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Developing A Blended Learning Approach For Army Leader Planning

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14. ABSTRACT *(Maximum 200 words)*:
The objective of this research project was to develop a blended learning module that facilitates the integration of component knowledge into higher order leader concepts and skills. As the Army is transitioning many of its institutional courses to a blended learning curriculum, the Training and Doctrine Command (TRADOC) has called for ARI to demonstrate blended learning approaches in the development of course material. Thus, training content was identified within the Aviation Captains Career Course (AVC3) that would benefit from the use of blended learning techniques to further the acquisition of skills and knowledge. Specifically, the Tactical Decision Exercise (TDE)-Builder tool was developed to foster military planning skills with a particular focus on the topic of intelligence preparation of the battlefield (IPB). As there is limited time available in the course to ensure that the knowledge is acquired by all students, the tool provides students with the opportunity to practice conducting the IPB exercise at their own pace with the goal of reinforcing the knowledge and skills acquired during the course. The final tool and supporting documentation was transitioned to AVC3 instructors/trainers for use as a blended learning approach for the course. The software runs a stand-alone application that does not require administrative rights and does not require server or Internet access. This report documents the process that was used to develop the tool and provides an overview of how to employ the tool. The software is enclosed in this report and also can be obtained by contacting the U.S. Army Research Institute for the Behavioral & Social Sciences at the above address.

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DEVELOPING A BLENDED LEARNING APPROACH FOR ARMY LEADER PLANNING

CONTENTS

CONTENTS (continued)

DEVELOPING A BLENDED LEARNING APPROACH FOR ARMY LEADER PLANNING

Introduction

Purpose of Present Research

As the Army is transitioning many of its institutional courses to a blended learning curriculum, the Training and Doctrine Command (TRADOC) has called for ARI to demonstrate blended learning approaches in the development of course material. Blended learning instructional approaches are defined as those which combine different training media (technologies, activities, types of events) to create an optimum training program for a specific audience (Bersin, 2004). This project, conducted as part of ARI's workprogram, focused on investigating effective ways of incorporating technology and learning science and blended learning methodologies into classroom-based instruction. Specifically, training content was identified within an institutional course, the Aviation Captains Career Course (AVC3), as being a good candidate for using blended learning techniques. Strategies for furthering the acquisition of military planning skills using technology were identified as critical training needs by the Commander and Small Group Instructors (SGIs) of the AVC3.

Additionally, as one problem with current blended learning approaches is the inability to modify existing technology to adapt to changes in the curriculum, a goal of the present research was to develop a blended learning software tool that could be easily changed by Army instructors. At the Science of Learning Workshop hosted by ARI, General William S. Wallace, Commanding General, TRADOC, discussed a transformation that is occurring between the Institutional and Operational Army (see Quinkert, Morrison, Fletcher, Moses, & Roberts, 2007; Wallace, 2006).[1] A dynamic model has evolved such that training and doctrine are improved by applying lessons learned from the Operating Force. As such, TRADOC, as the Generating Force, is responsible for training leaders and Soldiers to perform in the current environment as well as identifying the training gaps to respond effectively to future threats. Thus, Army training developers and instructors need instructional technologies that can easily be modified so that student exercises can be updated as needed to leverage the lessons learned.

Finally, as subject matter expert (SME) feedback is a critical aspect in the development of blended learning technologies, another goal of this research project was to not only develop a prototype blended learning tool but to also report on the process that was used to develop the technology. The AVC3 has a need for supplemental training for military planning, especially in relation to the intelligence preparation of the battlefield (IPB) aspect of the planning process. As there is limited time available in the course to ensure that the knowledge is acquired by all students, the supplemental training will provide students with the opportunity to review the material at their own pace with the goal of reinforcing the knowledge and skills acquired during the course. To achieve this objective, the technology had to meet certain requirements which were established through a spiral development process with the contractor, government contracting officer representative, the AVC3 Commander, AVC3 SGIs, and AVC3 students.

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[1]The information contained in this paragraph and the following paragraph is summarized from the Quinkert et al. (2006) and Wallace (2006) reports.

Captains Career Course Instruction

    Original concept of the blended learning approach. Goals of the Captains Career Courses (Company-grade Army leadership courses) are to (1) further develop Army leaders' cognitive skills related to decision-making and solving complex problems in their specialty areas and (2) prepare Army leaders to command and train at the company, battery or troop level and to serve as staff officers at the battalion and brigade levels. For Army leaders in Combat Arms Branches, one focus is on the integration of tactical knowledge and cognitive skills (see Leibrecht, Tucker, Haverty, Blankenbeckler, & Green, 2009). In particular, there is an emphasis on developing the knowledge and skills for military planning reflecting troop leading procedures at the company level and the military decision-making process (MDMP) at the battalion and brigade levels.

    One blended learning technology, Military Decision Making Process Scenario-based Training for Operational Readiness and Mission Effectiveness (MDMP STORME), was previously developed for company-grade Army officers as supplemental MDMP training and has been well-received by the Army training community.[2] The technology organizes training modules, images, videos, templates, smartbooks, and references related to the MDMP and is delivered either on the web or as a standalone application on a compact disc. The technology was developed with input from Army training developers and instructors who provided excellent examples of each step of the MDMP process via videos and who ensured the quality of the product's instructional content. Although the tool is an excellent resource for MDMP documents, it does not provide opportunities for students to practice using the material, which is the impetus for the current project. That is, there is a need for blended learning technologies that provide students with the opportunity to produce the outputs associated with the planning process and receive feedback from instructors on their work.

    In light of the strengths and limitations of using MDMP STORME as supplemental training for Army leaders, a research project was designed to develop a prototype training tool that would provide AVC3 instructors with the flexibility in developing different training scenarios (i.e., tactical decision exercises, TDEs) to hone military planning skills. In addition to the benefits for instructors of being able to more quickly change existing TDEs (vice recreating a set of paper/pencil documents and graphics) or more quickly develop new TDEs, the training tool also would greatly benefit students by providing additional time on task (i.e., more practice opportunities outside of the classroom). In fact, recent research, demonstrating higher performance levels for students who took all or part of their instruction online compared to those in traditional face-to-face instructional environments, suggested that the higher performance may be due in large part to instructors promoting more time on task throughout the courses, not the delivery medium per se (Means, Toyama, Murphy, Bakia, & Jones, 2009). These increased practice opportunities may be exceedingly important for National Guard and Reserve Soldiers who do not receive as much face-to-face training as Active Duty Soldiers throughout their AVC3.

    Moreover, research has shown that an instructional approach that affords students with more control over the learning process, constructivist instructional methods, has been found to have benefits on student outcomes over behavioral (demonstrating and sequencing of tasks) and cognitive (leveraging past experience and using organizing principles) methods, even for novices (for a review see Leibrecht, Goodwin, Wampler, & Dyer, 2007). In summary, the

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[2] Please contact the second author for additional details regarding this technology (Sidman@aptima.com).

blended learning approach adopted in this project reflects a constructivist approach in that it allows students to explore the instructional material on their own in the context of a realistic problem with minimal guidance from the instructor during the exercise. One additional benefit for students is that the tool would automate some of the more mundane aspects of creating military planning products (e.g., drawing symbols). This automation of mundane aspects allows for further improvement of time spent on the desired task—that is, the student will spend more time visualizing the battlefield, considering the interaction of friendly and enemy forces, and creating appropriate tactical actions during the practice exercise. The tool also may foster a more dynamic learning environment such that students can more easily change their plans upon discussing their ideas with the class.

Intelligence preparation of the battlefield (IPB). As one objective of the AVC3 is to further develop Aviation officers' military planning skills, the officers learn the specific knowledge and skills needed to perform the MDMP.

> *The military decision making process is a planning model that establishes procedures for analyzing a mission, developing, analyzing, and comparing courses of action against criteria of success and each other, selecting the optimum course of action, and producing a plan or order. The MDMP applies across the spectrum of conflict and range of military operations. Commanders with an assigned staff use the MDMP to organize their planning activities, share a common understanding of the mission and commander's intent, and develop effective plans and orders* (US Department of the Army, 2005, p. 3-1).

The MDMP consists of the following seven steps and each has its own set of steps, analyses, and decision points:

1) Receipt of mission,
2) Mission analysis,
3) Course of action (COA) development,
4) COA analysis (war game),
5) COA comparison,
6) COA approval, and
7) Orders production.

For the present research, the AVC3 leadership requested that the training tool provide supplemental training for the second step of the MDMP, mission analysis, and, in particular, focus on developing skills related to IPB.

> *Intelligence preparation of the battlefield/battlespace is a systematic process of analyzing and visualizing the portions of the mission variables of threat/adversary, terrain, weather, and civil considerations in a specific area of interest and for a specific mission. By applying intelligence preparation of the battlefield/battlespace, commanders gain the information necessary to selectively apply and maximize operational effectiveness at critical points in time and space* (US Department of the Army, 2009, p.1-1).

IPB consists of performing the following four steps (US Department of the Army, 2005, p. 3-17):

1) *Defining the battlefield environment*; identifying characteristics that influence friendly and threat operations - it helps determine the area of interest (AI);
2) *Describing the battlefield's effects*; evaluating the effects of terrain, weather, and some civil considerations in the area of operations (AO); identifies constraints on friendly COAs, avenues of approaches and engagement areas;
3) *Evaluating the threat;* analyzing intelligence to show how the threat operates when not constrained by the environment; and
4) *Determining threat courses of action (COAs);* determining all of the combat multipliers an enemy would use based on the results of the previous steps; identifying and evaluating all the courses of action available to the threat.

When each step of the IPB process is performed, specific outputs are produced. These products help commanders determine their mission, refine their situational understanding, and better visualize the operation (US Department of the Army, 2005; 2009). For the present research, one focus of the tool is to provide leaders with practice preparing products related to steps 2 and 4 above. For Step 2, *describing battlefield effects*, the tool was designed to provide leaders with practice opportunities for developing combined obstacle overlays (COOs) and modified combined obstacle overlays (MCOOs). To develop these products, leaders analyze the effects of terrain features (e.g., vegetation, road widths) on battlefield mobility (COO). Then, they evaluate the battlefield environment's effects on military operations (MCOO; e.g., mobility corridors, avenues of approach, key terrain, observation and fields of fire, cover and concealment).

For step 4, *determining threat COAs,* the tool was designed to provide practice opportunities for determining the threat's *most dangerous course of action (MDCOA)* and *most probable course of action (MPCOA)* which could significantly affect the mission. Thus, the tool provides the graphics for creating situation templates (SITEMPs) for each threat COA that is developed. SITEMPs "are COA overlays (graphics) which depict an enemy's initial force dispositions through to the enemy's likely objectives and desired endstate" (US Department of the Army, 2009, p. 2-50). As such, the SITEMP overlays are placed on top of the MCOO to analyze how the threat will fight not only based on doctrine but how they will be affected by terrain and weather throughout the battlefield. SITEMPs also can include time-phase lines to indicate the movement of forces and the expected flow of the operation (US Department of the Army, 2004); one benefit of the tool is the capability to easily create the threat COA at each time point.

A final product of Step 4, for which the tool affords practice, is an event template which "represents a sequential projection of events that relate to space and time on the battlefield and indicate the enemy's ability to adopt a particular course of action" (US Department of the Army, 2004, p. 1-75). The event template is a guide for intelligence synchronization and intelligence, surveillance, and reconnaissance (ISR) planning and depicts the named areas of interest (NAIs; areas where key events are expected to occur; US Department of the Army). The event template typically indicates the times each NAI is expected to occur ultimately, thus, the activity or inactivity will confirm or deny a COA (i.e., indicate which COA the threat will adopt; US Department of the Army, 2009). The combination of the NAIs, indicators, and time phase lines (TPLs; estimates depicting movement) associated with each threat COA form the basis of the event template.

Friendly COA development. In designing the tool for practicing the development of threat COAs, it became clear that the underlying architecture of the software could be modified easily to also support practice opportunities for developing friendly COAs. That is, following the

completion of the mission analysis step of the MDMP, leaders and staff officers conduct COA development for friendly forces to determine how to best achieve the mission given the commander's guidance and visualization of the array of forces and effects of the decisive operation and given the threat COAs (US Department of the Army, 2005). COAs are identified that can defeat all feasible enemy COAs and are feasible, acceptable, suitable, distinguishable, and complete (US Department of the Army, 2005). Similar to creating different threat SITEMPs, different COAs for friendly units can be developed using the tool; graphics for the decisive, shaping, and sustaining operations can be overlaid on each threat SITEMP. As with paper and pencil techniques, graphical control measures are used in the tool to coordinate the operation and show the relationship of friendly forces to one another, the enemy, and the terrain. Additionally, with the tool, the COAs for friendly units can be easily created for each phase of the mission shown in the threat SITEMP. Units that have been placed in one time phase are carried over to the next time phase where they can then be adjusted to reflect their updated position. Finally, the tool provides practice in developing the products of COA development – COA statement and sketch.

> *The COA statement clearly portrays how the unit will accomplish the mission and explains the concept of operations. It is written in terms of the battlefield organization and includes the mission and end state. The sketch provides a picture of the maneuver aspects of the concept of operations. Together, the statement and sketch cover the who (generic task organization), what (tasks), when, where, why (purpose), for each subordinate unit* (US Department of the Army, 2005, p. 3-37).

Spiral Development / Technology Requirements

Initial design concept and requirements (TDE-Builder Version 1). To ensure that the tool was designed and developed with the requisite capabilities for producing the IPB and COA development products for the AVC3, several design requirement meetings were held with the Commander and SGIs of the AVC3. During these meetings, the Commander and SGIs received a demonstration of the current version of the tool and had the opportunity to ask questions and provide input into the next version of the tool (i.e., a spiral development process). The SGIs also provided materials to aid in the development of the IPB exercise that was delivered with the final version of the tool. In this way, the TDE Builder developer ensured that the tool would meet the training needs of the AVC3.

For the initial meeting, a basic design concept was presented to the AVC3 such that the tool would help instructors develop scenario-based training via TDEs that could be used in class or assigned as homework. From experience working with Maneuver Captains Career Course (MC3) TDEs in prior projects, the initial design concept presented to the AVC3 was a map at the center of a computer screen bordered with pull down menus and comment boxes. The initial pull down menus consisted of a sample of enemy and friendly ground-unit icons. During the demonstration, the icons were placed on the map and resized to show the ease in which an array of forces could be created on the map. One of the pull down menus also had selections of different types of shading that could be displayed on the map in any shape configuration that was desired; this was shown as an effective way for depicting restricted terrain.

The Commander and Small Group Instructors of the AVC3 responded positively to the initial design concept, and the Commander provided feedback on how to build upon these basic capabilities to meet the needs of the students and instructors. Specifically, the Commander requested that the tool be developed to promote practice opportunities for the IPB practical exercise. As such, the following design requirements and capabilities were suggested:

- Background information for the scenario as a separate page before students access the map page;
- Overlay layers of graphics: COO + MCOO + SITEMP; turn specific overlays on or off;
- Different overlays for MPCOA and MDCOA;
- Text boxes for the students to define the battlefield environment, define the battlefield effects, evaluate the threat, describe the MPCOA and MDCOA, identify three high value targets for each COA, and create an event matrix;
- Additional icons from FM 1-02 – enemy and friendly for all echelons; and
- Compatibility with PowerPoint to possibly automate the movement of icons per time phase lines for a wargaming exercise.

TDE-Builder Version 2. The tool was revised to address the initial requirements, and approximately six months following the initial design requirements meeting, a second meeting was held with the Commander and SGIs of the AVC3 and selected AVC3 students to discuss additional requirements for the tool to enhance its use for students and instructors. The following additional design requirements and capabilities were suggested for student use:

- Display the enemy template in the background while the map is in use;
- Draw time phase lines; and
- Additional time phases (two time phases were originally available).

The following additional design requirements and capabilities were suggested for instructor use:

- Change background information for different scenarios;
- Add different icons and maps for different scenarios;
- Print; and
- Save as pdf or Word document.

TDE-Builder Version 3. The tool was revised based on these additional requirements, and a third design requirements meeting with the Commander and SGIs of the AVC3 and selected AVC3 students resulted in the following additional requirements for student use:

- Ghost icons across all time phases;
- Additional unit icons or ability to draw icons;
- Additional MCOO graphics (e.g., avenues of approach, key terrain, mobility corridors);
- Label icons; add text to the icons (e.g., main effort, supporting effort);
- Display both MPCOA and MDCOA at the same time; differentiate between the two threat COAs (e.g., different colors of shading);
- Event template; overlay on top of the two threat COAs to display NAIs; and
- Display map and text boxes of student responses (define the battlefield environment, define the battlefield effects, evaluate the threat, describe the MPCOA and MDCOA, identify three high value targets for each COA, and create an event matrix) at the same time; layered windows.

The following additional design requirements and capabilities were suggested for instructor use:

- Text boxes for instructor comments/feedback; added as another layer so that the students could go back to their original work;
- Re-label header tabs for background, map, and student work pages;
- Separate pages for student work describing MPCOA and MDCOA; and
- MAC compatibility.

TDE-Builder Version 4. The tool was revised based on these additional requirements, and a fourth design requirements meeting with the Commander and SGIs of the AVC3 and selected AVC3 students resulted in the following additional requirements for instructor use:

- Additional maps (Ft. Knox, National Training Center (NTC), Iraq);
- Additional symbols; all of the tactical mission tasks, mission graphics, and unit types – or the ability to change the basic symbol (e.g., change the number of dots depending on the size of the unit, select the unit and then select the size);
- Grading tools; instructors use certain symbols to grade student work; add Microsoft Word drawing tools to meet this need (e.g., scalable circle); and
- Compatibility with Microsoft Office Suite; copy student work on map into PowerPoint or Word to demonstrate it to the class (e.g., copy map as a picture file or screen shot).

TDE-Builder Final Version. During the final IPR, a final set of requirements was indicated by AVC3 SGIs and students:

- Tactical mission tasks need to rotate;
- Additional IPB symbols (mobility corridor, man-made obstacle, key terrain, decision point);
- Additional friendly unit icons including some Aviation unit icons and/or the ability to select the unit or change the dots / hashes;
- Additional enemy unit icons;
- Draw a light blue circle for AO;
- Draw a light red circle for AI;
- Draw AO in AI; and
- Menu of drawing tools like Microsoft office.

The SGIs and selected AVC3 students responded positively to this version of the tool and indicated that when the final changes were made the tool would be an asset to the course. It was discussed that the tool may be especially useful for students of the Reserve Component AVC3 to help them prepare for the Phase 2 residential portion of the course (Phase 1 is delivered via a distance learning format).

All of the suggested design requirements listed above were carefully considered and prioritized, and the next section of the report provides screenshots and descriptions of the capabilities of the final version of the tool that was transitioned to the Commander and SGIs of the AVC3. Due to resource constraints, the following suggested design requirements were not included in the final tool:

- Display map and textboxes of student responses at the same time; layered windows; and
- Microsoft Word-like drawing graphics including circles.

TDE-Builder Facilitates Guided Practice

One advantage of the tool for instructors is that the background information for the scenario can be changed so that the tool can be used for new classroom-based TDEs. By using this tool, instructors can provide students with multiple practice opportunities because of the time savings afforded by the tool (students do not have to spend long periods of time creating symbols and graphics via paper and pencil methods). Thus, students have more time to focus on developing the skills related to the critical planning steps of the MDMP facilitated by the tool (i.e., mission planning and COA development). Emphasizing student practice in varied, realistic contexts is an effective training technique for developing the cognitive and adaptive skills related to Army planning in part because it raises self-awareness of one's strengths and weaknesses (for reviews see Fischer, Spiker, Harris, McPeters, & Riedel, 2008; Fischer, Spiker, Riedel, 2008a; Fischer, Spiker, Riedel, 2008b; Fischer, Spiker, Riedel, 2009a; Fischer, Spiker, Riedel, 2009b; Tucker, Gunther, Pleban, Goodwin, & Vaughan, 2007). Additionally, the tool was designed so that instructors can provide direct feedback to students; this combination of self-learning and mentorship offers a compelling approach to developing Army leader planning skills.

The TDE Builder was designed to promote blended learning within the AVC3. In its intended use, students may work through TDEs outside of the classroom, email their work to the SGIs, and review instructor comments either in or out of the classroom. However, there are additional potential uses of the tool to promote further blending (Table 1). In an extension of the intended use, instructors could present two student responses during the class and discuss interesting differences in the two approaches. The instructor could then make quick on-the-fly changes to the scenario (e.g., what-if exercises) and ask students to discuss how they would modify their plans in response to the changes. In addition, instead of requiring students to use the tool outside of class, the tool could be used first within the class to prepare the students for an out-of-class exercise. That is, to demonstrate the importance of terrain, SGIs could use the tool to create in-class exercises prior to field exercises (e.g., a terrain walk). The critical thinking and problem-solving performed by the students prior to the walk would better prepare them to pick up on key elements once on the walk. For example, on the terrain walk with printed COAs in hand, the instructor could lead a discussion of how seeing the terrain in person may cause a leader to alter his original COA.

Additionally, SGIs may want to use the TDE Builder not only while in the IPB portion of the course, but in other parts as well. For example, an instructor may have the goal of ensuring that all the students are familiar with the operational graphics as a prerequisite to the next day's lecture. The instructor may want to first provide students with a worked example of a COA using the TDE Builder and then have the students complete a homework assignment in which they are required to identify and define the various graphics. Another instructional goal may be to show how the COA sketch is either aligned or not aligned with the commander's intent statement. The instructor could first create a COA in the TDE Builder and then use the COA as part of the classroom instruction. As homework, the instructor could ask the students to use the TDE Builder to update the graphics to better reflect the commander's intent after the instruction. These are just a few of the possibilities that demonstrate how the TDE Builder could be used in a blended learning classroom environment, while complying with the objectives outlined in the current Program of Instruction.

Table 1.
Blended Learning Approaches for the TDE Builder

Supplemental Training	In-Class Discussion	Field Exercises
Additional PEs outside of class (e.g., homework, part of National Guard asynchronous course)	In-Class PEs	Develop COA using tool prior to terrain walk
Pre-AVC3 (e.g., PEs, knowledge of key concepts to prepare incoming students for AVC3)	SGI demonstration of key MDMP concepts	Use printed COAs from tool as discussion points during terrain walk
Post-AVC3 (e.g., additional PEs for students who want additional practice opportunities after course completion)	What-if scenarios (e.g., build on in-class or homework PEs to initiate group discussion)	Use COAs in after action reviews

The Tactical Decision Exercise (TDE) Builder Final Version

As described above, the TDE Builder is a blended learning application designed to facilitate training of IPB by providing students with hands-on experience conducting key tasks involved in the IPB process. As a blended learning tool, the TDE Builder should present the AVC3 with pedagogical and practical advantages over current methods. These pedagogical and practical advantages are closely coupled; generally, reducing practical burdens creates additional learning opportunities. Most vividly, much of the current IPB exercise was executed using paper and pencil, largely because of limited availability of computers in the classroom. Of course, paper and pencil tasks in and of themselves are not necessarily inappropriate. For example, if one of the learning objectives for the course was for students to produce symbols for friendly and enemy units, then actually learning to draw those symbols using pencil and paper may be appropriate. On the other hand, if the learning objective is executing the IPB process in order to develop the relevant planning and thinking skills, then time spent drawing unit symbols could be costly.

The final TDE Builder consists of the following capabilities for students concerning IPB and friendly course of action development:

- Text responses for defining the battlefield environment, battlefield effects, evaluate the threat, most likely and most dangerous enemy course of action, high value target listing, event matrix),
- Develop MCOO (maps, terrain symbols, IPB symbols),
- Develop ECOA 1, ECOA 2, and EVENTTEMP (enemy units, 6 time phases in which unit movement can be shown, phase lines can be changed),
- Develop COA 1, COA 2, COA 3 (friendly units, 6 time phases in which unit movement can be shown, phase lines can be changed,
- Print and save as pdf, and
- TDE Builder User Guide for Students (step-by-step instructions under the Help button).

In light of reducing practical constraints to increase opportunities for learning, one of the key initial features of the TDE Builder is the communication mechanism between students and the instructor. Given bandwidth limitations, the sharable products generated during the exercise needed to be sufficiently small to be sent via email or other distributed means. Therefore, saving a file that included maps, overlays, and so forth would not be a viable solution as these types of files tend to be extremely large (~5000kb). Instead, the TDE Builder produces a small XML file (~20kb) that the TDE Builder reads in order to then recreate what the student produced. All students and instructors will have their own copy of the TDE Builder on their computers. When students complete the exercise, they can simply email the XML file to the instructor, who can open the file using his/her own copy of the TDE Builder.

The final TDE Builder consists of the following additional capabilities for instructors:
- Edit IPB scenarios,
- Create new scenarios,
- Upload new maps,
- Provide feedback on student responses, and
- Print and save student responses.

The implied requirement is that the TDE Builder needs to be able to distinguish between student and instructor users. Consequently, the first screen a user is presented with prompts the student to identify themselves as either a student or instructor (See Figure 1).

It is important to note that the TDE Builder was developed to be a stand-alone application that can be run either directly from a CD or from an individual's computer. The application does <u>not</u> make changes to the computer's hard-drive registry, so the individual does not need administrative rights to download or use the application. Moreover, as the application does not need to run on the Internet or server, a certificate of networthiness is <u>not</u> needed from the post Network Enterprise Center (Directorate of Information Management) or similar agency. When downloading the application to the desktop or computer folder, download all of the files that accompany the software into a single folder. Then, run the application file.
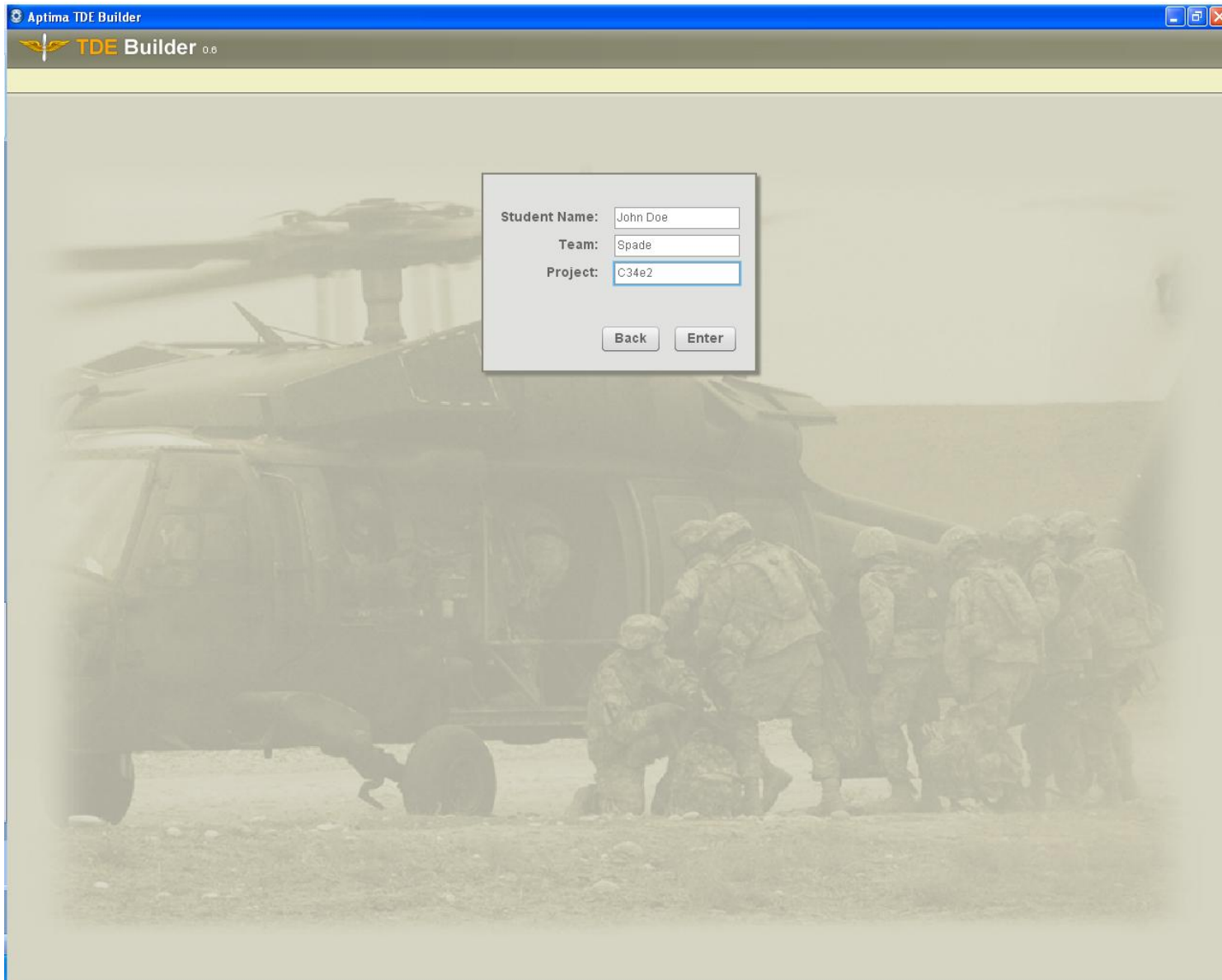
Figure 1. Log-in Screen.

A short text-based slide introduces students to the three components of the exercise: Situation, Describe Solution, and Create Graphical Overlays. The Situation component introduces the student to the overall scenario and mission. Specifically, it displays three sections: Overall Situation, ECOA 1 (Most Likely), and ECOA 2 (Most Dangerous).

Students then continue to the Describe Solution component of the exercise, in which they type in responses to several standard IPB questions, such as evaluating the threat (Figure 2), and completing an Event Matrix (Figure 3).
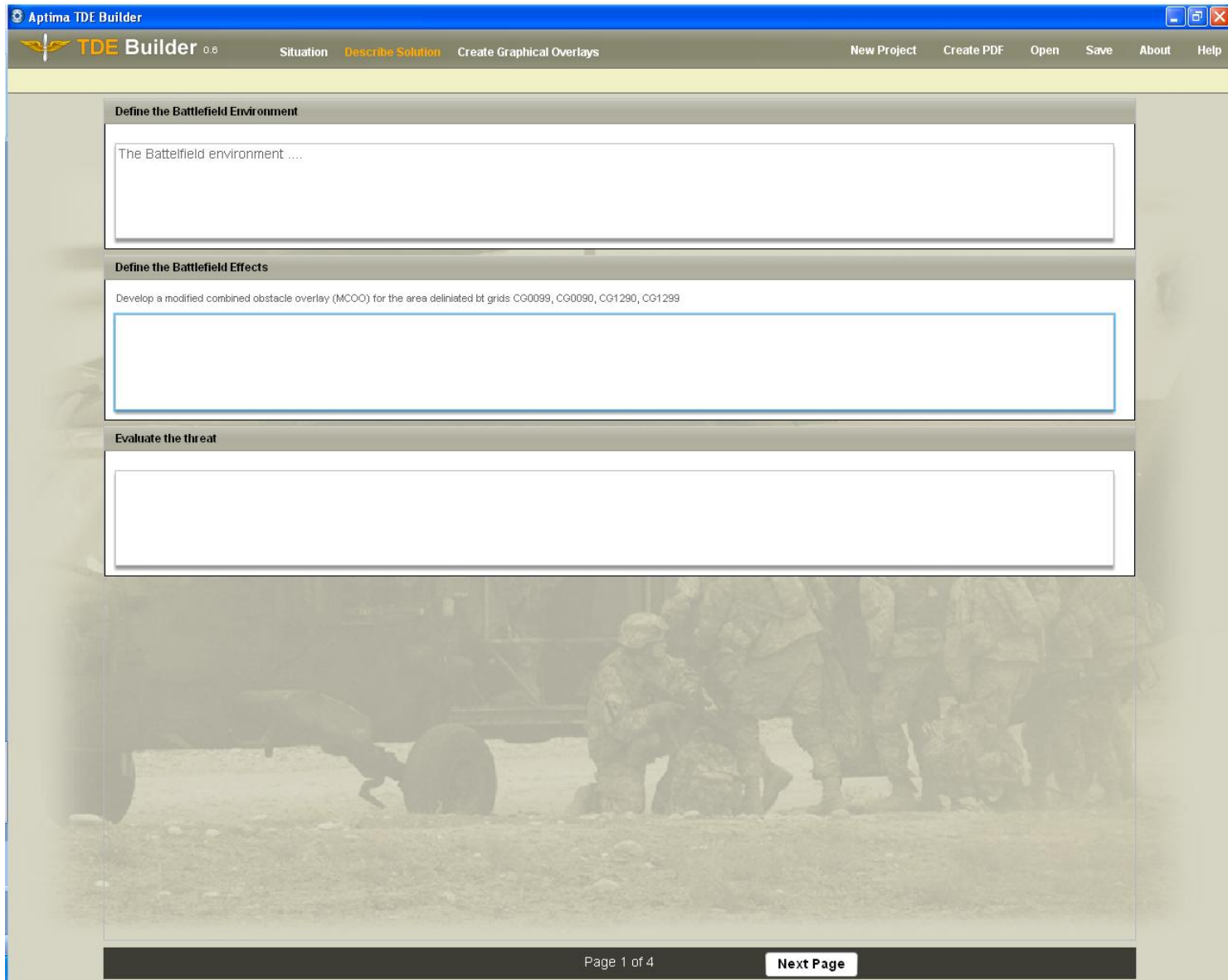
Figure 2. Evaluating the Threat.
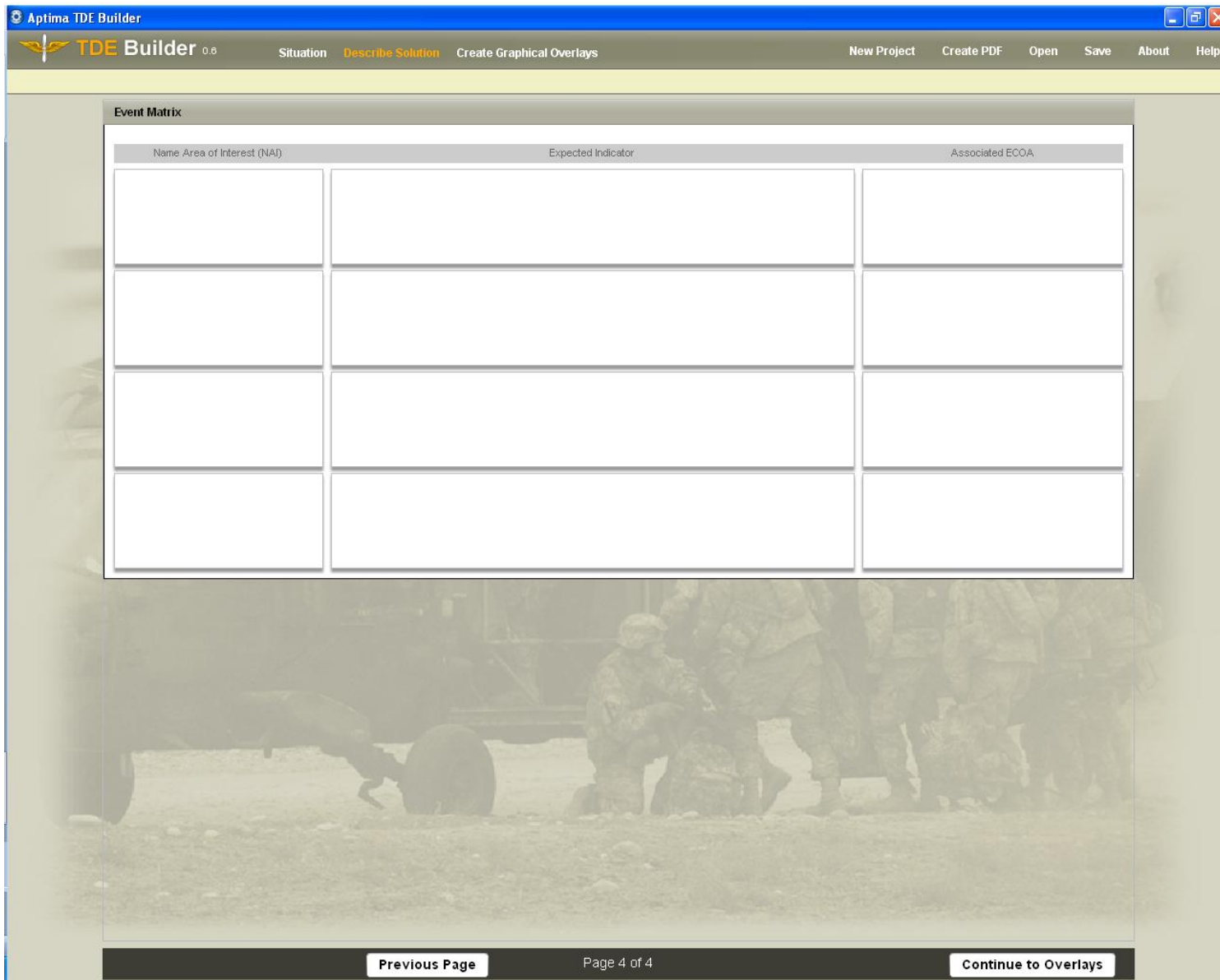
Figure 3. The Event Matrix.

The final, and most labor-intensive, component of the exercise is Create Graphical Overlays. Within this component, students progressively build a set of overlays starting with selecting a map, through identifying areas of key terrain, and arraying friendly and enemy forces over time and space. The student first selects a map upon which they will complete the exercise (Figure 4). This map will be provided digitally to the students by the instructor and is available for selection within the tool. Students can adjust the size of the image, adjust the opacity of the image (to help with display requirements), or zoom in or out of areas within the image.

Next, students develop the modified combined obstacle overlay (MCOO) and highlight areas of key terrain (Figure 5). The student can select from a variety of types of terrain from the menu on the left, and then outline an area on the map. The outline is created by clicking a point on the map to cover, and then adjusting the shape of the covered area by dragging the highlighted points. The advantage of this approach is that the student can outline unusually shaped pieces of terrain instead of using only standard shapes such as rectangles or circles.
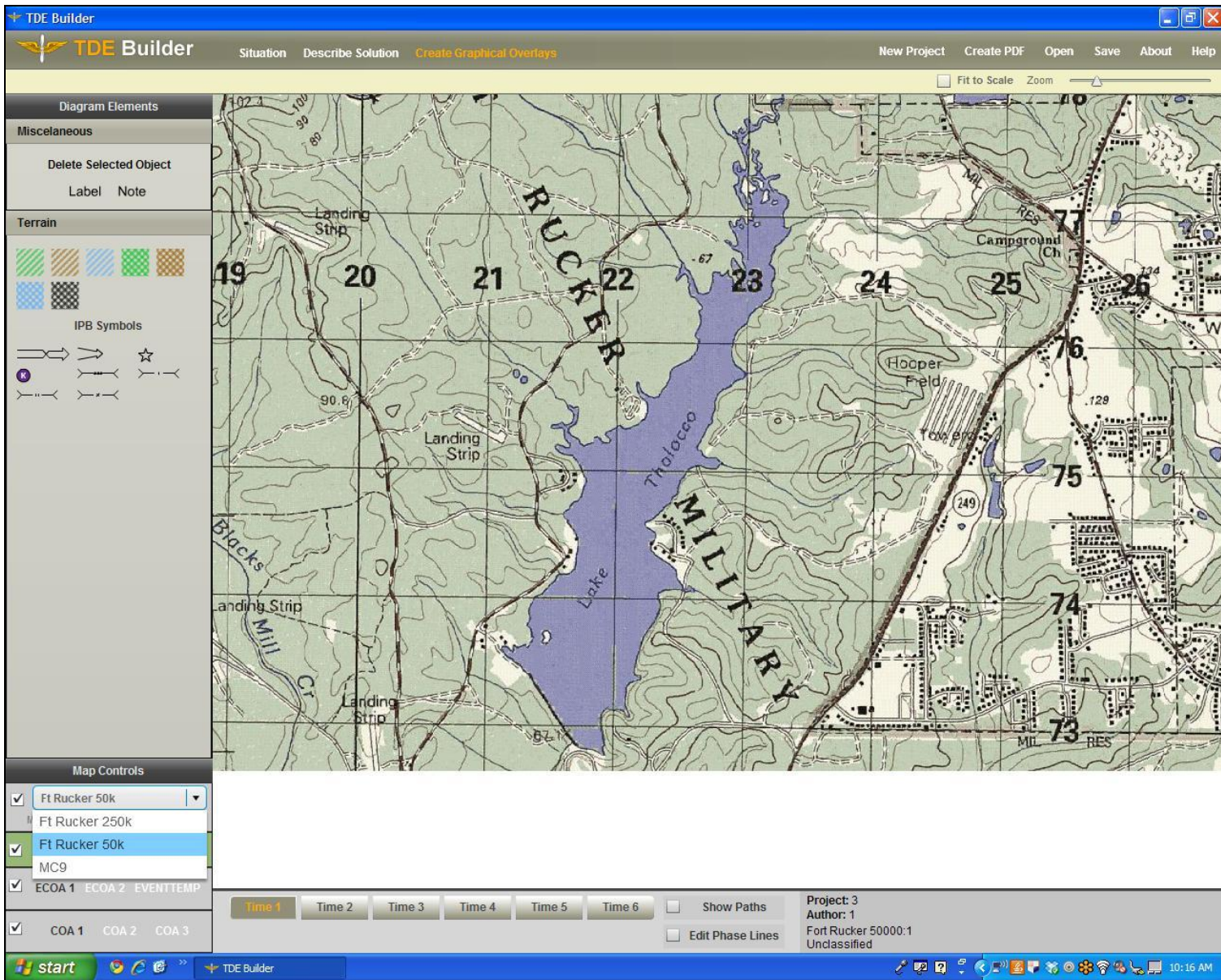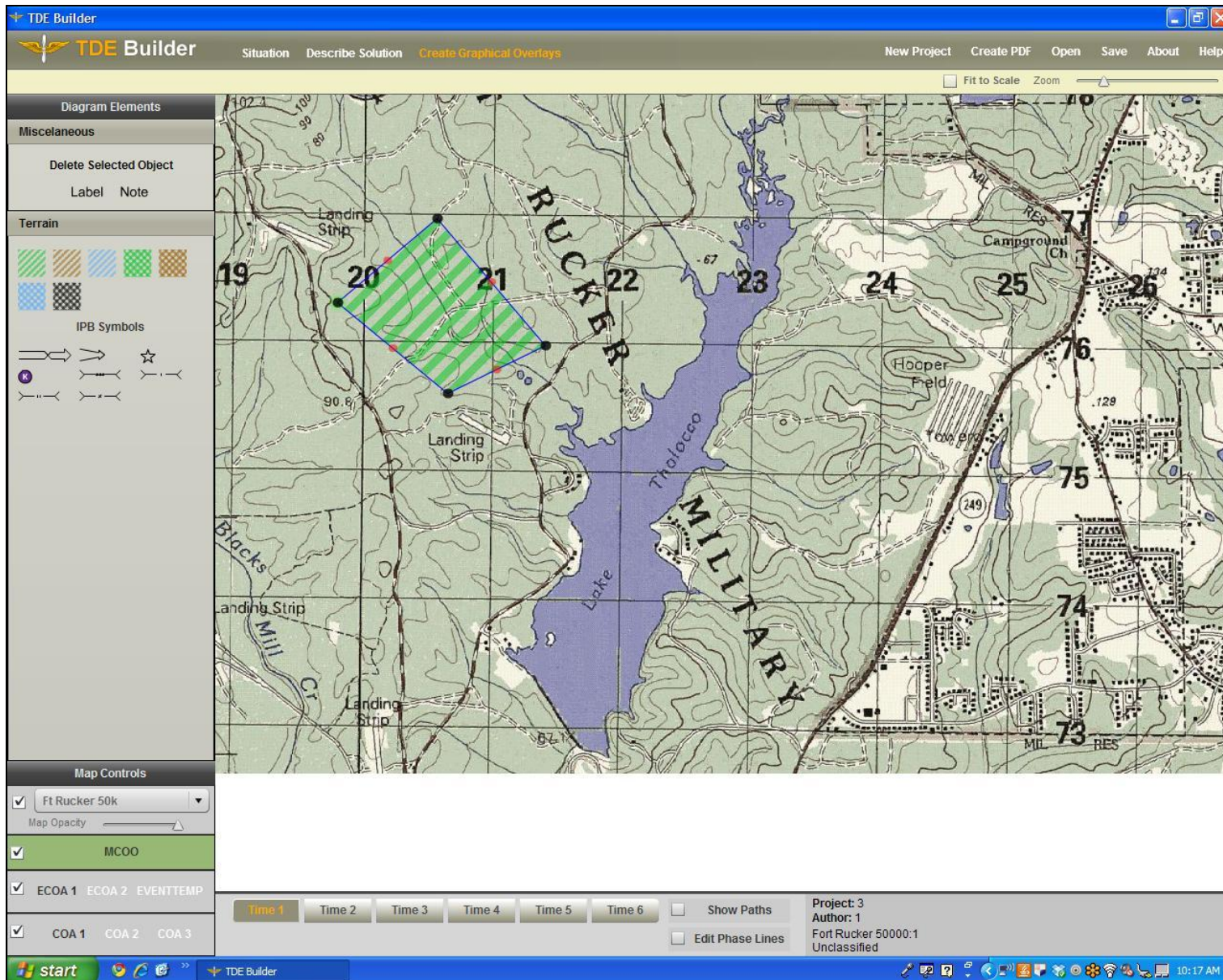
Figure 4. Map selection.

Figure 5. Highlighting Key Terrain

Next, the student arrays enemy, friendly, and neutral forces. The student first creates the enemy courses of action 1 and 2 (ECOA 1 and ECOA 2). By first clicking on ECOA 1 from the menu in the lower-left corner, the student can then drag icons from the left and place them anywhere on the map (see Figure 6).

The student can then create ECOA 2 by first clicking on the ECOA 2 button in the lower-left menu and dragging icons onto the map as before. The student can then click on the EVENTTEMP button to simultaneously display ECOA 1 and ECOA 2. In practice, students can view both ECOAs, compare them visually, and then identify named areas of interest (NAIs). Students identify NAIs by adding a Note from the menu in the extreme upper left (see Figure 7).
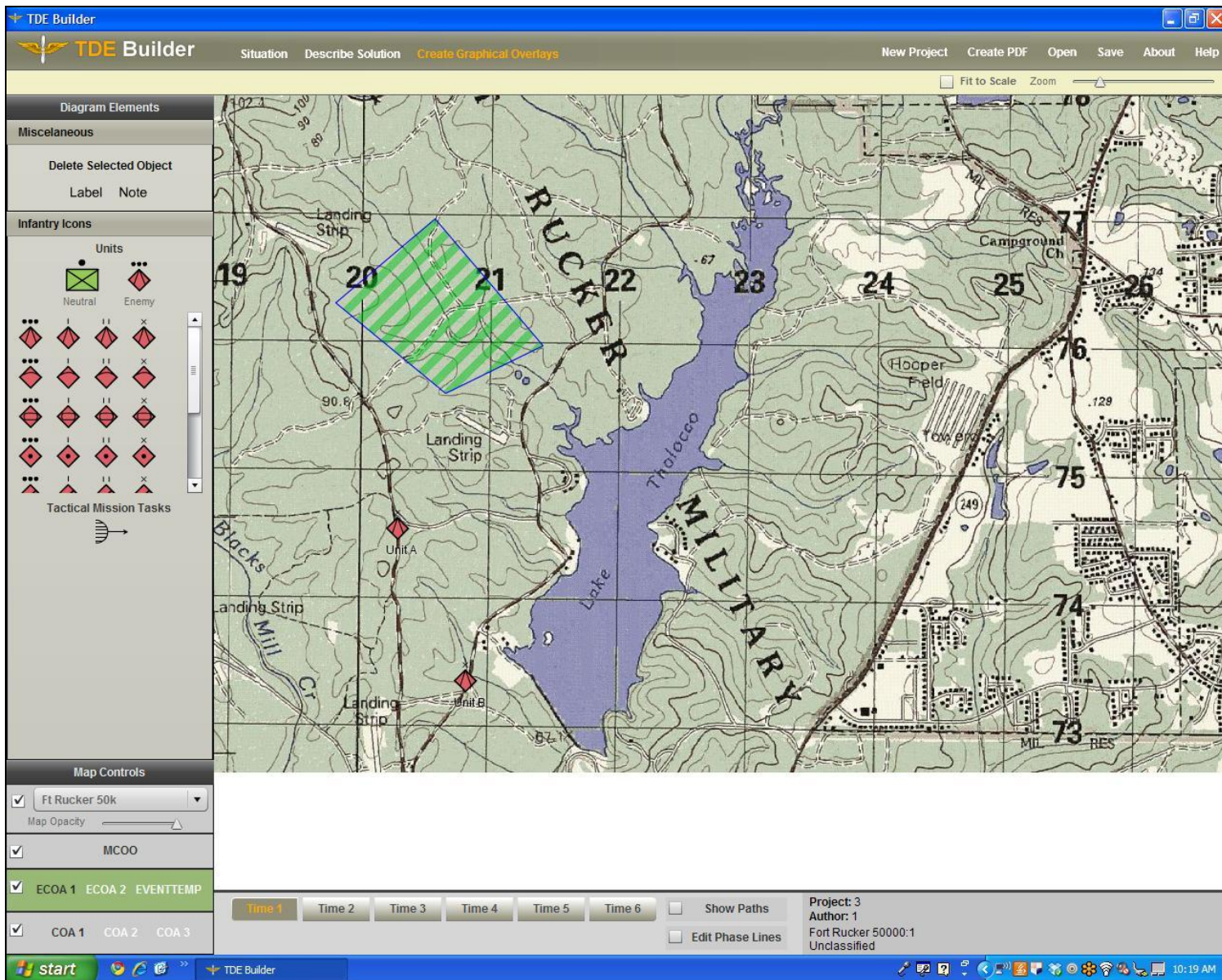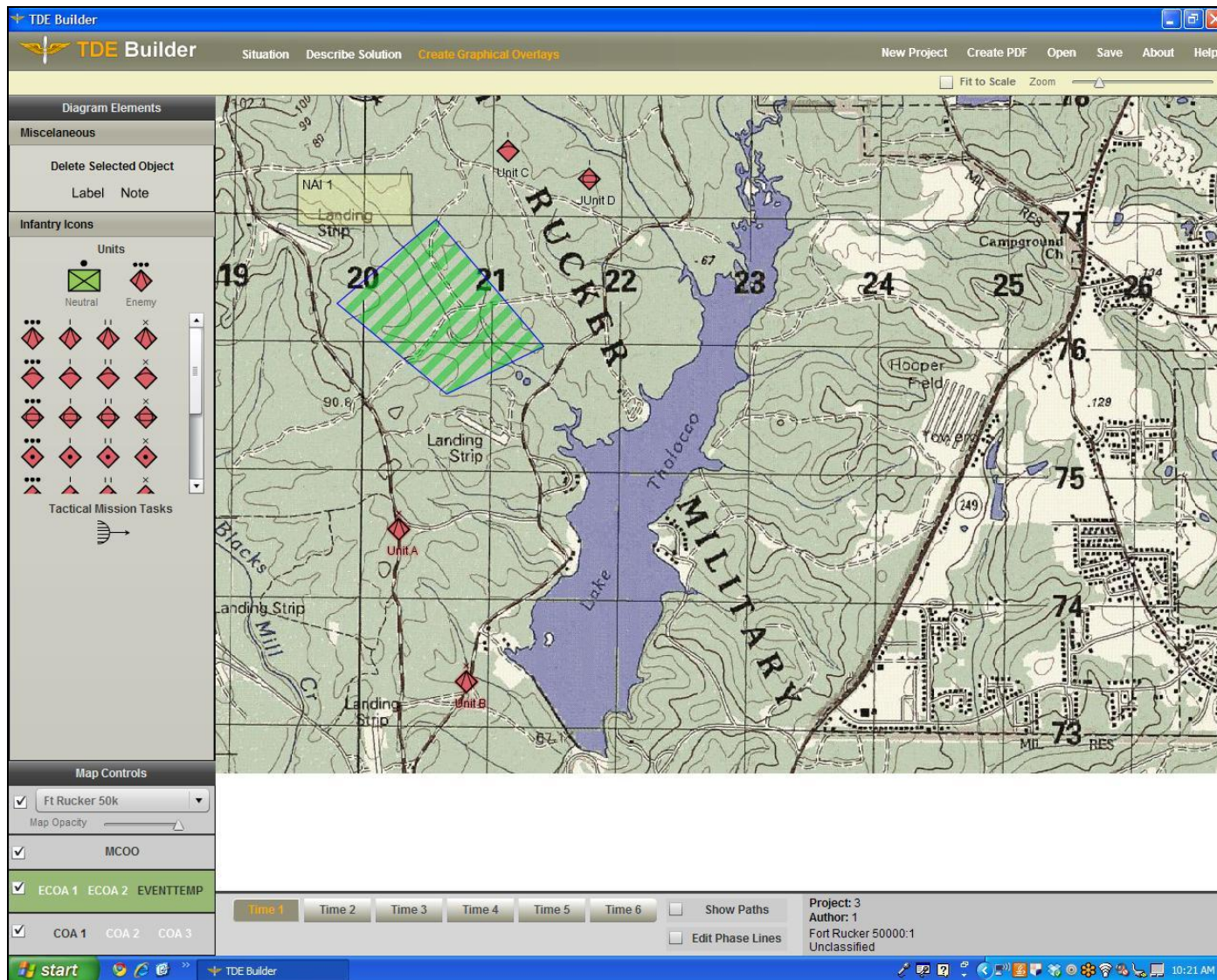
Figure 6. Creating an ECOA.

Figure 7. The EVENTTEMP displaying both ECOAs with a Note identifying a NAI. ECOA 1 has ghost-like icons toward the bottom of the screen whereas ECOA 2 has the clearly displayed icons at the top. If only the first ECOA was chosen, then the ECOA 1 icons would be clear and the icons for the second ECOA would disappear.

Students can array friendly forces in the same way as enemy forces. They first click on COA 1 and then drag friendly icons onto the map. They can repeat the process for COA 2 and COA 3 (Figure 8).

In addition to creating the two ECOAs and three COAs, students can also create up to six phases of each ECOA or COA to represent movement over time. "Ghosted" (i.e., faded) versions of the icons are carried over from the previous time phase and then are moveable (Figure 9). Students can select the "Show Paths" option to track where the icon moved from the previous phase to the current phase (Figure 10).
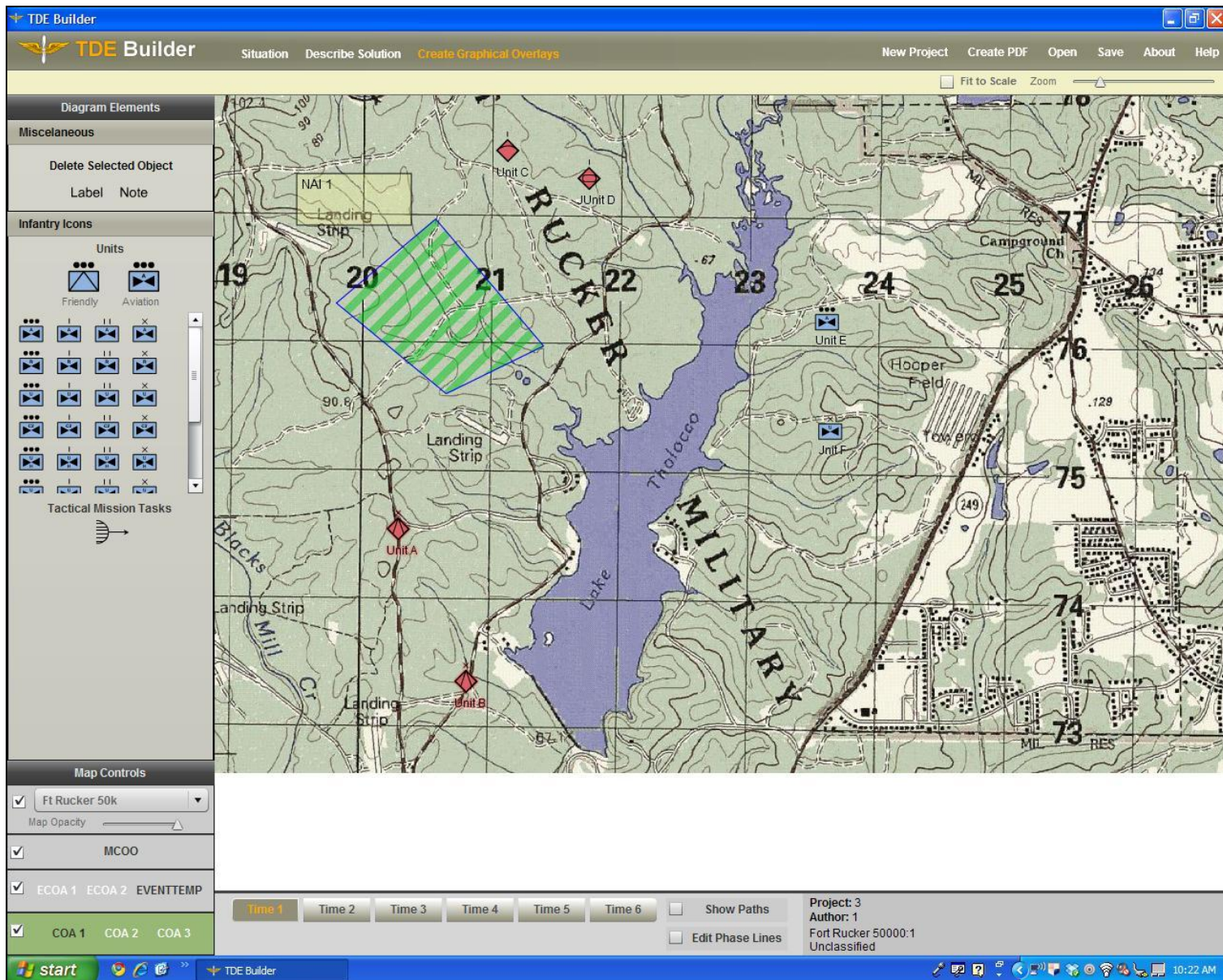
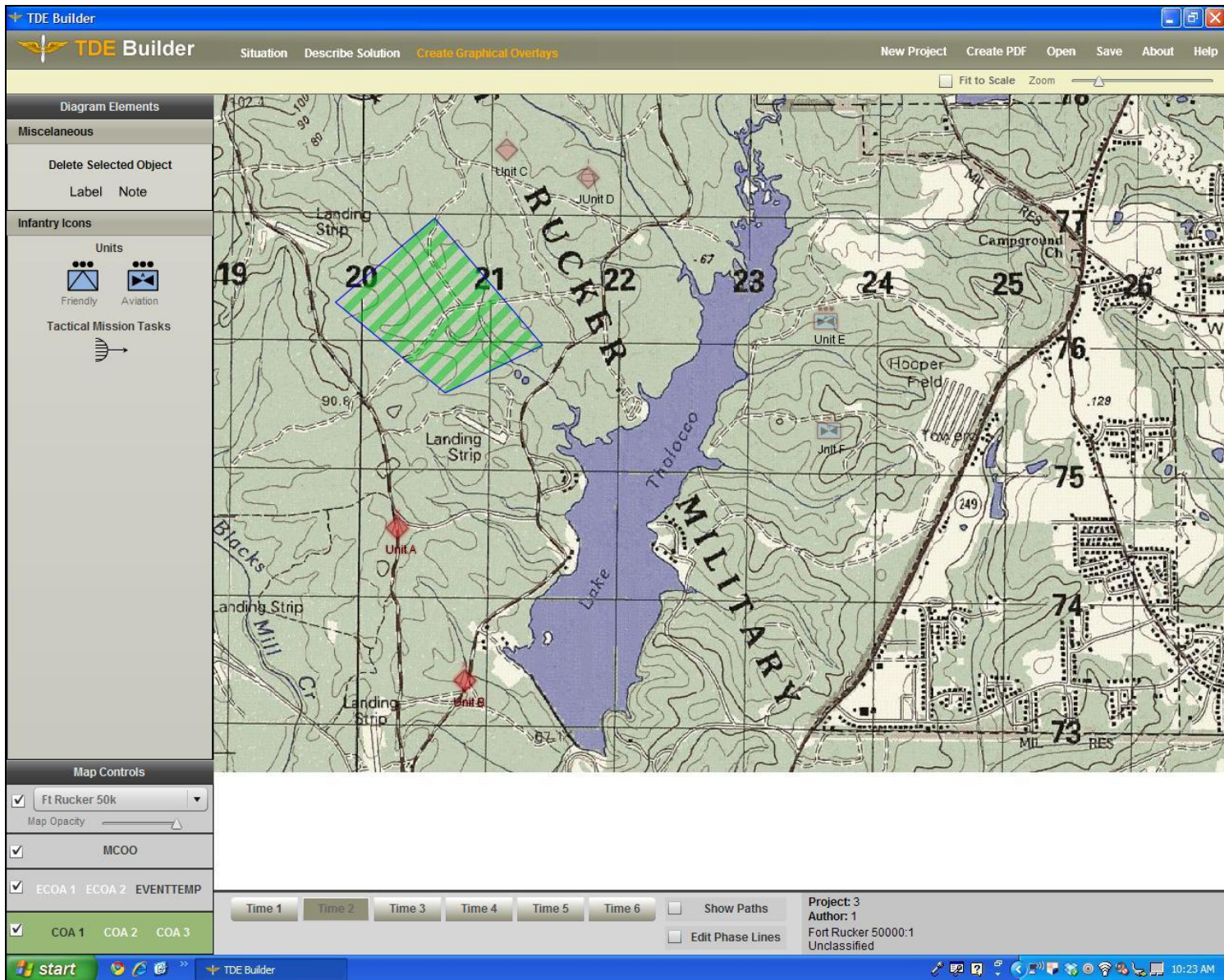*Figure 8*. Arraying Friendly Forces.

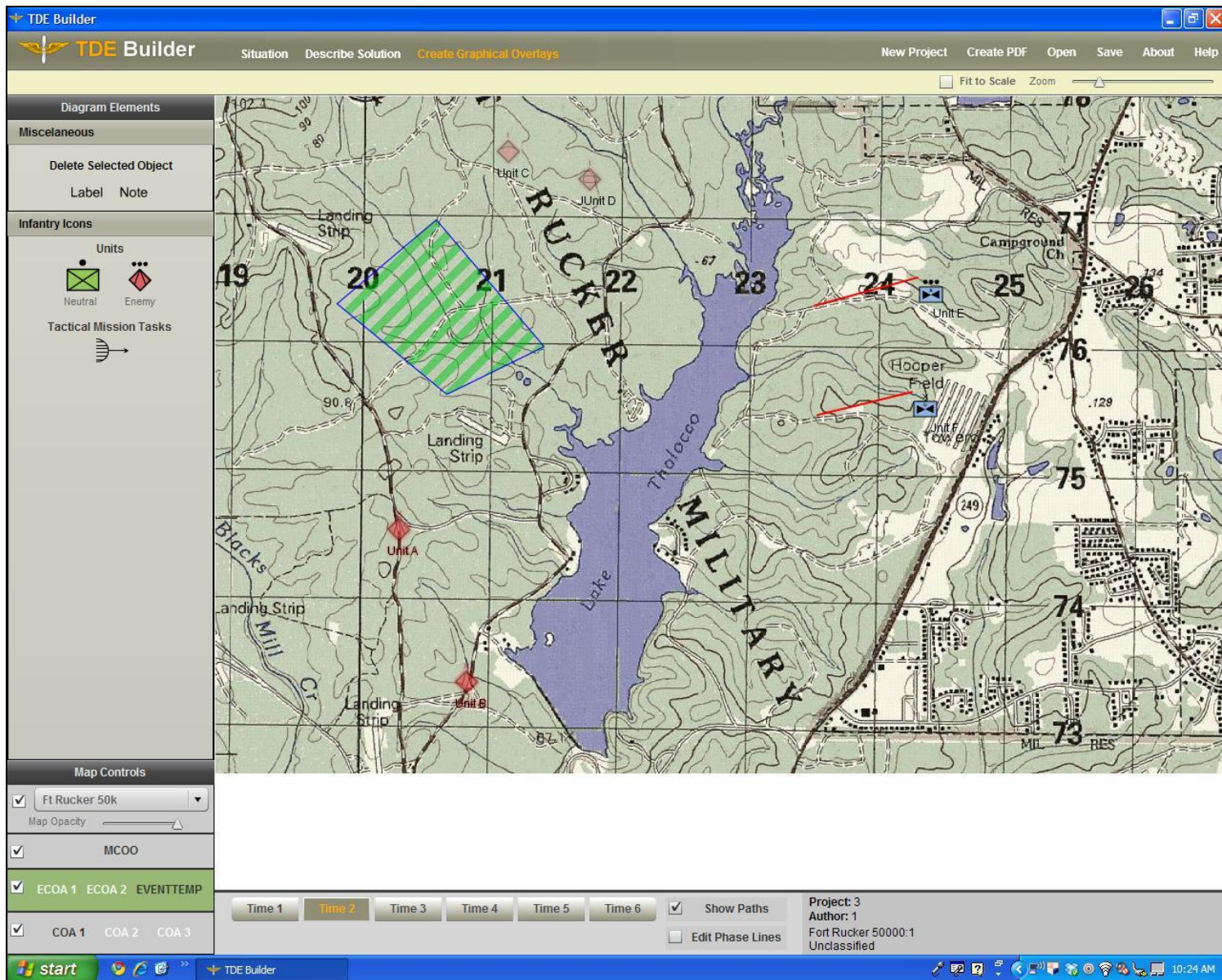*Figure 9.* Ghosted Icons Carried Over from Time 1 to Time 2.

Figure 10. Red Lines Show the Movement of Each Icon (in this case Friendly icons) from the Previous Phase to the Current Phase.

This completes the student exercise. At this point, they can save their work or print it out by selecting the appropriate function from the extreme upper right of the toolbar. They can email their saved XML file to the instructor, who can then open the file and review (again, either digitally or by printing it out). The instructor can add comments in the same way that students add Notes in the EVENTTEMP. The instructor can save their edited version and return an updated XML file to the student for review.

However, the tool was designed to be more than an electronic version of one particular exercise within the course. Instructors are encouraged to creatively use the tool to create new exercises, or as a focal point of classroom discussions. For example, instructors could create "what-if" scenarios by making small but important modifications to the existing scenario and requiring students to update their plans. Instructors also could create new and diverse scenarios that emphasize different planning considerations with IPB. Additionally, one interesting use of the TDE Builder would be for instructors to create *flawed* plans and ask the students to identify questionable aspects of the plans and answer how and why they would modify them. In all of these cases, the TDE Builder could be used as part of classroom activities, as homework, or in preparation for field exercises.

When instructors log in to the tool, they are presented with a variety of editing options. To edit the Situation and Describe Solution components, the instructor simply edits the text boxes. The instructor could modify the existing exercise (e.g., change the ECOAs), or create an entirely new scenario.

The instructor also can identify new maps for students to work with. Instructors identify images per normal protocol for attaching or inserting images: by browsing for the digital image on their computers and selecting the desired image (Figure 11). This action causes the tool to modify the XML script to recognize the selected image.

Having made these adjustments, the instructor then can email the revised XML file along with the new images to students. If students were working within a networked environment, the instructor could simply post the new file and images to the network.
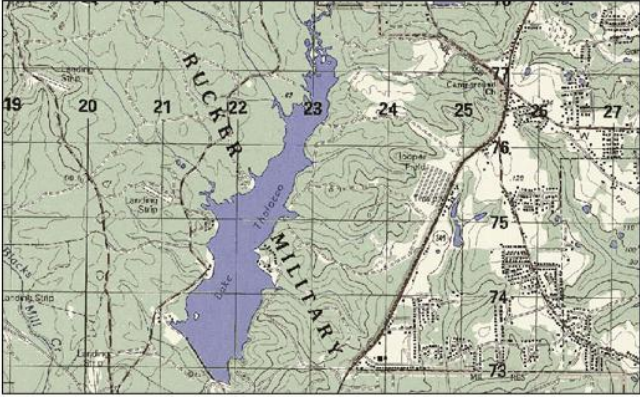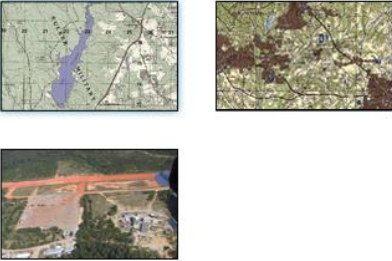
Figure 11. Adding a New Map

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Appendix A

Acronym List

AI	area of interest
AO	area of operations
AVC3	Aviation Captains Career Course
COA	course of action
COE	contemporary operational environment
COO	combined obstacle overlay
IPB	intelligence preparation of the battlefield
ISR	Intelligence, surveillance, and reconnaissance
MAC	Macintosh
MC3	Maneuver Captains Career Course
MCOO	modified combined obstacle overlay
MDCOA	most dangerous course of action
MDMP	military decision making process
MPCOA	most probable course of action
NAI	named area of interest
NTC	National Training Center
SGI	small group instructor
SITEMP	situational template
SME	subject matter expert
TDE	tactical decision exercise
TPL	time phase lines
TRADOC	U.S. Army Training and Doctrine Command