Tactics Training in Virtual Reality

(The Future of the Officer Advanced Course)

by Major Louis DiMarco

The company commander looked ahead and saw the Bravo section of his 1st platoon break the wood line as they began bounding forward. Turning to the right, he could see the small group of houses where the Alpha section was waiting. A glance at his commander's display told him that 2d and 3d platoons were moving along their designated axis.

At that moment, there was a sudden roar, and then the concussion of incoming artillery. He looked up in time to see the streak of antitank missiles; he watched both of the bounding Bravo vehicles take hits and explode. Missiles were also coming at him, but his vehicle defense system was faster than the enemy gunners: it launched smoke, chaff, and electronic countermeasures. As his helmet-mounted thermal goggles automatically came on, his driver was already moving back into the deep cover of the forest and out of the line of fire.

Now personally safe, the commander set to work to make sense of the situation using his vehicle commander's display, which was lit up like a Christmas tree. A quick review of status reports and a scan of his map and icons told him the bad news: 1st platoon had been cleverly ambushed by enemy forces camouflaged under thermal shrouds; his other two platoons, unable to move, were taking heavy fire from a combination of conventional and smart munitions. He was tired after ten hours of planning and execution, but now it was time to make the decisions and give the orders that would either save the situation or confirm the failure of his mission. Sweat and stress both showed on his face as he peered intently at his map looking for the answer to what was obviously a complex and vexing tactical problem.

So intent was the commander that he barely heard the chime ringing in his headphones indicating class was over for the day. He could log off the Advanced Course virtual reality training equipment and exit the tactical training matrix. After a moment's hesitation, he decided that his wife would understand if he stayed another hour: he just needed to issue a FRAGO and take out that enemy AT platoon.

The Army is just beginning to tap the power of virtual reality simulation. The exercise described here is an indication of the direction this type of training may take in the future. The key to getting there is establishing a vision of how to train for Force 21 now. This paper presents one view of how we may transform Advance Course students into the leaders of Force 21.

The focus of Force 21 officer training must be on creating leaders who are tactics experts. Future battles will be short, violent, and decisive. The defeat of a company or platoon may have national strategic consequences. There will no longer be latitude to allow leaders to learn "on the job." Institutional training will have to produce expert leaders who, in turn, can conduct unit training to achieve the standards required.

How will we train these experts? One adage holds that tacticians are grown, not trained. In other words, tactical ability is a function of hard-earned, expensive, and time-consuming field training and experience. Only the basics can be taught in the classroom. This view has always been substantially correct, borne out through hundreds of years of battlefield engagements. As we approach the end of the 20th Century, however, we know it is no longer entirely accurate; by the turn of the century it will be rendered totally erroneous. Technology, both current applications and those that are coming in the near future, will permit us to teach tactics to a degree of resolution undreamed of in the past. This will be accomplished primarily through simulation immersion in the Officer Advanced Course. It will surpass, in cumulative effect on the individual leader, the extraordinarily realistic field training now available at the Army's combined arms training centers.

Simulation immersion is the process of placing the individual student in a virtual reality matrix designed to assist him in learning and practicing specific tactical skills. This tactical training matrix (TTM) is very similar to the UCOFT gunnery matrix concept. Differences do exist, however: progress through the matrix is seamless; the skills on which the matrix focuses are cognitive, as opposed to mechanical; and the "immersion" is a daily event practiced over an extended period of time. The tactical matrix will be augmented by more conventional platform and small group instruction (accomplished using advanced automated techniques) and by specialized simulation designed to train special skills as a supplement to the tactical instruction.

As the "immersion" concept is implemented, however, other aspects of the advanced officer training curriculum will require adjustment. For example, some key skills required of military leaders do not lend themselves to instruction through simulation. At the Advanced Course level, these include personnel management, maintenance forms and records, introduction to other arms of service, and the Army writing program. These subjects are generally taught in a large-group platform instruction format. An inefficient instruction technique with relatively low learning value, this method monopolizes a disproportionate share of the student's resident course time training subjects that may contribute only peripherally to warfighting.

The most efficient way to teach these subjects as technology improves is through distributed training (DT). In the past, DT has been both ineffective from a learning point of view and difficult to manage and evaluate administratively. Current and near-future technology is changing this. Distributed training has the capability to become completely

automated, requiring only access to a base level of computer hardware. Though it will not be mandatory, in the near future virtually every commissioned officer will own at least a moderately powerful PC. The few who do not will have access to PCs through their unit or through public facilities such as libraries, education centers, and the local DOIM.

DT materials will be given to the student in the form of compressed floppy disks or, more likely, in CD-ROM format. Each CD will carry one or more classes, including practical exercises and tests. The classes will be multimedia presentations, employing graphics, text, animation, digitized voice, and video to present each subject. Lessons will be coded so that students must observe demonstrations and complete exercises before tests are open to them. Once the student takes a test, which will also make sophisticated use of the presentation media, he will transmit the answers using a modem to an electronic address at an administration center. All tests will be graded electronically and the results transmitted digitally back to the student. As with some current Army instruction, resident course attendance and promotions can be tied to DT completion. The DT package will probably be issued immediately, following the Officer Basic Course, with completion required before the officer attends the Advanced Course.

DT will not completely eliminate the need for some in-residence platform instruction, but it will significantly decrease the time devoted to it. Like DT, resident instruction will be almost completely automated and, therefore, will be in many ways far superior to the current system of a platform instructor armed only with a VGT. Further, automated instruction (resident and DT) will include on-line assistance, either by telephone from a TRADOC school instructor or, more likely, via modem through a DT bulletin board or an instructor's E-mail. Resident students, of course, can also get help directly from their assigned instructors.

Having used DT to complete a good deal of his education in important, but not essential, subjects, the company-grade officer will be ready for resident-phase education focused almost exclusively on warfighting. This will be accomplished by simulation immersion. Soon after arriving for resident advanced training, the officer will be introduced to the TTM. The matrix will contain dozens, if not hundreds, of tactical missions arranged and grouped according to mission type, difficulty, and unit size. Officers will be expected to start with simple company missions that stress tactical fundamentals before moving to more complex missions under extreme conditions. Eventually they will graduate to battalion- and then brigade-level missions.

The TTM will be designed as a continuous, seamless artificial reality. Beginning in the role of a new company commander, the student will receive missions, conduct planning and preparation, issue orders, and then execute the required operations. At the conclusion of each mission, he will take part in an after-action review (AAR). If the student demonstrates proficiency in the tasks tested by the mission, his next assignment will take him to a new level of the matrix, with a comparable increase in complexity. If the mission is less than successful, he will receive additional training and then execute the same mission requirements again in a different situation. This sequence will be repeated as necessary until the student masters the learning goals of the mission.

To the student, transition through the matrix will be seamless, with each new missions, logically related to the previous one. Advancement, occurring when the student has demonstrated mastery of the required skills at each level, will be disguised in a number of ways. Portions of the matrix will not be more difficult, merely different, and early learning-type missions may be run again later in the matrix to reinforce training objectives. Through role playing, the student will undergo attachment to other units and reassignment to new duty positions. These actions will not only provide a logical way to transition between missions and situations, but also will reinforce the consistency of the virtual world. The objective is to simulate an experience analogous to that of a World War II officer who lands at Normandy as an inexperienced company commander and, by April 1945, ends the war as a very experienced battalion commander.

Given the goals of the TTM, software and hardware design will be critical. It must accomplish several complementary tasks: create a realistic warfighting environment, permit the student to interface with the environment in a realistic manner, allow instructors to monitor the student's achievement of learning objectives, and facilitate through realistic AARs.

The warfighting environment will require effective automated forces, controlled by a sophisticated artificial intelligence (AI), that can perform all missions and related tasks as directed by the student. The AI must also produce realistic, flexible enemy forces of various sizes and at various levels of intensity and competence, and it must be able to simulate a variety of terrain and weather conditions. Finally, the environment must provide other realistic details such as subordinate personalities (including images and voices) and important maintenance and administrative tasks to make the environment more believable.

The interface with students needs to be simple, yet realistic, and capable of imparting all the information needed during the training. Hardware will include a modified CVC helmet for sound effects and receiving oral orders and reports, an integrated microphone for passing voice instructions and orders, a computer screen display to provide a first-person point of view for the purpose of situational awareness and reconnaissance, and either an actual commander's display unit or screen replica of the display. This interface will replicate the actual C^2 software of the vehicle and, supplemented by the digitized voice and video inputs of key leaders, will allow the student to fight the battle in essentially the same way he would in real life. Most important, the tactical decisions he makes will be based on the same stimuli (voice reports, digitized information, first-person view) that will influence him in battle.

Scenario design will be another key to the learning experience. The scenarios must go beyond the fundamentals of tactics. They must force the student to view tactics in an analytical manner and teach him how to make sound tactical decisions. Designers will have to pay special attention to both the scenarios and the accompanying instruction to avoid "school solutions" at the expense of the analytical process.

Each scenario will be designed and developed to make the student think. "Winning" as a concept will be irrelevant, bearing little relationship to the student's progress through the matrix. Rather, planning and judgment will be the mark of success. Some matrix scenarios will be structured so the mission is likely to fail; in these cases, the

learning objectives will be keyed to the student's performance in analyzing the adverse conditions that led to mission failure. The cumulative goal of the matrix is to employ realism and repetition to make sound tactical analysis and imaginative decision-making each student's unconscious, automatic reaction to battlefield stimuli. This will ensure not only that every leader can make good decisions, but also that he can keep pace with the information flow and tempo of the Force 21 environment.

Although the tactical matrix will be the centerpiece of the Officer Advanced Course, two other types of instruction will supplement and complement the tactical matrix: small group tactical instruction and specialized simulation.

The small group sessions will be somewhat similar to current conventional small group instruction but will focus on an exchange of ideas based largely on the student's matrix experiences. Students will periodically get together in small groups to discuss a variety of tactical problems, techniques, and solutions with an instructor. The goal of these discussions will be to allow the students to benefit from the analysis and experience of their peers. It will also force each individual to reflect upon and analyze his own tactical experiences, thus reinforcing the concept of a student-centered learning environment emphasizing individualized instruction and student responsibility.

Specialized simulations will be used to teach the student additional skills that he may require when executing the advanced portions of the matrix. These skills include fire planning, employing fire support assets, piloting remote reconnaissance platforms, coordinating with close air support, and performing specialized staff functions. For example, rather than telling a student how a logistics officer does his job, the simulation will assign the duties of a battalion logistics officer to the student and require him to plan and support a battle. Specialized simulation will also include larger, more conventional tactical simulators similar to the close combat tactical trainer (CCTT). Scenarios in these simulators will give the student additional practice on his tactical skills and introduce such concepts as leadership, "the fog of war," and the coordination challenges caused by large numbers of human players. CCTT simulators can also be networked to include a wide variety of branches, services, and other nations so that the student gains an understanding of joint and unified operations.

Most of the technology described here (graphics, tactically smart artificial intelligence, instructional software, digitized voice and video, and voice recognition) is currently available. What is required, then, is a concerted effort to harness the technology and shape it to meet the training needs of Force 21. This effort must begin soon and be maintained parallel to the doctrinal and organizational reshaping of the Army. The goal must be that when Force 21 is a reality, leaders will already be trained to maximize its effectiveness.

In the short term, much can be done to increase the use of simulation in company officer training. Currently, SIMNET, ARTBASS and JANUS simulators are being used to the maximum extent possible. Designed as unit trainers, they are very expensive to operate. Although they provide good training, the training is of limited duration, and cannot always be specifically tailored to what is happening in the classroom. What is needed is a simulation that can be operated in the small group class room, that provides an accurate representation of tactical operations at brigade and below, that is inexpensive, that is available every day of the course, and that can be programmed and modified by the instructor to meet the individual learning requirements of his students.

Commercial computer war games can do almost all of this and more now. These games offer a range of readily available capabilities: accurate unit modeling of U.S. forces at brigade level and below, combined with very capable enemy AI; quick scenario-building and customizing; accurate weather, morale, supply, and terrain effects; digitized 1:50,000 DMA map graphics combined with unit symbols and graphics; replay capability; and modem and networking capability. Integrating this technology fully into leader training will represent the first small step toward the simulation immersion required to create expert tacticians.

One of the central requirements of simulation immersion is a system that is simple, cost-effective, and versatile. Once such a system is designed, it will have applications well beyond officer advanced training. For example, software package could be used as part of distributed training to help officers who are serving in assignments away from troops in maintaining their tactical proficiency and professional currency. The software would also have obvious advantages in courses other than the Advanced Courses (Basic Course, ANCOC, CGSC) and could be adapted as a home station trainer for small units. With some modifications, a company or battalion commander could use the system to interface directly with the actual C^2 software of their vehicles and conduct unit CPXs. Finally, the simulation software could be used during actual operations to test COAs, wargame, and rehearse plans in the field.

The goal of the Force 21 Advance Course will be to produce a company-grade officer who is an expert tactician, capable of intuitively seeing and analyzing the battlefield, after only five months of resident training. These intuitive skills must be trained prior to the officer taking command of his unit if he is to have any hope of managing the information and operations tempo of the Force 21 battlefield. This will be possible only through rigorous immersion in tactical simulation. The technology used in institutional training will also have applicability in the field for small unit training. Simulation immersion training has the potential of not only producing expert leaders, but also expert units with the skills and capabilities they need to face the awesome challenges of the Force 21 battlefield.

Major Louis A. DiMarco was commissioned in Armor in 1981 from the U.S. Military Academy. A graduate of Airborne School, AOBC, BMOC, and the Infantry Officer Advanced Course, he is currently attending the Command and General Staff College at Fort Leavenworth. He served as a cavalry platoon leader, troop XO, and assistant S3, 1-1 Cavalry, 1AD, Germany; as squadron S1 and troop commander, 2-1 Cavalry, 2d AD, Fort Hood, Texas; and most recently as Cavalry Leader Course instructor, OIC Scout Platoon Leader Course, and Chief, Platoon Doctrine, U.S. Army Armor School, Fort Knox.