THE ARMOR CAPTAINS CAREER COURSE:
THE ART AND SCIENCE OF MOUNTED WARFARE VIA THE INTERNET

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Abstract

Training the art and science of mounted warfare to its soldiers presents significant challenges for today's Army in an environment of constrained resources, expanding missions, and unit reorganizations. The traditional "best practice" for this learning is a multi-month resident program of instruction, with an alternative correspondence program for those unable to attend resident courses. Understandably, correspondence programs cannot offer the same depth of learning in the "art" of mounted operations as resident courses because the interaction of small group instruction and peer collaboration cannot be duplicated. For various reasons, correspondence courses are often the only viable option for most Reserve Component soldiers, giving them little opportunity to fully develop the range of complex abilities demanded by mounted operations. To address this dilemma the U.S. Army Armor School at Fort Knox, Kentucky, has established a dynamic, innovative program to deliver both the art and science of mounted warfare to a diverse, sophisticated, and widely dispersed student population using learning technologies. The Armor School applied lessons learned from operational tests of various distributed learning methods to create a student-centric, open learning environment that provides a model for future military distributed learning courses addressing similar content. This paper describes the conception, development, implementation, and evaluation of the *Armor Captains Career Course*, used to qualify Reserve Component officers to command and serve in the mounted arms.

Authors' Biographical Sketch

Mr. David E. Robinson is a Senior Analyst and the Deputy Director of Education Technologies and Training for A B Technologies, Inc., at the corporate headquarters in Alexandria, Virginia. An armor officer and veteran of the Persian Gulf War, Mr. Robinson joined A B Technologies in October 1996 upon retirement from the U.S. Army with the rank of lieutenant colonel. During his Army career, he served three tours of duty with armored cavalry regiments, and he designed, developed, delivered, and evaluated over a dozen functional and professional military education courses for officers and noncommissioned officers. Since joining A B Technologies, Mr. Robinson has led several educational and training projects, and he is currently engaged in converting Armor School lessons to various distributed learning formats and creating a combination DL/EPSS "Recruiter Support Initiative" for the U.S. Army Recruiting Command. He holds a Bachelors of Science in Management Science from Florida Institute of Technology, a Master of Arts in Human Resources Development from Webster University, and a diploma from the U.S. Marine Corps Command and Staff College.

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BACKGROUND

Several years ago the United States Army Armor School (USAARMS) at Fort Knox, Kentucky embarked on an ambitious program to use learning technologies to more effectively and efficiently provide its professional development courses to a broader audience, primarily officers within the Army National Guard (ARNG). Beginning in November 1996, the Armor School began a series of operational tests of distributed learning to assess which techniques and technologies are most appropriate for their various learning audiences. The Armor School used the experience they derived from these tests to create a distributed learning version of the Armor Captains Career Course (ACCC), called the ACCC-DL. This course provides all the content of the resident ACCC to Reserve Component armor officers whom otherwise would be unable to attend required schooling at Fort Knox.

For those familiar with the Armor Officers Advanced Course (AOAC), the Army changed the course's title to the ACCC to reflect revision of its curriculum and the inclusion of material from other professional development courses that captains have received later in their careers.

ARMOR CAPTAINS CAREER COURSE

The ACCC prepares junior officers, typically Army armor captains with 4 to 5 years' experience, for command of company-level units and assignment to staff positions at the battalion and brigade level (see Figure 1). Also, successful completion of the course is one of several prerequisites for company command, promotion to major, and attendance at higher-level professional and functional development courses. Active Component (AC) officers attend an 18-week long resident ACCC at Fort Knox. For Reserve Component (RC) officers, the existing alternatives were attendance at the resident course or enrollment in a 2-year
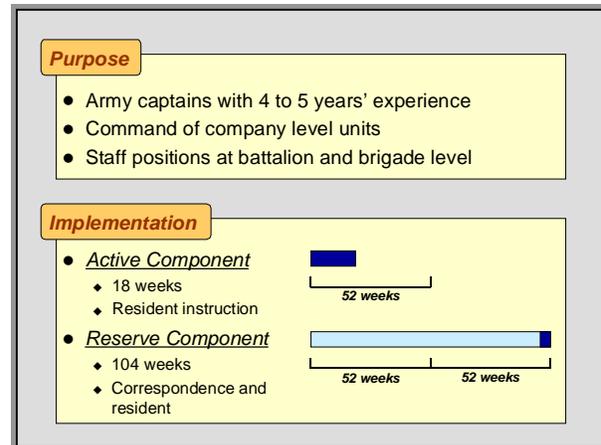

Figure 1. Armor Captains Career Course

correspondence course followed by a 2-week resident phase at Fort Knox. Very few RC officers attended the resident ACCC because their non-Army commitments, and low number of available vacancies, frequently precluded such a choice. With these circumstances, the majority of RC officers attained course certification through the correspondence option.

The Art and Science of Mounted Warfare

The ACCC's curriculum addresses the skills and knowledge needed to successfully plan, lead, and direct mounted combat operations. Most of the curriculum focuses on the "science" of these operations: unit and equipment capabilities, limitations, and planning factors; staff procedures; the military decision making process; command and control considerations; orders formats; intelligence preparation of the battlefield; etc. But woven throughout the course is instruction in the "art" of mounted warfare: development of the intuitive faculties that enable officers to integrate the various factual aspects of mounted operations in such a fashion as to create unique solutions for various tactical situations. Derived from a

synthesis of knowledge and experience, the blend of art and science is what enables graduates of the course to effectively perform their duties in combat units.

Although the instructional material within the resident and correspondence versions of the ACCC was virtually identical, the quality of the learning experience certainly was not. Resident students enjoyed the benefits of small group instruction, collaboration with their peers in practical exercises, role-plays, and continuous interaction with their instructors over a period of 18-weeks dedicated to the learning experience. The key to this experience has been the Small Group Instructor (SGI); a seasoned junior officer with experience as a company commander and as a battalion/brigade staff officer. The SGI coaches the relatively inexperienced student officers in the abilities needed to "see the battlefield," an essential component of successful combat leadership. With groups of 12 to 16 students, each SGI presents instruction and facilitates learning using experiential exercises and directed studies.

In contrast, correspondence students had few, if any, opportunities to work with their peers, and very little interaction with instructors at Fort Knox or elsewhere during 102-weeks of nonresident studies. Further, when they arrived for their 2-weeks of resident instruction at the end of their correspondence phase, many students found themselves inadequately prepared to effectively participate in a collaborative, performance-based learning environment.

Stimulus for Distributed Learning

During the Cold War and in today's national security environment, resident and non-resident graduates of the ACCC could find themselves called upon to apply their abilities in identical circumstances with little time for additional preparation. With this imperative the Armor School wanted to break the mold of traditional approaches to training and offer non-resident students a learning experience that came closer to approximating the rigorous, enriching, and highly successful resident course. To attain this goal within available resources, the leadership at USAARMS chose to create a distributed version of the ACCC, employing learning technologies that are appropriate for the content, the audience, and the available systems. Following is a discussion of the major factors that influenced their decision, and continue to influence the present and future situation.

Force Structure To conserve resources, the Army reduced the number of Active Army armor units. Yet, to retain sufficient numbers of armor units in the total force structure, Army National Guard (ARNG) units from other combat arms (e.g., infantry) were reorganized into armor battalions. This increased the need to provide high-quality ACCC instruction to ARNG officers.

Evolving Missions With each additional domestic and international crisis, Active Army and ARNG units are asked to perform a greater variety of missions due to the continuously changing world situation (e.g., peacekeeping, urban warfare, humanitarian relief, disaster relief, etc.). Traditional modes of instruction are neither dynamic nor flexible enough to rapidly change their curriculum to reflect the demands of "just-in-time-training" or mission preparation that these situations demand. Further, traditional courses do not offer sufficiently diverse channels of delivery to enable rapid access to critical learning for a distributed audience.

Diminished Resources The costs associated with moving ARNG students to Fort Knox and paying them for 18-weeks of resident instruction are substantial. With other priorities competing for limited funds, many National Guard units cannot afford to provide a few selected officers with the resident experience at the expense of alternative requirements. Other ways had to be found to provide the ARNG officers with economically viable quality instruction.

Available Technologies The rapid proliferation of personal computers (PCs), the continuing improvement in their capabilities, and expanded options for interconnectivity presents new conduits to deliver training. Pervasive and affordable, PCs have been used for almost two decades to deliver stand-alone training products; first by floppy disk, then CD-ROM, and now DVD. The advent of increasingly inexpensive and faster Internet connectivity–coupled with improvements in Web-based animation, streamed audio and video, and online virtual environments–expands the delivery options even further. Especially noteworthy is the capability of Web-based programs to be distributed from several locations while being simultaneously administered from one location.

Now, centrally located (or widely dispersed) instructors can manage course content and track student progress. Further, students and instructors can now communicate and collaborate with one another via a common platform. This is the essence of the Fort Knox solution, the development and implementation of which is discussed later.

OPERATIONAL TESTS

Before Fort Knox committed their training resources to creation of an online ACCC, they wanted to gain first-hand experience in the technologies, techniques, and procedures necessary to convert existing resident and non-resident materials to a distributed learning format. To explore options and develop a cost-effective course of action, USAARMS conducted 3 operational tests of various DL presentation and distribution methods from November 1996 to early 1998 (see Figure 2). Also, beginning early in 1998 to prepare for creation of the ACCC, USAARMS converted the AOAC to Total Army Training System (TATS) standards. Following is a brief description of these tests and a subsequent discussion of the TATS process.
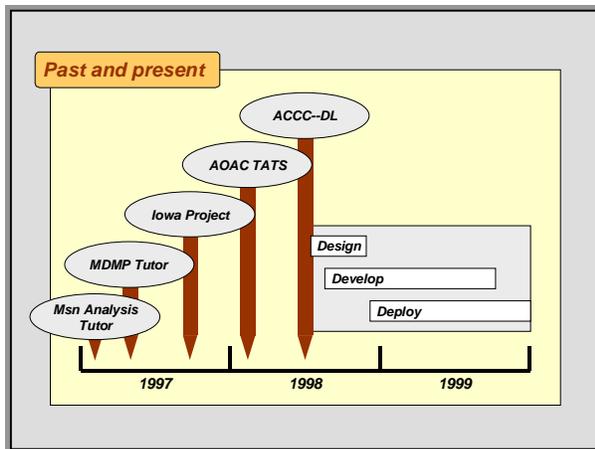

Figure 2. DL tests and projects at Fort Knox

Mission Analysis Tutorial

Fort Knox's first test of DL methods was the creation of a CD-ROM tutorial that covered the multi-step mission analysis process at the battalion level. The CD-ROM represented a purely asynchronous method of instruction, and the results of its creation and testing between November 1996 and June 1997 convinced USAARMS that student interaction with an SGI was essential to the learning process for this material.

Military Decision Making Process Tutor

Nearly concurrent with the Mission Analysis Tutorial, USAARMS tested a hybrid CD-ROM and Internet-based method of instruction on the complex and lengthy Military Decision Making Process (MDMP). Development began in late 1996, testing began in mid-1997, and refinements continued into mid-1998. Instructors distributed the CD-ROM to students, who then loaded the MDMP Tutor software onto their PCs. With a custom embedded application called *Map Edit*, students could create diagrammatic courses of action on a digitized map and exchange these files with the instructor and their fellow students via file transfer protocol (FTP) over the Internet. The instructor could then annotate the diagram with additional graphics and text, send his comments back to the student for further study and work, and circulate examples of the best solutions among all the students. The MDMP Tutor successfully demonstrated Fort Knox's "instructor in the loop" concept and it afforded a tantalizing glimpse of the effectiveness of collaboration via distributed learning technologies.

The Iowa Project

In mid-1997, USAARMS decided to conduct an ambitious test of blended DL presentation and distribution methods. They developed an 8-week mini-course for a small group of students, requiring them to produce a course of action statement and sketch for a mounted brigade attack. The project's students were volunteer officers and an NCO from the Iowa Army National Guard and an Active Component instructor from the U.S. Army's Combined Arms and Services Staff School (CAS3) at Fort Leavenworth, Kansas. To acknowledge their participation and the assistance provided by the state of Iowa, USAARMS called this effort the *Iowa Project.* Work began on the course in August 1997, the students "attended" class from mid-October to early-December, and the final report was delivered in January 1998. The Iowa Project included the Mission Analysis Tutorial, the MDMP Tutor, custom designed asynchronous interactive Web-based instruction, synchronous Internet-based instruction, and videoteletraining.

The Decision to Proceed

The results of the Iowa Project, and the experience gained from the other tests, convinced USAARMS to proceed with creation of the ACCC-DL using blended presentation and distribution methods. To implement the program, USAARMS created a team of government and contract personnel in mid-1998. Following is a list of participants and their roles in the on-going effort.

USAARMS provides funds, facilities, content, instructors and subject mater experts (SMEs), training developers, and information technology (IT) support.

A B Technologies, Inc. performs the role of learning systems integrator, creates course design and lessons, and directs day-to-day operations.

IBS Interactive, Inc. provides listserv administration, Web site development and design, IT integration, IT support, *Athena* software, and WBT software development.

blaxxun interactive provides the Virtual Tactical Operations Center (VTOC).

Global Information Systems Technology, Inc. provides the MDMP Tutor, related IT support, and contract administration.

Under USAARMS direction, the development team applied the Army's Systems Approach to Training process to create the course. The next five sections provide a description of this implementation.

ANALYSIS

Application of TATS

The Total Army Training System (TATS) is an Army-wide program designed to implement common standards for all training tasks performed throughout the United States Army (Active Army, Army Reserve, and Army National Guard). Developers at the Armor School began converting resident AOAC lessons in early 1998 using the TATS process; revising the content, instructional methods, and presentation media. The application of TATS to an existing course of instruction provided task and learning analysis, and it created a common baseline of training support packages

for the new ACCC in its resident and distributed learning formats.

DESIGN

Design Considerations

USAARMS established design criteria for the course's Web-based training (WBT) functionality and levels of interactivity, and they established the philosophy for the learning environment; to focus all materials and events on the learner by presenting instruction that offers conditional navigation and stimuli for all receptor preferences (i.e., sight, sound, and text). Learning is iterative throughout all phases of instruction by presenting the same tasks several times at increasingly sophisticated levels of cognition. This provides the learner with sequential development of complex skills, and presents just enough new knowledge at each step to enable accomplishment of the new task while reinforcing previous learning.

Although much of the course's instruction is delivered via WBT, the SGI is intrinsic to the design. Special software developed by IBS Interactive, called *Athena*, provides courseware management and administration in real time. Athena performs automatic grading and "gate" opening for students, while simultaneously allowing instructors to obtain status and performance reports, intervene manually if necessary, and change the course content to reflect new doctrine or mend unclear portions of instruction. Athena also produces data output compatible with selected, existing Army student management systems (e.g., Army Training Requirements and Resources System and Automated Instructional Management System-Redesign).

Creation of the Design Document

From June to August 1998, the development team worked on a design document that would describe the course's structure and content, and provide the developers with a map to guide their efforts. The ARNG had to retain the 2-year instructional model for their officers, so USAARMS chose to work within that timeframe to create a course that

would embody the design considerations while employing the selected learning technologies.

The development team began by verifying the competencies required of ACCC graduates in their duty positions with tactical units, and using these as the endstate of the course's instruction. With the competencies firmly established, the team determined the required abilities, and then the supporting tasks, that would establish the course's learning objectives.

With the competencies, abilities, and tasks identified, the development team designed a two-phased course based on the resident ACCC's curriculum (see Figure 3).
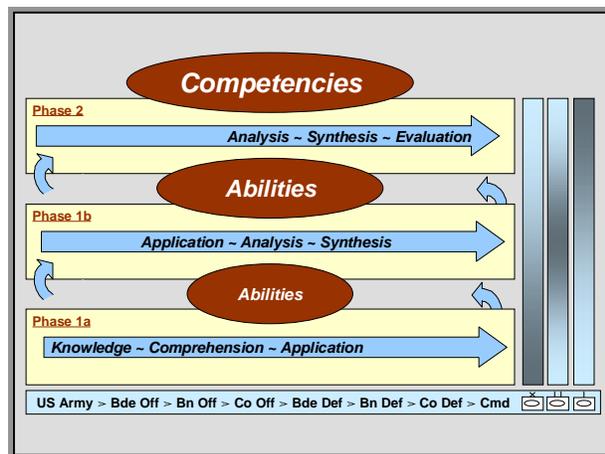

Figure 3. ACCC-DL Design Concept

Students begin the course in Phase 1a and proceed "horizontally" through each phase, completing lessons that cover the topics shown in the figure's bottom-most bar. The shaded vertical bars on the figure's right-hand side show the emphasis applied in each phase of the course in relation to the Army's tactical units, portrayed by their respective operational graphic symbol below each bar: Phase 1a emphasizes brigade-level operations, Phase 1b emphasizes the battalion-task force, and Phase 2 emphasizes the company-team.

Phase 1a. Students start with 52 weeks of asynchronous WBT (approximately 240 hours of instruction) and develop abilities in brigade, battalion, and company level offensive and defensive operations at the cognitive levels shown in Figure 3's horizontal arrow (per Bloom, et al 1956, "Taxonomy of Educational Objectives").

Phase 1b. This phase lasts for 50 weeks. It is composed of 60 hours of asynchronous WBT and 10 weekend drills (comprising 2 videoteletraining sessions and 8 synchronous Internet-based sessions in a virtual Tactical Operations Center). Through reiteration of the earlier material at higher levels of cognition and application, the students increase their abilities in the topic areas that were previously learned in Phase 1a.

Phase 2. For the final phase, students travel to Fort Knox for 2 weeks of intense, execution-focused training using the Army's suite of mounted simulations and several exercises without troops on the terrain in northern Kentucky.

DEVELOPMENT

Development Environment

The development group is composed of several teams, with the group headquarters and most teams located at the Armor School consisting of Government representatives (SMEs, beta testers, instructional designers and technologists, and contract administrators) and contractor support. The contract group leader is located at Fort Knox, as are the bulk of contract training developers (approximately 12 people from A B Technologies) and 3 learning system programmers from IBS Interactive). Additional programmers from IBS Interactive work on the project from their office in Huntsville, Alabama, and additional training developers from A B Technologies work on the project from Alexandria, Virginia. The company that is developing the Virtual TOC, blaxxun interactive (their name uses lower case letters throughout the title), works out of offices in San Francisco, California and their headquarters in Germany.

All work originates and is managed from the Fort Knox facilities, and the Armor School conducts periodic reviews of the course's progress. Contract group members travel from their home offices to Fort Knox on a routine basis to discuss evolving styles, new student interactions, and the latest software enhancements.

The training developers are organized into small production teams of 3 to 5 people centered on an instructional designer who understands adult learning principles and, more specifically, how military officers learn their trade. Each team is

also supported by a contractor SME (usually a retired soldier) whose presence allows the Armor School's SMEs to provide overarching direction and quality control. Centrally located technical editors and graphic artists are intrinsic to establishing the look and feel of the materials, as they are produced by different production teams. Daily review by the Armor School's SME ensures that instructional materials are correctly produced and meet high quality standards.

The most important factor in the success of this effort is the problem solving nature of the production teams. Limited by the selected learning technologies and the client design specifications, the team developed innovative ways to help students interact with the instructional materials.

Development Process

Using the training support packages produced during the TATS conversion of AOAC, developers create outlines and flowcharts for the ACCC-DL lessons. Developers then create individual Web pages that comprise the lessons, using Microsoft's FrontPage software for layout and composition.

If developers choose to employ student activities, interactions, or animations in a lesson, they can select from a suite of these objects devised earlier or they can request creation of a new object (which gets added to the suite for future reuse). The team's graphic artist/animator uses the developers' specifications to create illustrations and animations using Macromedia's Flash or Shockwave.

After the pages and animations are combined, the files are given to IBS Interactive for programming that establishes the relationships and dependencies between the pages, using the developers' flowcharts as a guide. Once all files are ready and the programming is complete, they are "hung" on a beta server for the Government's review and testing. After the Government's approval, the lessons are moved to the Armor School's Digital Training Access Server (DTAC) for student and instructor access.

IMPLEMENTATION

The Armor School began the ACCC-DL course with a pilot test beginning November 1, 1998, which included 66 National Guard officers from selected units in Pennsylvania, Texas, and California. The student population represented the full range of computer literacy, educational backgrounds, and military experience. Later in the pilot course, selected Active Component Marine Corps and Army officers began the instruction.

Instructors at Fort Knox review student progress and communicate regularly via e-mail with their virtual small groups. Also via e-mail, the Armor School sends the students' chains of command periodic reports on their performance and progress. The same staff that manages the resident ACCC performs course administration, and additional resident instructors remain on-call to assist the ACCC-DL staff, if needed.

EVALUATION

Current evaluation is limited to measurements of changes in student performance and their reaction to the methods and media. The Armor School will complete a full evaluation of the ACCC-DL when the first class graduates in early-2001.

Students routinely demonstrate an improvement of 10% to 40% on tests after completing the online instruction, providing validation of the selected instructional and presentation methods for this material so far. When they arrive for their resident phase (after the synchronous DL phase), the students will be required to demonstrate their abilities in conditions approximating the field environment. At that time, USAARMS will have a full picture of the students' true ability to perform in relation to their resident peers.

The development team has modified some existing and future DL instruction based on student comments and performance on the course's tests. Students confirmed the role of the SGI and the value of mentorship in this course that emphasizes cognitive material.

CONCLUSIONS

Because of their experience with the ACCC and other efforts, the Armor School has identified the following issues and observations regarding DL.

Cost Effectiveness versus Learning Effectiveness

Issue. Not all courses lend themselves to total DL conversion and complete abandonment of resident instruction.

Discussion. The intended audience and the course content determine the resulting design. For students to effectively learn higher-level cognitive skills (e.g., leadership and tactical problem solving) in a distributed learning environment requires a blended approach that applies the strengths of each instructional mode to the content for which they are best suited. These approaches would include face-to-face instruction for curricular elements that address the "art" of relevant competencies (e.g., those best taught through behavior modeling and group roleplays) and asynchronous learning technologies for elements that address the "science" (e.g., factual and procedural information). Also, actual "walking the ground" in a field environment is essential to grasp the subtleties of terrain appreciation and climatological effects on tactical operations; topics that require experiential learning for full comprehension.

Observation. Not all DL conversions will result in cost savings in instructors or time. However, efficiencies can be gained by using learning technologies to prepare students before face-to-face instruction and for sustainment learning afterwards.

Instructor Involvement

Issue. Some students require external motivation to complete course elements on schedule, and all students benefit from dialog with instructors.

Discussion. Having an instructor "in the loop" helps to motivate students: knowing that someone is monitoring their progress keeps them alert and responsive. Several times during the ACCC-DL, instructors identified lagging students. If students did not respond to the instructor's comments, the situation was brought to the attention of the students' supervisors via e-mail (with a courtesy copy to the student). In almost all cases, students responded within 72-hours and brought themselves back on schedule. For those students that experienced difficulties with some concepts, having an instructor directly respond to their questions and comments helped them to grasp the material and enrich their learning experience.

Observation. Online instructors, responding synchronously or asynchronously, are essential for effective learning with the ACCC-DL curriculum.

Course Design Requires a Holistic Approach

Issue. Creating a blended course for higher-level cognitive competencies requires an overall course design.

Discussion. The strategy of analyzing and designing courses task by task–and individually determining instructional, presentation, and delivery methods for each lesson–does not work for curricula similar to the ACCC's. An overall course design, with the end-state identified for the target population, must be developed first. Identification of the levels of learning within each task and ability must be accomplished before deciding whether all or part of a task can be taught through DL exclusively.

Observation. The traditional SAT approach of defining end-states and creating test plans early in the course development effort works well with blended courses. This technique helps to identify which content is best suited to the various instructional methods, and it contributes to the course's sense of continuity.

Final Observations

Using the computer to deliver the science of mounted warfare, and instructors to convey and evaluate the art, has proved an effective mix for the Armor School. This approach has played to the strengths of each medium while offsetting their inherent weaknesses. Using the Internet as a distribution method allows flexible, responsive, and robust communication between students and instructors while simultaneously providing a reliable platform for delivery of automated instruction.

The Armor School is now exploring how they can best leverage their investment in the ACCC-DL material, because much of the content has relevance to other courses they teach at Fort Knox. They have established dialog with the U.S. Army Military Intelligence Center at Fort Huachuca, Arizona, and the U.S. Army Combined Arms Center at Fort Leavenworth, Kansas, to

share their experience and, eventually, the materials developed for the ACCC-DL.

The Armor School's ACCC-DL initiative has set the stage for the next phase in their deployment of advanced distributed learning: embedding online constructive and virtual simulations and gaming features to augment existing practical exercises. This development will improve the fidelity and effectiveness of online learning for future mounted warriors, and offer opportunities for enhanced readiness of U.S. armored forces into the next century.