is that you cannot put together an ad hoc network and expect it to operate in a coherent fashion," he said. "You've got to have execution control in terms of starts and stops, the passing of message traffic, and you've also got to have test configuration management and control."

The way FCS systems are being designed to work together through a network and "built-in intelligence" makes it more than the sum of its parts, Cozby said. "The lead system integrator has recognized, as we have, that you need to build, test and train a network-centric force as you would fight it."

The Army, meanwhile, is working with the other U.S. military branches to plan a complex multi-service test and evaluation event that will exercise joint tactical tasks.

Many of the details of this multi-service distributed event have not yet been finalized, but the intent is to use this event to establish a mechanism to support test and evaluation of "systems of systems" that will be used for future joint operations.

As currently planned, the event is to take place in August 2005. It is described as a risk-mitigation event because it will be a prelude to a complex experiment that will be conducted by the FCS lead system integrators the following year. The lessons learned from the event will be applied to enhance the technologies, tactics, techniques and procedures employed by the FCS unit when operating with other services, and also to shape the continuing development of distributed test and evaluation methods and infrastructure. **NO**

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