

'LIVE SYNTHETIC' ARMY'S NEXT GENERATION OF SIMULATION

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Soldiers from a brigade combat team (BCT) are at a combat training site doing a routine live-fire exercise. Well, maybe not so routine.

Suddenly enemy jets pop out of the clouds streaking toward them. The Soldiers scramble for cover as missiles rain down. They hear the explosions from the missiles impacting all around them, see the flames and debris, and smell the smoke. But this is where it gets a little bit eerie. Those enemy jets are being piloted a thousand miles away by fellow BCT Soldiers, some in aircraft simulators and others on computer gaming stations. The Soldiers see the visual recreations of those jets in real-time through special glasses that allow them to see the real world around them while simultaneously viewing the simulations.

Data from the simulations stream into the Soldiers' glasses from satellites and ground relay stations. In turn, the pilots in simulators and those using gaming stations see what Soldiers are doing in the live environment by satellite and unmanned aircraft video feeds and sensors on the Soldiers that transmit precise locations and activities. Sounds of the battle are generated through special earpieces that harmonize with the visuals and the smells are pumped in through special odor machines.

Pipe dream? Not really, said COL John Janiszewski, director of the National Simulation Center (NSC), U.S. Army Combined Arms Center (CAC), Fort Leavenworth, Kan.

"We're now looking at a concept called the Future Holistic Training Environment Live Synthetic" that will eventually do this and much more, he said. "We're now documenting the requirements."

By next year, Janiszewski plans to define the specific requirements for live synthetic and hopes to begin fielding systems by fiscal year (FY) 2022 and have them in place Army-wide by FY 2025.

In the meantime, the NSC is having discussions with industry and experts in the science and technology community to "close some of those gaps" in capability.

Although simulators have been around for decades, the problem is that most were designed to be used in isolation. Live synthetic fuses them all seamlessly. There are four basic types of simulations that will need to be fused to make the



Photo illustration by Peggy Frierson

vision a reality. They go by the acronym LVC-G — live, virtual, constructive - gaming.

Live Simulation (LS)

This is "real people operating real systems in the field," Janiszewski said. Soldiers have been doing this since the dawn of warfare. Janiszewski said live simulations have improved significantly since he joined the Army 26 years ago.

The sounds and smells mentioned in the setup scenario have already been added to LS in mock towns at the National Training Center, Fort Irwin, Calif. Marines at nearby Camp Pendleton are using animatronics in their LS. Animatronics are computer-generated images of people or even animals that appear to be physically present — some are friendly, some not.

Another improvement is that Soldiers' movements today can be tracked through radio frequency identifiers attached to their bodies, a quantum leap from the Multiple Integrated Laser Engagement System (MILES) introduced in the 1980s, which didn't track movement, only hits from weaponry.

Although LS has seen significant improvements, "we're not there yet," he said, meaning the Army doesn't have the glasses that would permit the use of "augmented reality." Cloud computing capability will also likely play a role in this.

As troops draw down from Afghanistan, more and more Soldiers are doing LS at combat training centers and at installations. Commanders didn't have a lot of responsibility planning and executing training over the last 12 years of war since it was done for them, Janiszewski pointed out. Now, it's their responsibility. Mobile training teams from the CAC are helping them out with this, he said. "When we're at peace, we're an Army of preparation."

Virtual Simulation (VS)

"This is real people operating simulation systems," he said. "Like your child driving the racing car at the video arcade. The child believes he's in a real vehicle with steering, gas, brakes, and a display."

VS is what most people think of when they think of simulation. The Army has had them around for decades now: tanks, trucks, helicopters, Bradley Fighting Vehicles, and more. Tank crews and aircraft crews operate in separate simulators but can share a common picture of the training exercise.

These systems are already sophisticated with verisimilitude displays, motion, tactile, and auditory feedback, he continued, adding that he's not seen any significant leap forward in virtual simulation since it's pretty realistic already.

Constructive Simulation (CS)

This is simulated people and equipment operating in a simulated environment, he said.

In a typical constructive simulation, operators are looking at a computer screen watching contours on a map and icons representing friendlies and enemy, along with their weapons, vehicles, aircraft, and materiel. Operators can move objects around using their mouse.

Over the last decades, Janiszewski said CS has gotten more realistic, meaning the representations on the screen are more sophisticated and movements are more precise and closer to real time. Also, terrain mapping has gotten more detailed. Entire, large-scale organizations can be represented this way, and while not as exciting as being in a virtual simulation, it is just as effective, he pointed out. In fact, Janiszewski said his unit in Germany in 2002 and 2003, rehearsed the Iraq invasion and the roll up to Baghdad using CS.

The U.S. Army Training and Doctrine Command (TRADOC) uses CS for analytical and experimentation purposes as well as gaming future scenarios.

Gaming Simulation (GS)

This is similar to CS but instead of icons and contour lines on a map, the view on the computer screen looks real. Think of the popular "Call to Duty" or "Halo" video games.

Janiszewski said gaming is the simulation that by far has had the most advances, especially in the last few years. GS is so new, in fact, that his office has yet to add gaming to its current acronym LVC-IA (live, virtual, constructive-integrative architecture), which describes the Army's current efforts to integrate training systems across the simulations realm. Gaming is not yet officially part of the Army's simulation syllabus — but he expects it to be soon.

"Gaming is probably the most prevalent and popular capability we now have," he said. That's because one, it's realistic and engaging; two, you don't need a bulky, expensive piece of equipment like a virtual simulator; and three, there is a plentiful supply of computers.

Forging Ahead

Besides adding gaming to the mix and fusing the four simulations together, there are a few other challenges to get to live synthetic.

For one, NSC doesn't have the accreditation that would allow it to operate simulations over the Secure Internet Protocol Router Network (SIPRNet). Obtaining the certification and accreditation "is critical if we want to train the way we

fight," he said. A successful SIPRNet workaround for now is the NSC's use of the Global Simulation Capability Network (GSC Net), which "is a training network that allows the NSC to distribute constructive simulations from Fort Leavenworth to home-station training locations in support of division and corps training events," he said.

GSC Net also allows units that are strung out over several states, as is often the case with the National Guard and Reserve, to use the existing Defense Information Systems Agency operational network, he said. For example, NSC at Fort Leavenworth recently pushed out a training simulation via the GSC Net successfully to Soldiers at Fort Bragg, N.C., he said.

Another issue in getting to live synthetic is funding.

"I worry about the budget every day," he admitted. "I try to articulate why we need the resources, [and] try to show the positive effects [of simulation on] training and readiness of the Army."

Janiszewski said he "doesn't like to use the cost factor of why we want to do this, but in truth, it's cheaper to train in a simulator" than live. For instance, he pointed to a study that showed it cost about \$3,500 to fly a real attack helicopter per hour while an attack helicopter simulator cost around \$500.

The cost curve can also be lowered by simulating instructors and tutors on the simulators, he said. Scripts or even robots could mentor Soldiers doing the tasks. This would cut down on the need to hire more contractors.

Another benefit simulation provides in cost, as well as time savings, is that simulations can be delivered right to the installation. Fort Hood, Texas, was the first to use LVC-IA in 2012, he said. Soldiers from a 1st Cavalry Division BCT used the three simulation components successfully in a feasibility assessment exercise to determine if LVC-IA could be rolled out Army-wide. It wasn't true "live fusion" as envisioned for the future, but it nonetheless demonstrated that the three types of simulation could be used successfully in an exercise.

Then, Soldiers at Fort Drum, N.Y., used CS to train on logistics while interacting with Soldiers at the Joint Readiness Training Center at Fort Polk, La., who were doing LS. Data was transmitted back and forth live via a mission command information system which gave them a common operating picture, he said.

Along with Forts Drum and Hood, LVC-IA systems have been delivered to Fort Riley, Kan.; Fort Stewart, Ga.; Fort Bliss, Texas; and Fort Campbell, Ky. Fifteen more sites will get deliveries between now and FY 2016. The Guard and Reserve will be included in all simulation training, Janiszewski added.

In addition to that effort, it's standard practice now at combat training centers for Soldiers to use CS as part of their leader development program prior to going to the live environment. This type of "progressive training strategy increases proficiency during the follow-on live event," he noted.

Besides simulation efforts within the Army, Janiszewski said sister services and allies are sharing simulation ideas and interconnectivity since "training together is critical for the U.S. in the future."

(David Vergun writes for the Army News Service.)