Untapping the Potential of Games for Learning

by Patrick E. Clarke

Landing a plane on the heaving deck of an aircraft carrier is widely regarded as one of the most difficult maneuvers any military flyer has to do. So, it would seem that Navy flight officers beginning their second tour of duty on a carrier would justifiably be very confident of their skills. They certainly wouldn't be thinking that they'd need any sort of game training to enhance their skills.

But, "The concept of 24 Blue—training in flight deck operations and safety— came from the fact that more injuries happen on a flight deck, when Navy flyers begin their second tour of duty," according to Doug Whatley, founder and chief executive of Breakaway Ltd. Back-to-back assignments to be carrier pilots generally don't occur, so, "Because they've been away from flying for awhile, they have the mental knowledge, but need to have their skills honed," said Whatley. He continued, "24 Blue is an entertaining way for Navy flyers and deck crew to refine their skills and bring them back to their needed proficiency level. They experience all the different elements they need to be both safe and efficient on the flight deck." 24 Blue is used by the Naval Education Training Command.

To Whatley, the technology of creating training games isn't the hard part. "The biggest hurdle is the knowledge gap between us and the people we create the game for." So, Breakaway came up with a very creative and effective way to lessen that knowledge gap. "We actually had the entire development crew spend a week on a Navy carrier," said Whatley.

LARGE-AND SMALL SCALE DOD PROJECTS

Training games for the military such as 24 Blue that offer cost-savings in addition to solid training that is also entertaining have a strong advocate in Robert A. Wisher, Ph.D., director, Advanced Distributed Learning Initiative (ADL), Office of the Secretary of Defense (OSD). According to Wisher, research shows that games:

Increase spatial visualization—" You can look at an object such as a two-dimensional map and render it in the mind as 3-D."

Increase Situational Awareness—or knowing about the environment around you. "For example, there's evidence that the use of games increased the driving ability of teens and young adults through increasing their situational awareness," said Wisher.

“Even the learning involved in operating a joy stick can transfer to operating a control stick in an aircraft,” said Wisher. He makes reference to a study in the 1990s that showed that Israeli pilots who played games that simulated the cockpit environment performed better when actually piloting than pilots who didn’t play the game.

The ADL initiative is looking to develop consensus with the military, industry and academia of ways to harness the advantages of a training technology and base it on unified specifications and standards.

“We’re trying to integrate games into a structured learning environment,” said Wisher. “The structured environment could then evaluate performance based on a common model, and then direct the trainee to additional training based on weaknesses found in the evaluation.”

DARWARS Ambush!, created by BBN Technologies for the Defense Advanced Research Projects Agency (DARPA), is an example of a game that incorporates feedback and lessons learned. DARWARS Ambush! is a multi-player game environment (team vs. team; team vs. artificial intelligence) that teaches our troops how to anticipate and react to ambushes and improvised explosive devices, transfer situational awareness during troop rotations, and recognize and adapt rapidly to constantly changing insurgent tactics, according to BBN. “The system focuses on troop level experiences and convoy ambushes as well as dismounted forces, allows for field authoring so that new experiences can be added to the system easily, and provides support for capturing, sharing and discussing incidents.”

Booz Allen Hamilton’s Integrated Gaming System (IGS) is also a sophisticated system created for the Army Training and Doctrine Command (TRADOC) to conduct its Army Transformation Wargames and “rehearse” sophisticated maneuvers. By doing this they are able to discover mistakes ahead of time in the classroom instead of during battle. The Entropy- Based Warfare model is the strategic heart of the system. Mark Herman, a McLean, Va.-based vicepresident who leads Booz Allen Hamilton’s modeling, simulation, wargaming and analysis work, is the author of the Entropy concept and the Entropy- Based Warfare model’s designer. “There are other factors that historically have allowed small, well-motivated forces to dominate larger, unmotivated opponents,” said Herman.

“Entropy is the tendency for everything— from our universe to our kitchens—to become more disorganized over time,” said Herman. He continued, “On the field, many variables can interfere with best-laid plans, such as morale, weather and logistics, which are key factors usually ignored in most campaign models. Entropy-Based Warfare allows us to bring them in and replicate the real-life chaos of battle.”

Herman is also quick to point out that, “In wargames, the enemy always gets a vote.” He explained that Booz Allen Hamilton does lots of gaming that supports real-time, real-world situations. Thus, if the situation is set in the real world, there are only so many possibilities. “You can narrow them down through wargaming and come up with move/counter-move scenarios.”

Another large-scale, widely used training system is Virtual Battlespace 2 (VBS2), developed by Bohemia Interactive Australia (BIA). VBS2 is often used in conjunction

with Calytrix Technologies' LVC Game, according to Damon Curry, international sales manager, Calytrix. Calytrix and BIA realized early on that VBS2 would be most useful if VBS2 users could participate in larger simulation environments involving external simulators and trainers on the military's distributed interactive simulation (DIS) and high-level architecture (HLA) networks, according to Curry. "To make that possible, Calytrix developed LVC Game, which adds DIS/HLA connectivity and other related features to VBS2," said Curry." He added, "Today, many VBS2 users also use Calytrix' LVC Game, so the game players are interactive participants with many external trainers, constructive simulations, and so on."

The U.S. Marines purchased an enterprise license of both VBS2 and LVC Game approximately one year ago, according to Curry. "VBS2 and LVC Game are in place at numerous Marine Corps facilities, including simulation centers at Quantico, Camp Lejeune, Camp Pendleton, 29 Palms, Okinawa, Korea and Hawaii," said Curry. Both the United Kingdom Ministry of Defence and Australia have purchased enterprise licenses of VBS2 and LVC Game, and there are many other VBS2 and LVC Game users in Europe, Asia and elsewhere, according to Curry.

A key feature of VBS2 is its outstanding 3-D graphics, especially regarding human and vehicle movements in dense environments "Which, of course, is exactly the environment of military operations in urban terrain [MOUT], a critical area of military training today," said Curry. "Another key feature of the VBS2 is its Real Time Editor, which permits changes or additions to simulation scenarios while they're running, saving huge amounts of valuable training time by permitting modifications to training scenarios 'on the fly' and thus maintaining the training tempo without interruption."

Calytrix and BIA have very recently enhanced VBS2 through the addition of Calytrix' Combat Net Radio Simulator (CNR-Sim) and CNRLog. "VBS2 users benefit in several ways," explained Curry, "such as having an unlimited number of simulated radio channels; being able to replay radio communications in sync with VBS2's After Action Review facility; and compatibility with external CNR-Sim users and also users of other DIS-compliant radios."

For their part, Forterra Systems and Forterra Federal Systems build distributed virtual world technology for training and simulation in defense, homeland security, medical, corporate and entertainment industries. Using the OLIVE (On-Line Interactive Virtual Environment) platform—a digital gaming technology—their customers can rapidly create realistic 3-D virtual environments that can be used as single-user applications as well as large-scale simulated environments with potentially thousands of concurrent users. "Within OLIVE, users interact in a powerful, immersive collaboration and communication medium, with realistic 3-D avatars that mimic natural human movements and appearances," David "Bart" Bartlett, director, marketing and business development, Forterra Federal Systems Inc., told MT2. During the last year, Forterra Systems has released OLIVE 2.0.1 and continues to win contracts with the military, medical and intelligence community. "Forterra's new release and upcoming capabilities will include new collaboration tools that integrate presentation tools, streaming video, virtual conferencing, along with real world terrain and increased military and intelligence requirements. Forterra's technology and services enable organizations to train, plan, rehearse and collaborate

in ways previously considered impossible or impractical," pointed out Bartlett.

RESOURCE SAVING INDUCEMENTS

The U.S. Army is exploring the use of games for training in part because of the overhead involved in more traditional training, including facilities, time and personnel, according to Jeffrey Leser, chief, Simulation Division, Digital Leader Development Center, U.S. Army Command and General Staff College (CGSC), Fort Leavenworth, Kansas. "And a lot of gaming technology is portable—which is an asset given the Army's need to train soldiers where they are," said Leser.

"We've run full-scale gaming simulations," said Leser. During the capstone exercise of the Advanced Operations and Warfighting Course (AOWC), "Twelve simultaneous division level exercises were run," said Leser. He continued, "Previously, the cost of that exercise would have run into the millions of dollars. We took 250 to 300 personnel worth of overhead and reduced it to nine people. Plus, we were able to run multiple exercises—so more students had the opportunity to work at the level instructors prepared them for."

The center teaches at the brigade, division, corps and theater level, using experiential learning. "We don't believe in a single simulation being used," explained Leser. "We have the instructor identify learning objectives—what decisions do students need to make to indicate they've mastered the curriculum. From there, we develop or find the right simulation."

The center has six active simulations, and maintains a library of over 50 other simulations or games, according to Leser. "Games need to have the ability to move a student through time to where the student can see second and third order effects of their decisions." Leser offered the following example:

"In Iraq, if I provide power to a Sunni part of town: 1st order effect—Sunnis are happy, but Shias are not happy.

2nd order effect—the U.S. is blamed for not providing power for all; Shia insurgents blow up power station.

3rd order effect—Sunnis and Shias protest U.S. inability to provide security and power for Iraqi citizens.

"As the effects of decisions are seen—learning occurs—that's the kind of thinking we want to foster," explained Leser.

To Leser and his colleagues, a game is simply a venue for the student and the instructor to explore what happened and why. He also emphasized, "We are not using simulations to tell students how to solve problems in Iraq."

AVT Simulation is a company that is conducting studies on bringing commercial and gaming technology to the military training community, in addition to providing their own simulations. "We've been doing visual engineering studies for the Air Force, Army and Navy to help them understand what's out there in terms of commercial

and gaming technology that would be applicable for military training and what is the best approach," said Cliff Ingari, vice-president, AVT.

The company has also developed the AH-64D Apache Helicopter Recurring Skills Trainer for the countries flying the attack helicopter. "The trainer hones the skills of Apache pilots and gunners. Yet, it's a desktop trainer," said Ingari. "So, the trainer is low cost, but offers high fidelity training which addresses perishable skills."

AVT has been working with Rockwell Collins on the Air Command and Tactics Trainer (ACTT) for the British Army. "We build flight models—which give the simulator characteristics of flight, so crew members get the actual touch and feel of the aircraft," said Ingari.

The two companies have also developed collective trainers— "Which is a roomful of trainers networked together so you can have a full squadron play on the same battlefield," explained Ingari. "So, multiple crews can be on a mission—learning how to work together as a team, or as a unit, while refining command and control tactics. There are just a whole host of training objectives that can be accomplished on ACTTs."

AVT developed the SAF (Semi-Automated Forces) integration for the ACTTs. "So the SAF offers computer-generated bad guys on the ground or in the air. They even have their own set of tactics."

AVT also developed the sensor and radar systems and flight controls to include the glass cockpit and multi-function display, in addition to several other systems.

The ACTT's are currently being updated, and Ingari anticipates that the updates will be completed by early next year.

eSim Games has a single product family, Steel Beasts Professional. The simulation models the gunner's and commander's position of various armored fighting vehicles in a virtual 3-D environment. This allows both networked and solitary training of single-vehicle, platoon and reinforced company scenarios with a high level of tactical confidence, according to the company.

In the U.S., West Point offers one course utilizing Steel Beast Professional for basic tactical instruction, according to Nils Hinrichsen, director, marketing and customer service, eSim Games. The Army's 1st Armored Division has also purchased licenses for the product.

"On the other hand, we have steadily expanded and intensified our relationships with our customers in Europe and elsewhere," said Hinrichsen. He continued, "We developed a gunnery and crew procedure trainer for Denmark. After this, there were customizations for Sweden, the Finnish Armored Corps and Denmark again. Then, Australia and New Zealand acquired a defensewide license, and currently, we're working for Spain and Denmark on their infantry fighting vehicle programs. Recently, the MoD of the Netherlands has expanded their number of licenses almost tenfold."

Hinrichsen points out that they're all returning customers who asked eSim Games to

add more functionality and to expand the number of licenses. “I believe that’s a testimony to both the high fidelity of our solution and its significant versatility in training employment,” said Hinrichsen.

eSim Games has completed work on a new entrylevel simulation for the Spanish Army’s mechanized infantry units equipped with the Australian-Spanish Cooperative Development Pizarro infantry fighting vehicle (IFV). The company is in the acceptance test stage with providing the Danish Army with a simulation for CV9035 IFV crews. Steel Beast is also the basis of their simulator cabins for gunnery, crew procedure and platoon-level tactical training, according to Hinrichsen. Next will be follow-on developments for the Spanish Army including its Leopard 2E main battle tank, according to Hinrichsen. “Much of the work we do in 2009 will depend on the outcomes of the Steel Beasts Conference for our Army customers this year in Stockholm,” said Hinrichsen. “Our expectation is a shift in customer demand towards asymmetric warfare and integration with other simulations via HLA and DIS.” He added, “Together with Calytrix Technologies we have already made initial steps which will be presented to the public at their booth during ITEC 2008 in Sweden.”

POLICY DEVELOPMENTS

“I’d like industry to recognize the advantages of working on a common model,” said Wisher. “It’s going to reach a point where if you want to sell games to DoD you must have a common model as part of the game. So, we hope to be a facilitator with industry on a common goal.”

Wisher and his group at OSD know that keeping track of the continuing developments in the world of military gaming can be a daunting prospect. So, three working groups have been created:

Standards—“the idea is to integrate games into the sharable content object reference model environment through data models.” Design principles—to look at the emerging science of designing games for learning and enjoyment. “We need to make sure games for training offer both learning and enjoyment,” stressed Wisher.

Business model—this group will look at metrics, cost, return on investment, throughput and other factors.

The working groups are open to all. “We’re also going to have a weekly Webinar and occasional workshops related to policy,” said Wisher.

So, the gaming industry will continue to develop imaginative ways to train the warfighter, while Wisher and OSD will offer some organization to go along with the imagination. ?

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