Technical Report 1129

Virtual Environments for Dismounted Soldier Simulation, Training, and Mission Rehearsal: Results of the FY 2001 Culminating Event

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A Directorate of the U.S. Total Army Personnel Command

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14. ABSTRACT *(Maximum 200 words)*:

This report describes the activities and results of the third year culminating event (CE) of the "Virtual Environments for Dismounted Soldier Simulation, Training and Mission Rehearsal" Science and Technology Objective (STO). This STO is being conducted jointly by the U.S. Army Research Institute for the Behavioral and Social Sciences, the U.S. Army Simulation, Training, and Instrumentation Command (STRICOM), and the U.S. Army Research Laboratory. This four-year effort (FY99-FY02) is focused on overcoming critical technological challenges that currently prevent high fidelity dismounted soldier simulation. The objectives of the CE were to integrate and evaluate the technologies developed during the year. The key technologies included: a Dismounted Infantry Virtual After Action Review (AAR) System; new behaviors and improved operator control for Dismounted Infantry Semi-Automated Forces (DISAF); soldier control of DISAF through Voice Recognition and Synthesis; enhancements to the soldier simulator, the Soldier Visualization Station (SVS); an improved locomotion device, the Omni-Directional Treadmill (ODT); a dynamic terrain server; and a Mission Planning and Training Tool (MPTT). The CE provided a realistic and challenging test of the systems and capabilities under development. The results identified both accomplishments and areas in which improvements and corrections are required.

15. SUBJECT TERMS

Virtual Environments, Dismounted Infantry, Simulator Sickness, Locomotion Simulators, DISAF, Semi-Automated Forces, After Action Review, Voice Recognition, Voice Synthesis, Training Effectiveness

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Personnel Performance and
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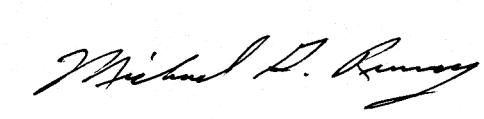
FOREWORD

The U.S. Army needs a capability to effectively simulate the performance of dismounted soldiers in virtual simulations. In current fielded systems, such as the Close Combat Tactical Trainer, dismounted combatants are involved in the combined arms operation in an artificial and generally unsatisfactory manner. Virtual simulation can provide a means for dismounted leaders, soldiers and units to train effectively over a wide range of conditions. The same technologies also can be used for development of new Infantry concepts and doctrine and applied to development of mission planning and rehearsal tools. The capability to use effective virtual simulations for dismounted combatants has implications for training of today's dismounted leaders and soldiers and for the development of effective Objective Force Warrior concepts and systems.

Emerging Virtual Environment (VE) technologies, such as low cost computer image generators, locomotion platforms, intelligent computer-controlled forces, and immersive displays, have the potential to provide training, mission rehearsal, and experimentation capabilities for dismounted soldiers and leaders. However, the potential of VE is currently unrealized because critical hardware and software gaps, documented effective training methods and strategies, and training support tools need to be developed and integrated.

In response to this need, the U.S. Army Research Institute Simulator Systems (ARI-SSRU) and Infantry Forces Research Units (ARI-IFRU), the U.S. Army Simulation, Training, and Instrumentation Command (STRICOM), and the U.S. Army Research Laboratory Human Research and Engineering Directorate (ARL-HRED) and Computational and Information Sciences Directorate (ARL-CISD) are participating in a joint Science and Technology Objective (STO) entitled "Virtual Environments for Dismounted Soldier Simulation, Training and Mission Rehearsal." This four-year effort (FY99-FY02) is focused on overcoming critical technological challenges that currently prevent effective dismounted soldier simulation. This report describes an assessment of progress in meeting STO objectives conducted by the participating organizations at Fort Benning, GA in September 2001.

The results were briefed to the sponsoring Dismounted BattleSpace Battle Lab and representatives of the participating organizations on 19 November 2001 in Orlando, FL. They are being used to guide activities for the final year of the STO.



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- And especially the soldiers who participated.

VIRTUAL ENVIRONMENTS FOR DISMOUNTED SOLDIER SIMULATION, TRAINING, AND MISSION REHEARSAL: RESULTS OF THE FY 2001 CULMINATING EVENT

EXECUTIVE SUMMARY

Research Requirement:

The U.S. Army Research Institute Simulator Systems (ARI-SSRU) and Infantry Forces Research Units (ARI-IFRU), the U.S. Army Simulation, Training, and Instrumentation Command (STRICOM), and the U.S. Army Research Laboratory Human Research and Engineering Directorate (ARL-HRED) and Computational and Information Sciences Directorate (ARL-CISD) are participating in a joint Science and Technology Objective (STO) entitled "Virtual Environments for Dismounted Soldier Simulation, Training and Mission Rehearsal." This four-year effort (FY99-FY02) is focused on overcoming critical technological challenges that currently prevent high fidelity dismounted soldier simulation. The research objective is to develop a dismounted leader trainer at the fire team, squad, and platoon level. Leader trainees will be able to execute a series of realistic training scenarios (combat operations and support operations) in the simulator. Repeated practice, enhanced by training features, coaching, and After Action Reviews (AARs) will build decision-making and coordination skills. Computer-controlled or semi-automated agents will represent subordinates, other friendly forces, enemy forces, and civilians. The intent is to have a training system that is realistic and effective, yet requires a fairly low level of personnel support for subordinates and role players.

During each year of the STO there have been two major types of activities: research and technology development, and preparation for and conduct of a culminating event (CE). The purpose of the CE is to insure the compatibility of the technologies under development and to obtain soldier feedback on their use. This report describes the activities and results of the FY 2001 CE.

Procedure:

The FY 01 CE was held in September 2001 at Fort Benning, GA. The objectives were to integrate and evaluate the technologies developed during the year. The key technologies included: a Dismounted Infantry Virtual AAR System; new behaviors and improved operator control for Dismounted Infantry Semi-Automated Forces (DISAF); soldier control of DISAF through Voice Recognition and Synthesis; enhancements to the soldier simulator, the Soldier Visualization Station (SVS); an improved locomotion device, the Omni-Directional Treadmill (ODT); a dynamic terrain server; and a Mission Planning and Training Tool (MPTT).

Following final system integration and testing, Infantry soldiers participated in scenarios in the virtual environments, with one group of six soldiers participating for one day, and two groups of six soldiers participating for two days each.

Findings:

The CE provided a realistic and challenging test of the systems and capabilities under development. The results identified both accomplishments and areas in which improvements and

corrections are required. The capabilities under development generally performed well, not just as independent systems, but as coordinated components of a larger system. When systems did not work, the causes could usually be identified, and in some cases corrected, during the CE. Problems that could not be corrected immediately were identified as high priority items for future development.

Utilization of Findings:

The VE STO will continue for one more year. During that year, the effort will focus on correcting shortcomings and developing the higher-priority enhancements identified through the 2001 CE. Prior to the end of FY 02, a final CE will be held at Fort Benning.

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VIRTUAL ENVIRONMENTS FOR DISMOUNTED SOLDIER SIMULATION, TRAINING, AND MISSION REHEARSAL: RESULTS OF THE FY 2001 CULMINATING EVENT

Introduction

Army Need

The U.S. Army requires vastly improved dismounted soldier simulation capabilities to meet multiple needs. The first need is for simulations that allow dismounted leaders, soldiers and units to train effectively even if they do not have frequent opportunity to participate in high fidelity field training exercises. In addition, leaders, soldiers and units need effective mission rehearsal tools that prepare them for specific combat missions in all types of terrain. Finally, U.S. Army decision makers need inexpensive and high fidelity prototyping and testing systems that will allow them to explore and evaluate potential doctrine, organizations, equipment, and soldier characteristics. These needs are very important today; they are likely to be critically important as the Objective Force becomes a reality.

Emerging Virtual Environment (VE) technologies, such as low cost computer image generators, locomotion platforms, intelligent computer-controlled forces, and immersive helmet mounted displays, have the potential to provide training, mission rehearsal, and experimentation capabilities for dismounted soldiers and leaders. However, the potential of VE is currently unrealized because no one has yet solved critical hardware and software limitations, documented effective training methods and strategies, or created the training support packages necessary to use it.

In response to this need, the U.S. Army Research Institute Simulator Systems (ARI-SSRU) and Infantry Forces Research Units (ARI-IFRU), the U.S. Army Simulation, Training, and Instrumentation Command (STRICOM), and the U.S. Army Research Laboratory Human Research and Engineering Directorate (ARL-HRED) and Computational and Information Sciences Directorate (ARL-CISD) are participating in a joint Science and Technology Objective (STO) entitled “Virtual Environments for Dismounted Soldier Simulation, Training and Mission Rehearsal.” This four-year effort (FY99-FY02) is focused on overcoming critical technological challenges that currently prevent high fidelity dismounted soldier simulation. These critical challenges include: simulating locomotion; tracking weapons and body positions; creating realistic performance of computer-controlled dismounted friendly and enemy soldiers; simulation of night equipment and sensor images; making terrain and structures dynamic; developing appropriate training strategies and methods; assessing individual and unit performance; and determining transfer of training from virtual to live environments. The effort builds on previous efforts of the participating organizations in the development and use of virtual simulations.

The product of the STO will be a demonstration of a High Level Architecture (HLA)-compliant integrated dismounted soldier simulation system that includes the following components and capabilities:

- A locomotion platform which provides realistic perception of movement and accurate energy expenditure.

- A visual display system which can simulate a variety of night vision sensors and equipment accurately.
- "Intelligent" computer-controlled forces to represent enemy, friendly and neutral forces.
- Dynamic Terrain (DT), including damage to structures, rubble and other micro-terrain obstacles.
- Features to enhance the effectiveness of training and mission rehearsal.
- Demonstrated effectiveness of the system.

This effort addresses several required U.S. Army future operational capabilities described in U.S. Army Training and Doctrine Command (TRADOC) Pamphlet 525-66 (U.S. Army, 1997), including:

- The capability to provide highly realistic training through means other than on-the-job or field training in numerous areas, including training for dismounted soldiers and small group leader training.
- The capability to use advanced simulation as a means of providing training to achieve proficiency in critical combat skills.
- Realistic, advanced simulation capabilities to train/mission rehearse tasks that require multiple repetitions to achieve proficiency when repetitions would not otherwise be possible.
- The ability to conduct simultaneous interactive training for the total force.
- Simulations which have the dual capability of being an effective training tool as well as providing the ability to evaluate warfighting concepts and battle planning.
- Simulations and simulators which allow testing, and validation of Doctrine, Training, Leader Development, Organization, Materiel, and Soldier (DTLOMS) issues.
- The need to rehearse missions on the terrain and under the conditions that simulate the next deployment as closely as possible.
- Realistically simulated friendly and opposing forces necessary to train/mission rehearse tasks realistically within advanced simulation.
- The capability to develop and deliver training and mission rehearsals, on demand, to meet contingency mission requirements.

Prior Related Research

Prior to the initiation of the STO, each of the participating government organizations had initiated research and development programs related to the use of VE for dismounted soldier simulation. This was largely a result of the influence of Gorman (1990), who was an early proponent of the use of VE for dismounted infantry (DI) training. Partly as a result of his efforts, a conference was held in Snowbird, Utah in 1990 to discuss individual soldier systems and the role that an individual portal (or I-Port) would play in their development (Goldberg & Knerr, 1997). While consensus was achieved on the need for an I-Port, Operation Desert Storm prevented the initiation of a cooperative effort. The conference did provide the impetus for individual research programs, however.

ARI Virtual Environments Research

The ARI effort began with an initial examination of the feasibility of using VE technology for dismounted soldier training and the identification of difficult technical problems

and research issues (Levison & Pew, 1993). This was followed shortly with a more detailed examination of DI unit tasks and expected VE capabilities (Jacobs et al., 1994). With these reports as a basis, ARI initiated an in-house research program to investigate critical behavioral science research issues involved in dismounted soldier simulation. The initial four experiments were conducted to investigate interface effects on the capabilities of participants to perform simple tasks in VE. Variables investigated included the type of control device, amount of practice on the tasks, stereoscopic vs. monoscopic helmet mounted displays (HMDs), and type of display device (monitor, boom, HMD). Two experiments were then conducted that addressed the effectiveness of VE for teaching the configuration of and routes through large buildings, and the transfer of the knowledge acquired to the real world. These results led to the initiation of a program of basic research into the investigation of distance estimation in VE. ARI then investigated the use of VE to represent exterior terrain, both for training land navigation skills (identifying landmarks and learning routes), and performing threat assessments. This research is summarized in Knerr et al., (1998). The most recent research has investigated the use of VE for training team tasks, both in terms of training strategies and features (Lampton, McDonald, Rodriguez, Morris, & Parsons, 2001) and the effects of geographically distributed team members on training effectiveness (Singer, Grant, Commarford, Kring, & Zavod, 2001).

STRICOM VE Research

Dismounted Warrior Network (DWN) was a STRICOM program to develop a reliable, low-cost, easy-to-use capability to insert dismounted soldiers into VE. A series of engineering and user experiments were conducted during 1997 to explore the utility of a DWN system as a research and analysis tool and to investigate different interfaces for inserting dismounted soldiers into virtual simulations. A joint government-contractor team selected Virtual Individual Combatant Simulators (VICS) based on three criteria: a desire to have a diverse mixture of characteristics to examine; a cost/benefit assessment of system characteristics; and expected system availability. Following VICS selection, performance and interoperability issues were identified and resolved. Finally, the selected VICS, a DI Semi-automated Forces (SAF) station, an Exercise Support Station, and an After Action Review (AAR) Station were tied into a distributed interactive simulation (DIS) network and installed at the Land Warrior Testbed (LWTB), Fort Benning. An initial set of experiments was conducted using this configuration. They showed that the DWN could be used to assess the utility of the emerging “immersive” simulation technologies (Lockheed Martin, 1997a) both from a part-task engineering perspective and from a mission-oriented user perspective. ARI-SSRU and ARI-IFRU participated in the design and conduct of the experiments. (See Pleban, Dyer, Salter, & Brown, 1998.)

A follow-on project to DWN, entitled DWN Enhancements for Restricted Terrain (DWN ERT) focused on Military Operations in Urban Terrain (MOUT). New low-cost VICS were modified based on lessons learned in the first set of experiments. New locomotion methods were introduced, improved low-cost visual systems were incorporated, and new aiming techniques were implemented. In addition, DISAF was modified to support operations inside buildings. Experiments were conducted in July 1998 with these modified systems. The goal of this round of experiments was to investigate how well a fire team of VICS and DISAF could support MOUT tasks at the individual soldier, fire team, squad, and platoon levels. Engineering experiments, live tests at the McKenna MOUT site, and user experiments were conducted. The results are

documented in the DWN ERT Final Report (Lockheed Martin Corporation, 1998) and Salter, Eakin, & Knerr (1999).

ARL-HRED Research in Mobility Interface Devices

One component of the I-Port concept (Gorman, 1990) was an interface device that translated the soldier's movements into movement through the VE. This interface device was supposed to require the user to expend the same amount of physiological energy to move through the VE as would be required to move through the real environment. To demonstrate that such a device could be built, Sarcos Research Corporation built the Uniport™ in 1994..See Figure 1. On the Uniport, the user pedals to go forward and backward. Turning is accomplished by applying pressure to the side of the seat. The Uniport came to ARL-HRED and human factors studies were conducted in 1996 (Savick, Krausman, Leiter & Faughn, 1996 and Krausman, Savick, Leiter, Faughn & Knapik, 1997). Although the Uniport demonstrated the concept of an interface device that required the user to expend physiological energy to move through the VE, the user's movements on the Uniport (pedaling) are not as normal a motion for moving around the battlefield as walking or running.

Figure 1. The Uniport.

The Omni-Directional Treadmill (ODT) (Carmein, 1996) is a device that allows the user to walk and run in any direction See Figure 2..It was built in 1996 and demonstrated at the Annual Meeting of the Association of the U.S. Army (AUSA). During the demonstration, the soldier on the ODT interacted with other soldiers in a VE. The soldier on the ODT exerted himself physically to move through the VE much as he would to move through the real world. In contrast, the other soldiers were not exerting themselves very much physically to move through the VE. They were sitting at workstations and moving via joysticks.

Figure 2. The original Omni-Directional Treadmill (approximately 1997).

After the AUSA meeting, the ODT was taken to STRICOM and Fort Benning as part of the DWN and DWN ERT programs. In the Engineering Experiments and the User Experiments, the ODT was recognized as the locomotion interface device that permitted the most natural locomotion (Lockheed Martin Corporation, 1997). However, it also had some problems that limited its performance. The problems included misalignment of the user's heading with the vector along which the ODT returns the user to the center of the active area, false starts, overshooting stops, and difficulty side stepping and turning in place. It was also noisy, 85 dB(A)

at high speeds (Darken, Cockayne & Carmein, 1997). In 1998, the ODT was moved to ARL-HRED and these problems were addressed.

ARL-CISD Research in Dynamic Terrain

The ARL began research in dynamic terrain in 1996 with the Army Experiment 3 demonstration at the AUSA conference. Research in this area centers on distributed simulation methods and protocols, computational geometry, and real time graphics. In the area of distributed simulation, DIS protocols were investigated for efficiency in distributing dynamic terrain changes (Thomas, 1998). Work by Neiderer in efficient real time algorithms for computing holes in polygons (Neiderer, Thomas, and Pearson, 1998) enabled the simulation of wall breaching. Work by Neiderer and Hansen on distribution methods of rubble and debris (Neiderer & Hansen, 2001) is providing insight into the distribution problem.

The ARL-CISD contributed to the STRICOM DWN program by providing algorithms for wall breaching. Recent work with the VE STO with ARL, STRICOM, and ARL-HRED continues the development and transition of ARL developed distributed dynamic terrain research with the development of the Dynamic Terrain Server to include wall breaching, dings, rubble and debris, and physics-based wall damage.

STO Vision

The goal of the STO research is to develop a dismounted leader trainer at the fire team, squad, and platoon level. Leader trainees will be able to execute a series of realistic training scenarios (combat operations and support operations) in the simulator. Repeated practice, enhanced by training features, coaching, and AARs will build decision-making and coordination skills. Computer-controlled or semi-automated agents will represent subordinates, other friendly forces, enemy forces, and civilians. The intent is to have a training system that is realistic and effective, yet requires a fairly low level of personnel support for subordinates and role players.

History of the STO

During each year of the STO there have been two major types of activities: research and technology development, and preparation for and conduct of a culminating event (CE). The purpose of the CE is to insure the compatibility of the technologies under development and to obtain soldier feedback on their use. The first year CE was held at Fort Benning in September 1999. Its objective was to evaluate the improvements made in supporting technologies for Infantry soldier simulation since the DWN ERT experiments of 1998 (Lockheed Martin, 1998). The second year CE was held at the STRICOM Technology Development Center (TDC), and Institute for Simulation and Training (IST) at Central Florida Research Park, Orlando, FL in September 2000. The objectives of the second year CE were to insure that products were compatible and integrated, and to evaluate progress in DISAF behaviors, voice and gesture recognition, and night vision simulation. Specific training research issues were also investigated by ARI IFRU during this time (Pleban, Eakin, & Salter, 2000; Pleban, Eakin, Salter, & Matthews, 2001).

FY 01 Objectives

The FY 01 CE was held in September 2001 at Fort Benning, GA. As in previous years, the general objectives were to integrate and evaluate the technologies developed during the year. The specific technologies involved, and the evaluation objectives for each, are described briefly in the following paragraphs.

After Action Review (AAR) System

The key capabilities of this system are digital videodisc (DVD)-like replay with synchronized audio and video, including the capability to jump to pre-designated segments or views, and tabular data summaries. The aspects of the system to be evaluated were: its capability to capture and present information generated by other systems; its usability under reasonably realistic conditions; and its capability to provide the information requested by soldiers and AAR leaders.

Voice Recognition and Synthesis

Voice recognition was used by a Fire Team Leader to control DISAF subordinates. Voice synthesis was used by DISAF to acknowledge a command, indicate failure to understand a command, indicate completion of a task, or report that they have come under fire. Evaluation issues were recognition accuracy, correctness or appropriateness of DISAF response to the voice command, and appropriateness of the synthesized voice responses.

Soldier Visualization Station (SVS) Enhancements[1]

The SVS is a realistic immersive 3D virtual simulator described more fully in the approach section. Recent enhancements included the integration of dynamic terrain and the simulation of night conditions without the use of night vision devices. It also included the representation of streetlights and interior building lights, and the use of night tools such as flashlights and visible aiming lights. The evaluation issue was how the unaided night viewing compared with “normal” daytime simulations on criteria such as detection and recognition of objects and landmarks, movement rates, accurate use of weapons, and realistic appearance of the environment. See Pleban and Beal (2002) for a complete description of the simulated night vision goggle capability of the SVS.

Omni-Directional Treadmill (ODT)

The ODT is a complex locomotion interface. Aspects of the system to be evaluated were the ODT’s improved control algorithm, user interaction with the ODT, and its performance in general.

[1] The Infantry Center and School uses the term Squad Synthetic Environment (SSE) to describe the integrated set of dismounted solider simulators which are individually referred to by the developer (Reality By Design, Inc.) and developing agency (STRICOM) as the Soldier Visualization Station (SVS) and the Soldier Visualization Station Version 2 (SVS2). This report will use SVS to refer to an individual simulator, and SSE to refer to the integrated set of SVSs.

Dynamic Terrain Server (DTServer)

The DTServer provides a means to blow holes in buildings sized appropriately for the munition and building material and to create rubble in addition to the hole. Evaluation issues were: the comparability of the results (hole size and shape) across the various platforms in the CE; the comparability of the implementation in both the visual and structural (Compact Terrain Database (CTDB), for DISAF) databases; the perceived realism of the holes and rubble; and the impact of rubble on movement (both human and DISAF).

Dismounted Infantry Semi-Automated Forces (DISAF)

In addition to establishing compatibility with the DTServer, improvements were made to DISAF to reduce operator workload and add two new behaviors, Withdraw and Tactically Correct Default Behavior. Evaluation Issues were the appropriateness and realism of the new behaviors, and their impact on DISAF operator workload.

Mission Planning and Training Tool (MPTT)

MPTT was used as a demonstration and mission-planning tool. The primary evaluation issue was the perceived value of the demonstration.

Approach

The Virtual Environments for Dismounted Soldier Simulation STO FY 01 CE was held at the Dismounted BattleSpace BattleLab LWTB, Fort Benning. The first four days were devoted to equipment set-up, integration, and testing. Five days conducting scenarios with Infantry soldiers followed, with one group of six soldiers participating for one day, and two groups of six soldiers participating for two days each. The final day was devoted to packing and shipping equipment. In addition to the government organizations already identified, Boston Dynamics, Inc., CSC, Inc., Reality by Design, Inc., TRW, Inc., and IST supported the CE.

Technological Capabilities Evaluated in the FY 01 CE

AAR System

The AAR System was developed by ARI and IST to meet two needs. The first is to provide trainees with a common understanding of what happened during an exercise and why it happened, so that they can identify ways to improve their performance. Determining what happened during an exercise is particularly difficult in a MOUT environment, where buildings and other structures break up the visual field and limit the portion of the battlefield that can be observed by any one person. The second need is to facilitate data analysis, in order to support training feedback and research and development.

The AAR system connects to the network used by the soldier simulators and DISAF, and permits observation and recording of the exercise data. It was based on an earlier AAR system developed to support team training research (Lampton & Parsons, 2001). Among the key features of the baseline system were the use of a top-down view, digital data recording to permit immediate jumps to any point in the exercise, and the synchronized recording in digital form of the auditory communications. A number of enhancements were added to this baseline, in part to incorporate lessons learned from AAR systems for mounted soldiers, and in part to meet the additional requirements presented by dismounted MOUT operations.

Whether in the stealth (recording) or AAR (playback) mode, an enhanced top-down view is the primary view and organizing structure. See Figure 3. In the stealth mode, the operator can mark or flag events and viewpoints, fly freely through the environment, teleport to pre-selected viewpoints, zoom in and out, capture “snapshots” for later viewing, and toggle on and off information such as movement traces and individual identifiers. Individual floors of multi-story buildings can be selected for viewing. In the AAR mode, the operator can do all of those things and in addition, change viewing speed and location, and jump forward or backward to flagged events or times. A variety of exercise data can be shown in either tabular or graphic form, such as Killer/Victim tables.

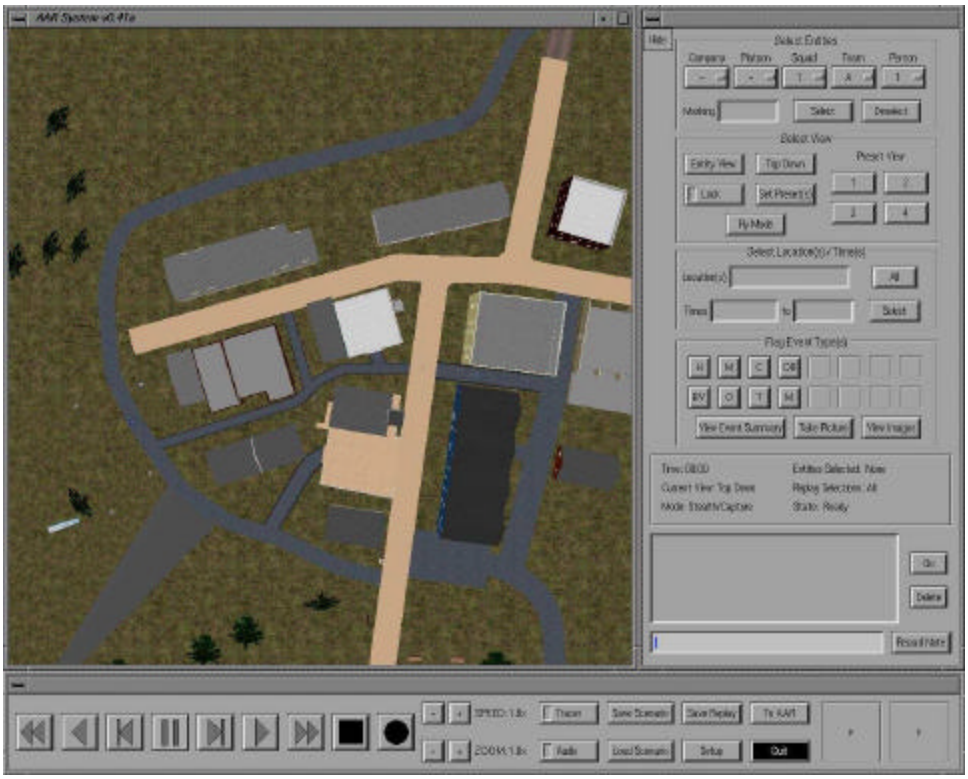

Figure 3. AAR system main display.

SVS Enhancements

The SVS is an evolving immersive 3D virtual simulator. The SVS uses a PC-based rear-screen projection system to present 32-bit color images in 1024 X 768 resolution on a screen approximately 10 feet wide by seven and one-half feet high to display the VE. The soldier can stand, kneel, or lie prone within a ten-foot square enclosure, but typically remains centered in that space. The immersed soldier's head and weapon are tracked using an acoustic and inertial tracking system. The soldier navigates through the environment via a thumb switch located on the weapon. Figure 4 shows a soldier in an SVS. As part of the integration effort, the updated version of the SVS was installed at Fort Benning. This version of the software included these new capabilities: streetlights, internal building lights, flashlights, visible and non-visible laser aiming lights, and dynamic terrain implementation.

Street Lights. Reality by Design modified existing 3D OpenFlight databases to include scene illumination from streetlights. The ability for lights to be "shot out" was incorporated to improve movement at night by DI equipped with night vision devices.

Internal Building Lights. The work done for "Street Lights" was very similar to that of "Internal Building lighting". The same rules and functionality apply. Interior building lighting may also be "shot out".

Figure 4. Soldier in an SVS.

Flashlights. Reality by Design developed the capability for the DI to use simulated flashlights in the simulator. The immersed user could turn on his flashlight and it would appear that there was a flashlight attached to the end of the weapon. The flashlight beam is visible to all networked SVS simulators, but not to DISAF.

Visible Laser Aiming Light. The immersed soldiers had the ability to use visible aiming lights, which displayed a simulated laser beam visible on the object or entity at which it was pointed. These aiming lights were visible to both networked SVS simulators and DISAF.

Non-Visible Laser Aiming Lights. Much like the Visible Laser Aiming Light, the immersed user could use the Non-Visible Laser Aiming Lights. This aiming light is only visible to those using SVS systems using image intensification (I2) or night vision goggle (NVG) simulation. None of the CE scenarios used aided night vision capabilities, or consequently, the Non-Visible Laser Aiming Lights.

Dynamic Terrain. The SVS simulators had the capability to display the effects of holes being blown in buildings. This approach works in conjunction with ARL's DTServer. When a detonation Protocol Data Unit (PDU) is received by the DTServer the correct physics based hole is created. This information is passed over the network and the receiving SVS simulators modify their 3D visual model to incorporate the hole. In addition to the blown hole data, data representing the location of rubble is sent to the SVS simulators which in turn display rubble in the proper location.

Figure 5. The Omni-Directional Treadmill with the sound enclosure.

Dynamic Terrain

The DTServer made its debut at the FY 01 CE. The DTServer is Linux-based software that receives Detonation PDUs from the DIS network, processes the data, and distributes the results to other simulators on the network. The DTServer transmits two types of results to receiving simulators on the network. The first is a 'ding' packet. A 'ding' results from small arms fire on a hard surface. Upon receipt of a ding packet, the simulator displays a model of a simulated crater at the point of impact.

The second result transmitted by the DTServer is a breach. A breach in the FY 01 CE resulted from an AT8 round impact on a building. The receiving simulators received a Breach PDU followed by a series of Polygon Vertex PDUs. When all Polygon Vertex PDUs were received, the simulators removed the polygons in the breach area, and replaced them with the new polygons received on the network.

The development of the DTServer provided the necessary capability to compute and distribute dynamic terrain changes to the simulation network. The use of a server allows the addition and modification of algorithms without changes to other simulators on the network, reducing the costs of implementing dynamic terrain.

Omni-Directional Treadmill

The ODT used in the FY 01 CE is an improved version of the original ODT (Carmein, 1996). In 1998, the ODT was moved to ARL HRED, where a new control algorithm was developed for it. This control algorithm reduces the problems originally encountered with the device (misalignment of the user's heading, false starts, overshooting stops, and difficulty side stepping and turning in place). Also, an enclosure was built to attenuate the noise coming from the ODT. The enclosure surrounds the ODT except for an opening around the active area. The enclosure is made of plywood and lined with acoustic foam. See Figure 4. For the FY 2001 CE, the ODT was returned to the LWTB. There it was networked with the other systems so that all of the soldiers interacted in the same VE.

DISAF and Enhancements

DISAF was developed to provide a realistic representation of DI on the virtual battlefield. The Infantry capabilities of simulations such as Simulation Network (SIMNET) SAF and Modular SAF (ModSAF) were limited to the low-fidelity viewpoint of tanks. The primary focus of DISAF has been the development of tactical behaviors for individual through squad level operations. DISAF is based on the ModSAF architecture. DISAF includes support for MOUT and rural terrain operations. Most of the DISAF behaviors are based on validated military Combat Instruction Sets (CISs). A database development process was developed to generate ModSAF Compact Terrain Database (CTDB) Multiple Elevation Surface (MES) structures from visual database files. DISAF provides an enhanced 2D Plan View Display (PVD) to support display of MES buildings and new Individual Combatant (IC) icons. In addition, DISAF can be networked to a Stealth Viewer to provide a 3D display. DISAF runs on a SGI under IRIX 6.2 or on a PC under Linux or Windows NT. DISAF capabilities and behaviors are summarized in Table 1. Efforts during FY 01 focused on enhancements to the Immediate Intervention Manager (IIM), integration of the DTServer capability, and a new Hasty Withdraw behavior. The IIM was developed to provide a mechanism by which the DISAF Operator could make changes to DISAF activities quickly and easily. The newly added functionality of the IIM is detailed below in Table 2.

Table 1.
DISAF Capabilities and Behaviors

<table>
<tr>
<td rowspan="2">DISAF/CGF – Capabilities Entities and Units
• US IC w/ M16A2 & Hand Grenade
• US IC w/ AT8 & Hand Grenade
• US IC w/ Squad Automatic Weapon (SAW) & Hand Grenade
• US IC w/ M203 & Hand Grenade
• US IC Fireteam A (M16, AT8, M203, SAW)
• US IC Fireteam B (M16, M16, M203, SAW)
• US IC Fireteam C (M16 x 3, SAW)
• US IC Auto Weapons Team (M16 x 2, SAW)
• US IC Squad (M16, Fireteam A, Fireteam B)
• US IC Rifle Squad (M16, Fireteam B x 2)
• US IC Auto Weapons Squad (M16, Auto Weapons Team x 3)
• US IC Platoon (M16 x 2, Rifle Squad x 3, Auto Weapons Squad)
• USSR IC AK47
• USSR IC Squad (AK47 x 6)
• Civilians
• Furniture</td>
<td>Plan View Display (PVD)
• Greater Zoom-In Capability (1:25 Map Scale)
• View Multiple Elevation Structures (MES) interiors, one level at a time
• MES windows, doors, and openings are distinguished by color
• Can display entity altitude to indicate MES level
• IC icons indicate posture and weapon position</td>
</tr>
<tr>
<td>Situation Awareness

IC Sensors
• Aural: detects and locates entities from movement and gunfire
• Visual: identifies and locates entities

Remembered Threats
• Visible entities
• Entities located, but not visible
• Entities known, but not located</td>
</tr>
<tr>
<td>BLUFOR Behaviors
• Halt
• Fire & Movement
• Throw Grenade
• Occupy Position
• Fire at Location
• React to Ambush
• Suppressive Fire
• React to Contact
• Move on Path
• Break Contact
• Mount / Dismount
• Clear Room
• Move Tactically
• Climb Up / Down</td>
<td>Autonomous OPFOR Behaviors
• Look Around
• Face Bogey
• Engage Threat
• Seek Cover
• Watch
• Engage from Cover
• Fall Prone & Freeze
• Freeze
• Pursue Threat</td>
</tr>
<tr>
<td>Automated MOUT Behaviors
• Fireteam Clear Room
• Squad Clear Room</td>
<td>Autonomous Civilian Behaviors
• React to Fire
• Wander</td>
</tr>
</table>

Table 2.
DISAF Immediate Intervention Manager Functional Capabilities

Behaviors	**Increasing Spacing**	**Decrease Spacing**	**Speed Up**	**Slow Down**	**Change Formation**	**Change Stance**	**Increase Duration of Rapid Fire**	**Decrease Duration of Rapid Fire**	**Shift Fire Up**	**Shift Fire Down**	**Increase Duration of Fire**	**Decrease Duration of Fire**
Traveling	X	X	X	X	X							
Suppressive Fire							X	X	X	X	X	X
Advance to Position	X	X	X	X	X							
Attack by Fire	X	X	X	X	X							
Assault	X	X	X	X	X							
Road March	X	X	X	X	X							
Hasty Occupy	X	X	X	X								
Fire and Movement	X	X			X							
Break Contact	X	X			X							
Manual Clear Room			X	X								

Mission Planning and Training Tool (MPTT)

MPTT is software system for rapid creation of 3D scenarios with realistic human entities. It is being developed under a STRICOM sponsored Small Business Innovative Research (SBIR) project. It is intended to be used for mission planning, mission rehearsal, training, course of action analysis, and AAR. MPTT provides human entities that are intelligent about how they move and accept high-level commands. The software operates in real time, runs on ordinary PCs, has support for DIS/HLA, and provides realistic 3D visualization. MPTT was incorporated in the CE as a stand-alone capability to demonstrate a mission for the soldiers prior to their execution of it. An MPTT display is shown in Figure 6.

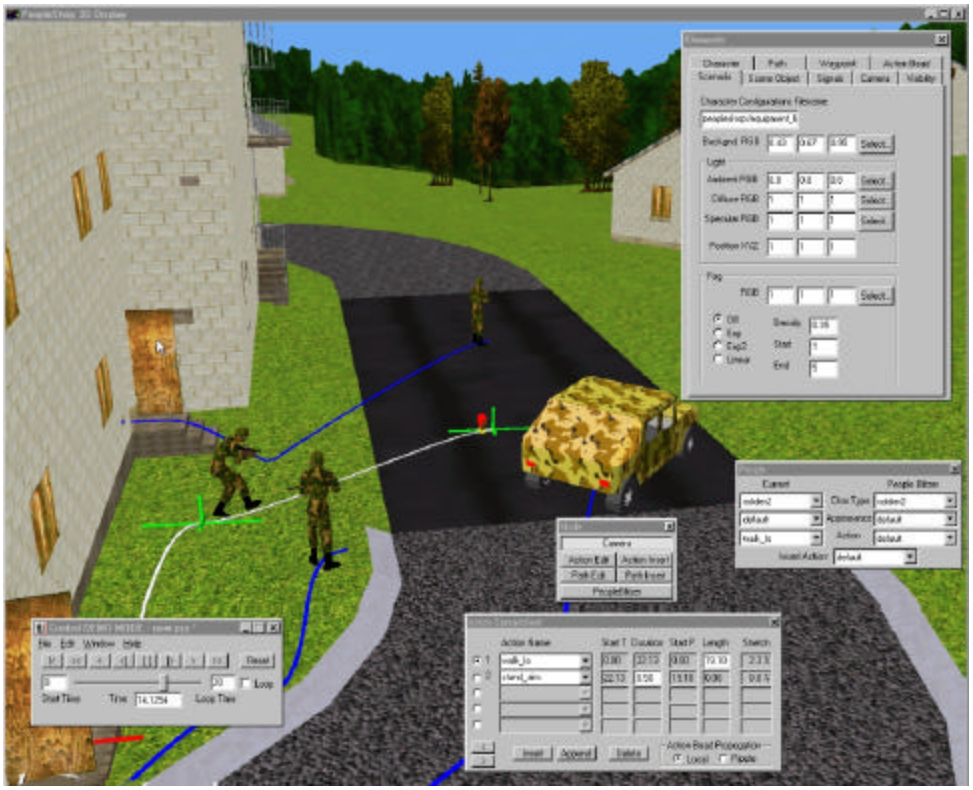

Figure 6. MPTT display.

Voice Control of DISAF

The goal of the Reusable HLA Voice Input/Output Capability for Human Simulation project is to further develop a Voice Recognition Federate (VRF) which allows a user to give spoken commands to SAF entities in the simulation. The VRF translates these voice commands to natural language text and then to commands that the SAF system can accept.

The first year of effort (FY 00) focused on two modes of voice interaction with DISAF. The first mode allows a SAF operator to use voice to control the graphical user interface (GUI) for the SAF. Operator commands include typical GUI commands such as "zoom in" and "zoom out." The second mode allows a small unit leader to use voice to control the DISAF with command and control commands. Normally the leader is in a fully immersive VE, but the same voice commands can be used from the SAF GUI. The leader is able to command the SAF using voice and receives feedback from them via text to indicate the orders were received and understood. The commands include "move to point echo", "follow me", "halt", and "hold fire". This allows the small unit leader to coordinate and control virtual ICs without additional operator intervention. Both modes can also be used simultaneously by a small unit leader sitting at the SAF GUI, who manipulates the SAF GUI and issues orders to the virtual ICs.

The second year of the effort extended the VRF system in the following ways. First, DISAF was modified to allow SAF entities to initiate and respond to speech appropriately based on their behavior. Second, the VRF was extended to include voice commands for selected new

DISAF behaviors, and to allow more natural identification of CGF entities and terrain locations. Third, off the shelf natural language products were incorporated into the system. Finally, the VRF was modified to better support multiple human and automated speakers.

Expanded Speech Synthesis Capability. The goal of this task was to allow DISAF entities to communicate more realistically with the user. These expanded capabilities allowed DISAF entities to reply to speech addressed to them and to initiate speech when appropriate.

Extend the Army IC Speech Set. The speech set was modified so that DISAF entities can be identified by a natural human name (e.g., "PVT Smith"). Voice commands can then be directed to a DISAF entity using this name. The way that terrain locations are specified was also modified to be more realistic. Important terrain features are identified prior to run-time and assigned feature names (for example, "corner of building A"). Voice commands can then refer to these feature names rather than specifying (x, y, z) coordinate values.

Evaluate Commercial-off-the-Shelf (COTS) Products for Natural Language Understanding. Commercial speech recognition products were evaluated for inclusion in the system. DragonSpeak was selected and incorporated.

Accommodate Multiple Speakers. The VRF was generalized to allow multiple speakers. Mechanisms were developed to allow a speaker to designate to whom he is speaking, and then require the addressed entity to appropriately "subscribe" to speech addressed to them.

The Culminating Event Network

The network configuration for the CE is shown in Figure 6. The following items were connected to the network:

- Five SVS individual soldier simulators. These were used by the squad leader, the two fire team leaders, and two of the three Fire Team A members. The simulators were identical, except for additional equipment in the Fire Team B leader's area for the voice recognition system. All SVSs were equipped with ASTi™ radio headsets, which permitted verbal communication on up to two channels, depending on the duty position. The squad leader could talk to his fire team leaders and the platoon leader (a role player). Each fire team leader could talk to the squad leader and his subordinates. Fire team members could talk among themselves and with their fire team leader.
- One ODT station, with DISim as the network interface and image generator. The third A fire team member used this simulator. Like the SVSs, this station was equipped with an ASTi™ radio headset.
- One Voice Recognition PC
- One AAR System PC
- One Dynamic Terrain Server
- One BattleMaster/DISAF Operator Station. The DIS SAF Operator and the Exercise Controller used this station.
- One Desktop SVS used by a role player.

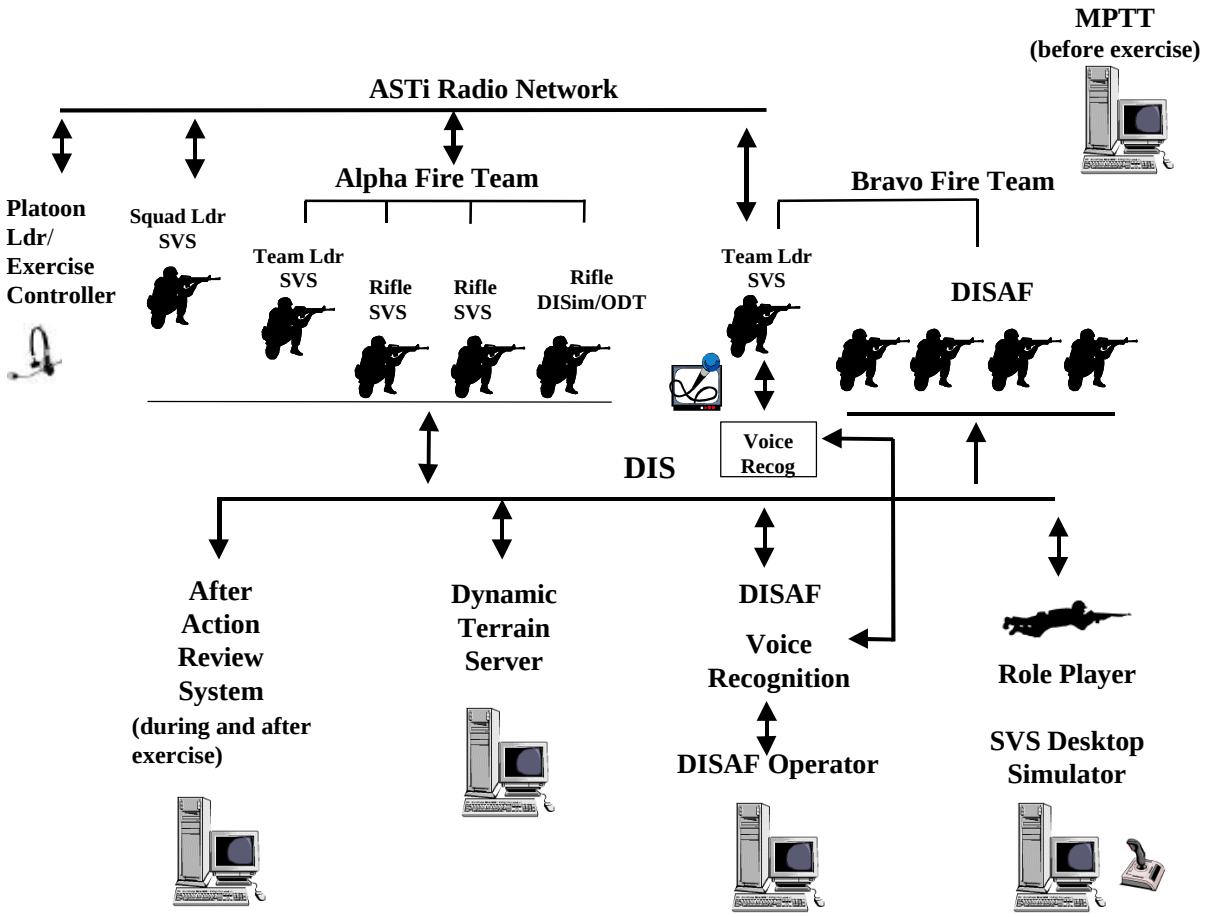

Figure 7. CE system configuration.

Scenarios

A general situation and eight different scenarios were developed for the CE. The general situation, in the form of a "Press Release", was provided to each new group of soldiers (exercise participants) before they began their training. This helped to provide a background overview as to why they were executing the various scenarios. The general situation is described in the paragraphs below.

> *The U.N. Protection Force continues to closely monitor conditions in the town of Dlubac located in the providence of El Polksa. Rebel forces from the radical nationalist group Black Sabbath have been linked to several terrorist bombings and attacks on the nearby towns. The strategic importance of Dlubac, overlooking one of the major routes entering El Polksa, makes this town a prime target for rebel activities. The U.S. 1-11th Infantry Battalion attached to the U.N. Protection Force has been tasked with coordinating U.N. activities within the region.*
>
> *Enemy forces have withdrawn from the town of Dlubac. There may still be insurgents and insurgent sympathizers within the town's population. Enemy*

presence is considered light, capable of conducting military operations in the immediate region with squad-size forces. There is no mechanized or motorized or indirect fire threat. Last reported enemy activity in the region was sniper fire in the neighboring town of Tuskin, 8 kilometers to the northwest, 3 days ago.

Your unit is always the 2d Squad of the 2d Platoon, Company A.

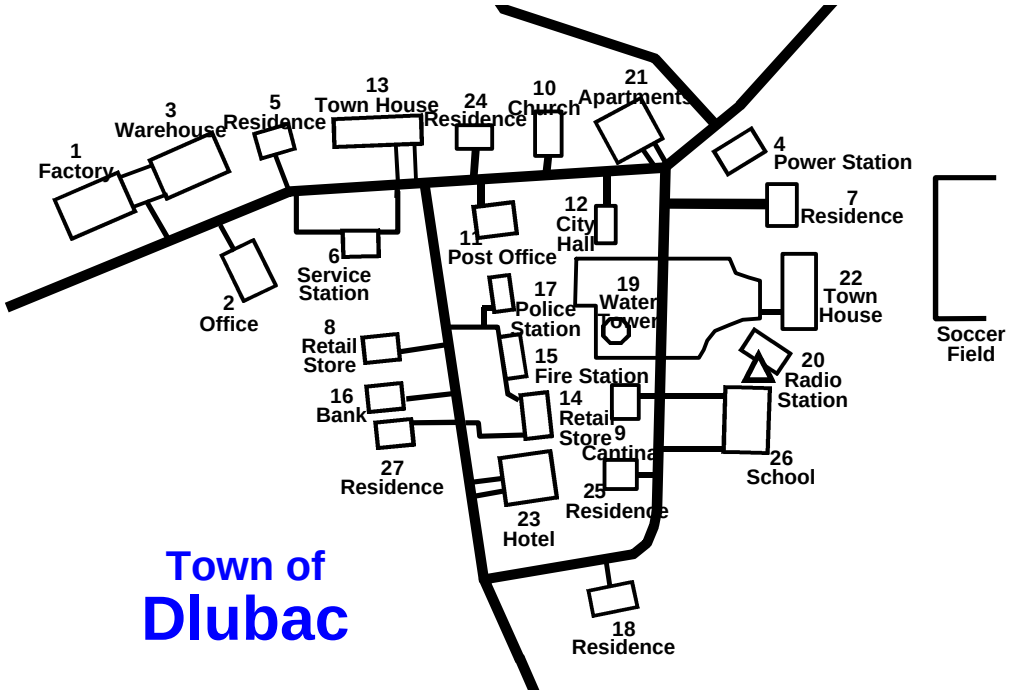

Figure 8. Map of the town of Dlubac.

Each of the scenarios was designed to be about 20 minutes in duration. They focused specifically on necessitating the soldiers to use the various new devices and capabilities in the VE. Each scenario provided a different mission so the capabilities would be used under differing circumstances. Scenarios were also designed to actively involve as many players as possible. Seven of the eight scenarios took place in the town of Dlubac itself. Dlubac was in fact a virtual representation of the Shughart-Gordon MOUT facility at Fort Polk, LA. A map is shown in Figure 8. The eighth scenario took place in a high-rise office building described as being in an adjacent town. The scenarios covered a variety of wartime and Support and Sustainment Operations (SASO). The descriptive scenario titles were:

- Support Operations Checkpoint
- Hostage Rescue
- Support by Fire
- Assault and Clear a Building
- Roving Patrol
- Air Assault and Clear a Building
- Crowd Control

- Downed Helicopter

Complete scenario descriptions are in Appendix B.

Questionnaires and Performance Measurement

The questionnaires used are briefly described below. All questionnaires are in Appendix C.

The *Demographic Questionnaire* contains 18 questions about the soldier's military career, training, personal characteristics, and experience with simulators.

The *SAF Performance Questionnaire* contains 17 items comparing the performance of SAF with that of real soldiers. Response alternatives are *Much Worse than soldiers, Slightly Worse than Soldiers, About the Same as Soldiers, Slightly Better than Soldiers,* and *Much Better than Soldiers.*

The *Simulator Capability Questionnaire* is a multi-part questionnaire covering a variety of topics. One set of 52 items asked soldiers to rate their ability to perform various tasks in the simulators (*Very Good, Good, Poor, Very Poor*). The balance of the questionnaire items to were rated on a five-point scale of *Strongly Agree* to *Strongly Disagree* and covered dynamic terrain (11 items), SVS enhancements (7 items), the AAR system (2 items), MPTT (2 items), and artificial lighting (9 items).

The *Training Effectiveness Questionnaire* contains 11 items asking how much improvement in task performance resulted from the day's exercises (*No Improvement, Slight Improvement, Moderate Improvement,* or *Vast Improvement*), and nine items asking about the realism of the scenarios (*Not Very Realistic, Slightly Realistic, Fairly Realistic,* or *Very Realistic*).

The *Voice Recognition Questionnaire* contains nine items on the use of the voice recognition system, seven rated on a five-point scale of *Strongly Agree* to *Strongly Disagree*, and two items asking for percentages.

The *AAR Evaluation Questionnaire* contains items on the use of the AAR system. Eight were rated on a five-point scale of *Strongly Agree* to *Strongly Disagree*, and four were open-ended.

The *Symptom Checklist* is a list of symptoms used to assess simulator sickness. It is a modified version of a checklist developed by Kennedy et al. (1993). Each of 16 symptoms is rated as *None, Slight, Moderate,* or *Severe*. The modification was the replacement of the single symptom "sweating" with "cold sweating" and "warm sweating."

The *ODT Questionnaire* and the *SVS Questionnaire* were administered to soldiers who used both the ODT and the SVS. Each contains 17 questions. Twelve items asked

the soldiers to rate their ability to perform tasks on each simulator on a five-point scale (*Very Poor, Poor, Fair, Good, Very Good*). Four items asked about the frequency of occurrence of events during the exercises (*Never, Hardly Ever, Sometimes, Usually, Always*). One item asked about the speed of the simulator (*Too Slow, About Right, Too Fast*).

A *Structured Interview* was used to obtain additional information. All leaders and most soldiers participated in a structured interview on the last day after the questionnaires had been completed. A *locomotion system debriefing session* was held to obtain more feedback from the soldiers regarding the ODT and SVS as locomotion interfaces.

Because the objective of the culminating event was to evaluate how well the technologies performed, rather than how well they trained, no attempt was made to collect soldier performance data.

Chronology of Soldier Activities

The daily schedule for the soldier participants is shown in Appendix D. Upon their arrival at the LWTB on their first (or only) day of participation, the soldiers were given an introductory briefing which described: the overall purpose of the exercises; the nature of the performance and questionnaire data to be collected, and the procedures that would be followed to insure the privacy of information collected; safety procedures; and administrative information. The soldiers then completed two questionnaires, the demographic questionnaire and the symptom checklist. They were assigned duty positions for the exercises based on their rank: Squad Leader, Fire Team A Leader, Fire Team B Leader, or Fire Team A Member.

All soldiers next received approximately one hour of instruction and practice on the use of the SVS. A live instructor provided the instruction. The major tasks are shown in Table 3.

After the completion of the SVS training, additional training was conducted on three parallel tracks. The three fire team members received training in the use of the ODT. Two of these soldiers would use it during the exercises. The third was trained so that he could serve as a back up. During the ODT training sessions, each soldier had approximately 20 minutes to use the ODT and become familiar with it. The two fire team leaders received training in the use of the voice recognition and synthesis system to control DISAF. The Fire Team B Leader would use it during the exercises. The other was trained as a back up. Finally, the Squad Leader received training and background information on the general situation for the upcoming exercises, and reviewed MOUT tactics and procedures. This completed the morning session.

In the afternoon the soldiers completed three exercises: one familiarization exercise and two training exercises. Each exercise session consisted of a verbal delivery of the mission order by the Instructor/Controller, usually supplemented by a demonstration using MPTT. The Squad Leader, supported by an operator, also used the MPTT to brief the squad. Soldiers then moved to their simulators (either SVS or ODT) and calibrated their weapons. The exercise was conducted. The soldiers then reported to the AAR station where the Instructor/Controller conducted an AAR. Soldiers were then given a break prior to starting the next exercise sequence.

Table 3.
SVS Tasks Trained

Postures • stand • kneel • crouch • prone	**Weapons calibration and use** • calibrate weapon • engage stationary target • engage moving target • engage stationary target while moving • reload
Change view/orientation while in position	**Auditory weapons recognition**
Basic locomotion (open terrain) • walk • run • crawl • crouch-walk	**Visual recognition** • friendly • enemy • civilians

Advanced locomotion (urban areas)
• doors
• windows
• stairs
• rubble
• stacking
furniture and other obstacles
	Visual Effects
	• night
	• lighting
	  • streetlights
	  • interior lights
	  • flashlights
	  • shooting out lighting
	• tracer fire

Whether they participated for one or two days, all soldiers were given the same questionnaires at the completion of their last day. These questionnaires consisted of

- Simulator Capability Questionnaire
- Training Effectiveness Questionnaire
- AAR Evaluation Questionnaire
- SAF Performance Questionnaire (Squad and Fire Team Leaders only)
- Voice Recognition Questionnaire (Fire Team B Leader only)
- Symptom checklist

The four soldiers who used the ODT over a two-day period also completed an ODT Questionnaire and an SVS Questionnaire, and participated in an ODT debriefing.

Additional questionnaires were administered to those soldiers who participated for two days. At the completion of their first day they were administered the Training Effectiveness Questionnaire and the Symptom Checklist. On the morning of the second day they were again administered the symptom checklist.

Results

Soldier Characteristics

The participants in the exercises were 18 Infantry soldiers in MOSs 11M and 11B, and in pay grades E-3 (6 soldiers), E-4 (7), and E-5 (5). Their average age was 23 years. They had a mean time of 45 months in the Army, and 15 months in their current duty position. Of the 18, 17 were right-handed, 17 had normal color vision, and 16 reported 20/20 vision (natural or corrected). Eight of the soldiers (four E-5s and four E-4s) were currently assigned as Team Leaders. Six soldiers (all of the E-5's and one of the E-4's) had completed a Primary Leadership Development Course, 15 had completed the Combat Lifesaver Course, 13 had completed Close Quarter Combat Training, and 4 had completed airborne training. None of the soldiers had completed a Basic Non-Commissioned Officer Course. One-half of the soldiers (two E-5s, two E-4s, and five E-3s) had received MOUT training at the McKenna MOUT site at Fort Benning since the completion of Basic training. None of the groups of soldiers were composed of members of the same organic squad.

Questionnaire Data

Simulator Capabilities

The responses to the Simulator Capability Questionnaire, which was completed by all soldiers, are summarized in Table 4. The means were calculated by assigning a response of *Very Poor* a value of 0, *Poor* a value of 1, *Good* a value of 2, and *Very Good* a value of 3. Not all soldiers responded to every question. Mean responses to the same items in the FY 99 CE are shown for comparison. The simulators used during the 1999 VE STO were an earlier version of the SVS. The questionnaire items are listed in order of descending FY 01 mean value.

Only 14 of 52 tasks were rated *Good* or higher (mean equal to or greater than 2.0). The more highly rated tasks consisted of identification of types of people (such as civilians and non-combatants) and tactically significant areas, imprecise movement, and communication. The lower rated tasks consisted of precise or rapid movement, including aiming, distance estimation, and locating the source of enemy fire using either visual or auditory cues. The overall mean rating of 1.74 was lower than the 1999 mean of 1.90, but higher than the 2000 mean of 1.63. It was not feasible to retrieve the prior years' data and conduct tests of the significance of these differences. However, it was possible to construct 95% confidence intervals around the 2001 means for each item and determine if the 1999 data fell outside of those intervals. Only one mean did. The item "Identify areas that mask supporting fires" had a higher mean in 2001 than in 1999 (2.00 vs. 1.72). Nevertheless, the general but non-significant trend was for a decrease in item ratings from 1999 to 2001.

Since 6 of the 18 soldiers had also experienced the ODT, there was the possibility that the means were lower because they reflected a combination of SVS and ODT

experience, not just the SVS alone. The soldiers who had used the ODT were removed from the sample and the means were recalculated. The overall mean for the new smaller sample was slightly lower than the full sample (1.67 vs. 1.74), indicating that the ODT did not contribute to the lower overall simulator ratings in 2001.

Table 4
Simulator Capability Questionnaire Responses.

Task	VE STO 1999 Mean	VE STO 2001			Change 2001-1999
		Mean	N	SD	
Move through open areas as a widely separated group.	2.38	2.33	18	0.69	-0.05
Move according to directions.	2.17	2.29	17	0.68	0.12
Understand verbal commands.	1.94	2.29	18	0.68	0.35
Identify civilians.	2.72	2.22	18	0.73	-0.50
Identify sector of responsibility.	2.11	2.17	17	0.61	0.06
Identify safe and danger areas.	2.22	2.11	18	0.68	-0.11
Identify non-combatants within a room.	2.24	2.06	18	0.48	-0.18
Execute planned route.	1.89	2.06	18	0.64	0.17
Maintain position relative to other team members.	1.78	2.06	18	0.72	0.28
Assume defensive positions.	2.06	2.00	18	0.58	-0.06
Communicate spot reports to squad leader.	1.94	2.00	18	0.70	0.06
Coordinate with other squad members.	1.88	2.00	18	0.69	0.12
Determine other team members' positions.	1.78	2.00	18	0.88	0.22
Identify areas that mask supporting fires.	1.72	2.00	18	0.00	0.28
Take position to one side of a doorway.	2.11	1.94	18	0.79	-0.17
Identify assigned sectors of observation.	2.06	1.94	17	0.64	-0.12
Move in single file.	2.00	1.94	18	0.72	-0.06
Identify covered and concealed routes.	1.94	1.94	18	0.64	0.00
Scan from side to side.	1.72	1.94	18	0.88	0.22
Fire weapon in short bursts.	2.00	1.89	18	0.75	-0.11
Communicate enemy location to team member.	2.06	1.89	18	0.81	-0.17
Move quickly to the point of attack.	1.94	1.89	18	0.46	-0.05
Locate assigned areas of observation, e.g. across the street.	2.17	1.88	17	0.69	-0.29
Move past furniture in a room.	1.56	1.86	14	0.72	0.30
Execute the assault as planned.	1.89	1.83	18	0.78	-0.06
Locate buddy team firing positions.	1.94	1.78	18	0.64	-0.16
Locate support team positions.	2.00	1.72	18	0.67	-0.28
Take a tactical position within a room.	1.83	1.72	18	0.81	-0.11
Aim weapon.	2.28	1.71	17	0.76	-0.57
Take hasty defensive positions.	1.89	1.71	17	0.76	-0.18
Engage targets within a room.	2.06	1.61	18	0.77	-0.37

Note: 1999 N=18.

Table 4. (continued)
Simulator Capability Questionnaire Responses

Task	VE STO 1999 Mean	VE STO 2001			Change 2001-1999
		Mean	N	SD	
Maneuver below windows.	2.06	1.61	18	0.77	-0.45
Identify enemy soldiers.	2.44	1.53	17	0.92	-0.91
Maneuver close to others.	1.65	1.50	18	0.87	-0.15
Move quickly through doorways.	1.61	1.50	18	0.83	-0.11
Move close to walls.	1.56	1.41	17	0.92	-0.15
Maneuver around obstacles.	1.67	1.39	18	0.82	-0.28
Fire weapon accurately.	1.78	1.35	17	0.91	-0.43
Maneuver past other personnel within a room.	1.55	1.33	18	0.76	-.022
Scan the room quickly for hostile combatants.	1.76	1.29	17	0.82	-0.47
Look around corners.	1.47	1.29	17	0.87	-0.18
Distinguish between friendly and enemy fire.	1.61	1.28	18	0.81	-0.33
Estimate distances from self to a distant object.	1.72	1.22	18	0.89	-0.50
Scan vertically.	1.11	1.12	17	0.90	-0.01
Maneuver around corners.	1.67	1.06	18	0.79	-0.61
Determine the source of enemy fire by sound.	1.78	1.06	18	0.92	-0.72
Visually locate the source of enemy fire.	1.44	0.83	18	0.87	-0.61
Climb up or down ladders.		1.92	12	0.53	
Locate enemy soldiers inside buildings firing at your unit.		1.71	17	0.76	
Climb up or down stairs.		1.55	17	0.92	
Determine the direction enemy rounds are coming from.		1.06	18	0.88	
Mean	1.90	1.74			

Note: 1999 N= 18.

AAR System

The AAR system was positively received. More than 83% of the soldiers agreed or strongly agreed that the AAR system:

- Was effective in displaying movement outside of buildings
- Was effective in displaying movement inside of buildings
- Made it easy to determine what happened during a mission
- Made it easy to determine why things happened the way they did during a mission
- Made it easy to determine how to do better in accomplishing the mission
- Helped them understand what occurred during the exercise, and
- Was more effective than conducting an AAR without any audio or visual playback (just talking)

The least positive comment about the AAR system was that 56% agreed or strongly agreed that it was effective in replaying communications. Since the communications played by the AAR system were rarely intelligible (as will be discussed later), this suggests that the ratings

for the AAR system benefited from a positive "halo effect." The soldiers had a generally favorable impression of the AAR system, and tended to rate it on the basis of that impression, as well as the specific item being rated. Since the AAR system was a new capability this year, there is no comparison with previous years.

DISAF Performance

DISAF performance was rated by the squad leaders and the fire team leaders. Mean ratings were calculated by assigning *Much Better than Soldiers* a value of +2, *Slightly Better than Soldier*s a value of +1, *About the Same as Soldiers* a value of 0, *Slightly Worse than Soldiers* a value of –1, and *Much Worse than Soldiers* a value –2. Results are shown in Table 5. Overall, the DISAF were rated the same as two years ago: -.79, or "Slightly Worse than Soldiers." The highest rated tasks were distinguish between friendly and enemy positions, move to designated location, locate known or suspected enemy positions, clear a building, fire weapons accurately, and clear a room. The lowest rated tasks were support by fire, maintain position relative to other squad members, change formation, take hasty defensive positions, communicate information to squad leader, and react to ambush. The tasks that showed the most improvement were distinguish between friendly and enemy positions, clear a room, clear a building, and locate known or suspected enemy positions.

Table 5.
DISAF Behavior Ratings

SAF Behavior	**1999 Mean**	**2001 Mean**	**2001 N**	**2001 SD**	**Change 2001-1999**
Distinguish between friendly and enemy positions.	-0.90	0.22	9	1.40	1.12
Move to designated location.	-0.10	-0.13	8	0.78	-0.03
Locate known or suspected enemy positions.	-1.10	-0.22	9	1.23	0.88
Clear a building.	-1.33	-0.38	8	1.11	0.95
Fire weapons accurately.	-0.40	-0.43	7	1.18	-0.03
Clear a room.	-1.44	-0.44	9	1.07	1.00
Deliver suppressive fire.	-0.80	-0.88	8	1.05	-0.08
React to contact.	-1.00	-0.89	9	0.99	0.11
Move through open areas.	-1.00	-1.00	8	1.12	0.00
Perform fire and movement.	-0.67	-1.00	7	0.76	-0.33
Move through built-up areas.	-0.67	-1.00	9	0.94	-0.33
React to ambush.	-0.88	-1.11	9	0.87	-0.23
Communicate information to squad leader.	-0.80	-1.11	9	0.87	-0.31
Take hasty defensive positions.	-0.50	-1.11	9	0.74	-0.61
Change formation.	-0.62	-1.25	8	0.83	-0.63
Maintain position relative to other squad or team members.	-0.50	-1.29	7	0.70	-0.79
Support by fire.	-0.67	-1.38	8	0.86	-0.71
Mean	-0.79	-0.79			

Note: 1999 N = 9.

Dynamic Terrain

All soldiers rated dynamic terrain. Results are show in Table 6. Overall, the battlefield environment, the process of creating a hole, and the hole itself were perceived as being realistic. Rubble was perceived as being less realistic and having little effect.

Table 6.
Dynamic Terrain Ratings

Question	**%Agree or Strongly Agree**
Battlefield environment (wrecked vehicles, building damage, civilians and vehicles moving about, etc.) was realistically portrayed.	92.3
The blowhole (AT-8 fire) created a hole exactly where it was to be placed.	84.6
The sound simulation of the blowhole "burst" (AT-8 fire) was realistic.	76.9
The effect created by the blowhole (AT-8 fire) is realistic.	69.2
The flash simulation of the blowhole "bursts" (AT-8 fire) was realistic.	50.0
The rubble effect realistically portrays that found in a MOUT environment.	46.2
I was able to distinguish rubble from a distance.	30.8
The effects of simulated rubble noticeably impeded movement.	28.6
The rubble effect worked well in conjunction with the effects of the blowhole.	23.1
The simulated rubble noticeably impeded both SAF and immersed players.	21.4
There is no impact or tactical advantage to blowing a hole in a building ceiling or floor.	7.1

Note: N = 18.

SVS Enhancements

The soldiers believed that the absence of fragmentation and flash-bang grenades (92.8%), smoke grenades, (85.7%), and flares (78.5%) adversely impacted their fighting ability. They were largely neutral (33.4% agree and 21.0% disagree) on the question of whether tac lights greatly aided in reducing civilian casualties. They agreed that the amount of light in the simulators accurately reflected time of day (86.6%), but were neutral on the accuracy of shadows in depicting time of day (33.4% agree and 20% disagree).

Training Effectiveness

Generally, squad and fire team leaders said that their performance improved as a result of the training. The percentage who said that their performance improved at least slightly ranged from 53% for the task “Clear a room” to 100% for the “Coordinate activities with your chain of command.” Ratings were generally better, and in no instance worse, than those given to the same tasks in the FY 99 CE. Complete results are shown in Table 7. In general, ratings for coordination, communication, and control tasks were higher than those for specific unit tasks or battle drills.

Table 7.
Squad and Fire Team Leader Training Effectiveness Ratings

Task	**% Indicating Improvement**	
	1999	**2001**
Coordinate activities with your chain of command.	44%	100%
Assess the tactical situation.	67%	93%
Squad/fire team communication and coordination.	78%	80%
Control squad or fire team movement during assault.	67%	80%
Control squad or fire team movement while not in contact with the enemy.	67%	80%
Control your squad or fire team.	67%	80%
React to Contact Battle Drill.	44%	80%
Plan a tactical operation.	33%	73%
Locate known or suspected enemy positions.	44%	67%
Clear a building.	56%	57%
Clear a room.	44%	53%

Note: 2001 N=15. 1999 N = 9. Squad and Fire Team Leaders who participated for two days completed the questionnaire at the end of each day.

Mission Planning and Training Tool (MPTT)

Almost all (94.5%) of the soldiers strongly agreed or agreed that the MPTT was an effective rehearsal tool, and 89.9% strongly agreed or agreed that the MPTT will make an effective mission planning tool.

Locomotion Interfaces – ODT and SVS

Because the ODT and SVS are unique devices, designed to allow soldiers to move through VEs in different ways, a one-to-one comparison of their performance is not appropriate. Therefore, the results from the questionnaires about performance on each device will be presented separately. Because only four soldiers used the ODT and completed locomotion system questionnaires, the results only indicate trends for the locomotion interface devices.

The questionnaire results for the ODT are shown in Table 8. Overall, the ODT was rated high for its ability to allow soldiers to move across open terrain. Its ability to allow the user to move naturally, maintain balance, and maneuver close to other people in the VE were rated "Fair." It received somewhat low ratings for its ability to allow the soldiers to maneuver around obstacles, maintain position relative to team members, move around inside buildings, and move tactically. It received low ratings for its ability to allow the users to maneuver around corners, look around corners, move quickly, and move through doors.

Table 8.
ODT Ratings

Task	Rating Frequency					
	Very Poor	**Poor**	**Fair**	**Good**	**Very Good**	**Mean**
Move Naturally	0	1	3	0	0	1.75
Maintain Balance	0	1	3	0	0	1.75
Maneuver Around Obstacles	0	2	1	1	0	1.75
Maneuver Close to Other People in the Virtual Environment	1	0	3	0	0	1.50
Maintain Position Relative to Team Members	1	1	0	2	0	1.75
Maneuver Around Corners	1	2	0	1	0	1.25
Look Around Corners	0	3	0	1	0	1.50
Move Quickly	1	3	0	0	0	0.75
Move Through Doors	0	2	2	0	0	1.50
Move Around Inside Buildings	1	0	2	0	0	1.00
Move Across Open Terrain	0	0	1	2	1	3.00
Move Tactically	1	1	1	1	0	1.50
Question	**Never**	**Hardly Ever**	**Some-times**	**Usually**	**Always**	**Mean**
Did your speed of movement through the virtual environment feel correct?	1	1	2	0	0	1.25
Did you forget that you were on the ODT during the scenario?	2	1	1	0	0	0.75
Did you feel safe on the ODT?	1	1	1	1	0	1.50
Did the ODT cause you to move when you were not ready?	0	0	4	0	0	2.00
	Too Slow	**About Right**	**Too Fast**			
Was your speed	4	0	0			

Note: N=4.

In general, the soldiers felt that their movement through the VE using the ODT was too slow. Although it did happen sometimes for one of the soldiers, most of the soldiers hardly ever got so immersed in the VE or so comfortable on the ODT that they forgot that they were on it during the scenarios. Because the ODT sometimes caused the soldiers to move when they were not ready and because some soldiers seemed to be more comfortable on the ODT than others, they rated their feelings of safety from *Never* to *Usually*.

During the debriefing, the soldiers made very positive comments about the HMD used with the ODT. The HMD combined with the ability to turn their bodies on the ODT allowed them to observe 360 degrees around themselves. However, the soldiers also described several

problems and weaknesses with the ODT. They felt that the active area of the ODT was too small. It limited their ability to move. The mechanical linkage restricted them to upright movement, so they could not kneel, go prone or crawl. On occasion, the cables going to the HMD and the ASTi™ radio entangled them. Another problem that the soldiers had was that they were unable to sight and accurately aim the weapon that was used with the ODT.

The questionnaire results for the SVS are shown in Table 9. Overall, the SVS was rated high for its ability to allow soldiers to move across open terrain, maintain balance, maintain position relative to team members, and move quickly. Its ability to allow the user to move naturally, maneuver close to other people in the VE, look around corners, move through doors, move around inside buildings, and move tactically were rated "Fair." It received low

Table 9.
SVS Ratings

Task	**Rating Frequency**					
	Very Poor	**Poor**	**Fair**	**Good**	**Very Good**	**Mean**
Move Naturally	0	0	3	1	0	2.25
Maintain Balance	0	0	1	2	1	3.00
Maneuver Around Obstacles	1	1	2	0	0	1.25
Maneuver Close to Other People in the Virtual Environment	0	1	3	0	0	1.75
Maintain Position Relative to Team Members	0	1	0	2	1	2.75
Maneuver Around Corners	1	1	2	0	0	1.25
Look Around Corners	0	1	2	1	0	2.00
Move Quickly	0	1	0	3	0	2.50
Move Through Doors	0	1	1	2	0	2.25
Move Around Inside Buildings	0	1	2	1	0	2.00
Move Across Open Terrain	0	0	0	2	2	3.50
Move Tactically	0	1	1	1	1	2.50
Question	**Never**	**Hardly Ever**	**Some-times**	**Usually**	**Always**	**Mean**
Did your speed of movement through the virtual environment feel correct?	0	1	1	2	0	2.25
Did you forget that you were in the SVS during the scenario?	2	1	1	0	0	0.75
Did you feel safe in the SVS?	0	0	0	2	2	3.50
	Too Slow	**About Right**	**Too Fast**			
Was your speed	2	2	0			

Note – N=4.

ratings for its ability to allow the users to maneuver around obstacles and maneuver around corners.

Half of the soldiers said that their speed through the VE using the SVS was about right, while the others said their speed was too slow. They hardly ever forgot that they were in the SVS, but they did feel safe using it.

In the debriefing sessions, the soldiers commented that the SVS was easy to use because it is like a video game. They liked the fact that the SVS allowed them to kneel and go prone. When boresighted properly, the weapon was accurate. Weaknesses of the SVS included the inability of the user to side step, the inability of the user to vary speed, and the fact that the tracking system sometimes lost the user.

Also in the debriefing sessions, the soldiers said that simulators that include systems like the ODT or the SVS could be useful to the Army for training or mission rehearsal. They felt that such systems would be useful for learning the layouts of buildings and practicing moving through those buildings. They also felt that these systems would be useful for MOUT training, specifically room clearing.

Observations of the soldiers on the ODT revealed several things about how soldiers interacted with the device itself and with the whole system – VE, weapon, HMD, radio and ODT. The noise enclosure did reduce the noise coming from the ODT, but it restricted the soldiers' stride length because it covered the ODT right up to the edge of the active area. The ODT control system performed as designed. There were only rare occasions when the soldiers had a false start, overshot a stop, or had problems because they made sharp turns on the ODT. In fact, the more they used the ODT the more comfortable they became with it. On the first two days of the CE, the system (VE, weapon, HMD, radio, and ODT) was not working well. There were network interface unit crashes and visualization system freezes. Also, the soldiers could not aim their weapon. These things frustrated the soldiers and prevented them from fully participating in the scenarios. Thus, they had little time to use the ODT and gave it low ratings on the questionnaires. The system worked much better for the second group. They were able to participate in the scenarios, and they felt that they could contribute to their fire team's efforts. They used the ODT for fairly long periods of time and generally gave it higher ratings on the questionnaires than the first group.

The soldier's ability to observe his environment seemed to be very good on the system that used the ODT. The HMD and the freedom of movement on the ODT allowed the soldiers to observe 360 degrees around themselves easily and naturally. During one scenario, the soldier on the ODT spotted and engaged an enemy soldier on the floor inside a doorway that two soldiers in the SVSs moved past without seeing.

Finally, the soldiers seemed to feel like they were active members of the fire team if they could crouch, kneel, go prone, crawl and aim their weapons. These are common tasks that are important to Infantry soldiers. The soldiers in the SVSs could do these things. The soldiers on the ODT could not because of the size of the active area, the mechanical linkage that senses the user' s position and the lack of a way to aim the weapon while using the HMD.

Voice Control of DISAF

Four fire team leaders used voice to control DISAF at some time during the event. They completed the DISAF Voice questionnaire. The results are shown in Table 10.

Table 10.
DISAF Voice Recognition Questionnaire Results

Questions:	**Strongly Agree**	**Agree**	**Neither Agree nor Disagree**	**Disagree**	**Strongly Disagree**
1. It was easy to give voice commands that SAF could understand.	0	1	0	2	1
2. It was easy to learn to give voice commands to SAF.	0	2	2	0	0
3. It was easy to tell if the SAF recognized or understood my voice commands.	0	4	0	0	0
4. Giving voice commands to SAF came naturally.	0	2	1	1	0
5. I frequently gave voice commands that the SAF did not recognize.	2	2	0	0	0
6. The SAF responded to my verbal commands.	0	3	0	0	1
7. The verbal responses were appropriate for the various situations.	0	1	1	0	2
	< 20%	**20-39%**	**40-60%**	**61-80%**	**>80%**
8. What percentage of time was SAF unable to recognize your voice commands correctly on the first try? (Respondents selected one of the ranges of percentages shown above.)	1	0	0	1	2
9. What percentage of time did SAF respond incorrectly to your voice commands? (Respondents selected one of the ranges of percentages shown above.)	3	0	1	0	0

On the positive side, 75% of the soldiers agreed that the SAF responded to their verbal commands, 50% agreed that it was easy to learn to give voice commands to SAF, and 100% agreed that it was easy to tell if the SAF recognized or understood their voice commands. On the negative side, 75% strongly disagreed or disagreed that it was easy to give voice commands that the SAF could understand, 100% strongly agreed or agreed that they frequently gave voice commands that the SAF did not recognize, and 50% strongly disagreed that the SAF verbal responses were appropriate for the various situations. One–half of the respondents indicated that

the SAF was unable to recognize their voice commands on the first try more than 80% of the time.

Simulator Sickness

A mean symptom score was calculated by assigning each response of *None* a value of 0, S*light* a value of 1, *Moderate* a value of 2, and *Severe* a value of 3. Some symptoms (cold sweating, difficulty concentrating, “fullness of head”, dizziness eyes open, dizziness eyes closed, and vertigo) were never reported. The most frequently reported symptoms at the end of the day were fatigue and eyestrain, both with mean symptom scores of 0.17, a level of occurrence equal to about one slight symptom reported for every six soldiers. Total symptom scores were slightly higher at the end of the day than at the start (0.67 vs 0.31) but the difference was slight, equating to about one more slight symptom for every three soldiers.

Lessons Learned

AAR System

Initial integration of the AAR system proceeded well. The AAR system was able to communicate with all systems almost from the start. However, problems were encountered: some were fixed during the CE, while others required further analysis. The major problems and corrective actions are described in the following paragraphs.

Communication with SVS. The SVS systems do not send DIS timestamps in their network packets. This affects “post mission” systems, like AAR systems, that record and try to look at the data later, rather than in real-time. Having the AAR system re-timestamp every packet as it was received solved this problem. SVS also does not send standard DIS appearance flags. Consequently, SVS entities do not indicate when they have been killed. This affected the tabular data presentation, and has implications for future enhancements, such as changing the appearance of an entity when it is killed.

DTServer. The AAR system can interface with the DTServer in one of two ways: the reliable Transmission Control Protocol (TCP) interface and the less reliable User Datagram Protocol (UDP) interface. When using the TCP interface, the AAR system showed all of the dynamic terrain changes correctly during the mission itself (during data capture), but got stuck at the time of the explosion during replay. This did not occur when using the UDP interface, although packet loss did occur. This was related to the timestamping problem. The SVS timestamp problem was fixed by re-timestamping packets as they were received at the main network part of the AAR system. The TCP DT interface has its own connection in the AAR system. Re-timestamping needed to occur at that interface as well. In other words, the code to do the re-timestamping needed to be in two different places in the AAR system.

Audio Capture. Prior to the CE, ARI and STRICOM purchased a two-radio, ASTi™ system for testing and use in Orlando. Before leaving for Fort Benning, we were satisfied with our ability to work with the ASTi™ radio system. The LWTB had an eight-radio system during the CE. The audio capture program seemed satisfactory during integration testing. However, it

became clear that exercises involving a large number of people caused a serious degradation of capturing abilities, so severe that the voice communications were rarely intelligible. This was not simply the result of too many packets coming in for the PC to handle. During the last scenario run during the CE, the AAR system was reconfigured to also capture the raw PDUs of audio from the ASTi™ radio for further analysis in an effort to troubleshoot the problem.

Review of that data show that the AAR system was mixing the voices on the different channels of the ASTi™ radios. (ASTi™ radios can have up to four channels.) If the capture software is changed to record just a single channel, it sounds. In order to support all four channels, either additional sound cards will be necessary, or software mixing of the four channels will have to be implemented. A Linux approach that could solve the problem more easily is also under investigation.

Statistics (Tables/Graphs). For the most part, the statistical reporting element of the AAR system worked. Unfortunately, the most interesting table was the Killer-Victim table, which did not work. This failed because the SVS does not send the "I'm dead" appearance flags in DIS. The AAR system therefore knew when an entity had been hit, but not when it had been killed. Changing the AAR system to use the Detonation PDU instead would be an interim solution, but would not work if the SVS soldiers could be wounded as well as killed. Some additional work on statistics is also needed to make it more flexible and robust.

Other Issues. Other solvable problems identified include:

- Postures in capture mode are not shown properly.
- Timestamp problem with crossing an hour boundary.
- Avatars were shown holding a grenade when actually empty-handed.

New Enhancements. Ideas for a number of enhancements resulted from our experience using the AAR system in the exercises.

- Save a viewpoint for an event as part of the "tagging" process. All viewpoints would still be available, but it might be useful to have one "saved" with the event.
- Present the soldiers with a larger view of only the virtual scene instead of a copy of the full interface. This could be done using the second monitor capability of the current video cards.
- Separate global scenario elements from the scenario elements for a specific instance of that scenario (for example, separate the viewpoints for a particular scenario from the event log for a particular run of that scenario). This would enable the global elements to be saved and loaded when the scenario is run again, without needing to be re-entered manually.
- Re-work tables and perhaps graphs to improve visibility from a distance.
- Develop a good method for showing dead players.
- Implement the kneeling and prone postures better (including movements and entity marking placement).
- Turn off display of entities that are on floors that are turned off.

DISAF Behaviors and Control

The enhancements to the IIM functioned as expected and appeared to greatly reduce the workload of the DISAF Operator. The DTServer implementation on DISAF ran flawlessly. Shots fired from DISAF or the SVS that resulted in building contact had the proper change displayed on the PVD. Hasty Withdraw was not tested.

The ability of a Fire Team Leader to command his SAF entities to move where he desired proved to be harder than expected. A proposed solution would be to allow the immersed leader to issue a “Follow Me” command. The Follow Me command would cause the designated troops to follow the live leader through the VE.

DI Simulators

The development of the capability to employ flash-bang devices, hand grenades (fragmentary and tactical smoke), and hand-held illumination should be a high priority for any future CE involving a MOUT environment. Many of the soldiers' concerns centered on flash-bang devices and smoke hand grenades, in particular, being unavailable for their use. These devices are used routinely in actual MOUT operations and need to be available in training to represent a realistic situation.

The capability to use simulated binoculars in the SVS was also identified as a desirable feature. This would allow the immersed soldier to have the ability to look through a simulated set of binoculars and have a more detailed view to allow him to identify targets at greater distances than is now possible. While looking through the binoculars the soldier should not be able to navigate through the environment, but should be able to change his orientation as if turning his head left or right. The orientation he looked last should be his orientation when he returns to natural view. To change the view to Binocular View the soldier should hold down a button on the unit (Binocular View only shown while button is depressed).

Scenarios

Furniture. Furniture should be added to all rooms involved in room-clearing operations in a MOUT environment for all future CEs. This not only helps the realism, but also provides a visual reference point for the unit maneuvering in a large building containing multiple rooms.

Scenarios cramped in time and space. The scenarios looked good on paper and seemed reasonable during the briefing from the Exercise Controller to the squad. However, the requirement to limit the scenarios to 20 minutes led to time and space problems that were not recognized prior to the CE. In fact, the scenarios were “cramped” in both space and time. The opposing force (OPFOR) was often positioned within range of the squad at the beginning of an exercise. In several of the scenarios, actions started before the squad had enough time to get into an initial formation. Although it might have been interesting to have one scenario start off very quickly, in general the quick starts were counterproductive to the goal of observing if the DISAF fire team and the ODT member of Fire Team A could get into the proper formation and how rapidly they could do so. There is another problem with having opposing forces located so close to each other at the beginning of a scenario: once the DISAF Blue forces have line of sight with

the OPFOR, the SAF controller is faced with challenges if the scenario calls for anything other than the forces to immediately begin engaging each other. Setting different starting positions for the OPFOR, and allowing the squad some time at the beginning of the scenario to get into formation could mitigate the problems without major revisions to the scenarios.

Lack of points of reference. Dozens of different visual models (such as various types of furniture and vehicles) are already available in DISAF. These objects should be used to enrich the visual content of the village to provide natural points of reference. For example, inside the high-rise building it would be logical that there would be some furniture in at least some of the rooms and perhaps in the hallways. In a similar manner there could be at least a few automobiles parked within the town and a few benches placed appropriate for bus stops. Instead of arguing about which is the “salmon colored” building, the squad members could reference a building relative to a parked car, bench, or flowerpot. For the defensive scenario situated on a rooftop, use objects or rubble to mark the edge of the rooftop. Without additional cues it is hard to judge how close you are to the edge of the roof. This needs to be implemented with care. If too many "realistic" objects are emplaced, the computer systems may be overloaded and fail to operate in real time. Conversely, if objects are placed only in those areas where action is to take place, soldiers will learn to expect something in those areas where the extra objects are located.

Cognitive texturing. In the same manner that adding even a few objects can increase the visual texturing of the environment, an object can be placed to provide cognitive texturing. For example, very similar sets of objects could be placed in two different rooms such that in one room an alert squad member will recognize a carefully constructed sniper position whereas the same objects positioned differently would merely be a cluttered room.

Voice Recognition Federate

The VRF demonstrated several strengths during the CE. The VRF was a robust member of the integrated environment and did not suffer nor initiate any unexpected crashes. The VRF could be reconfigured easily to react to changes in scenarios as well as to work around predictable errors in real time. The VRF also demonstrated that (as long as commands were understood) a live soldier could command SAF entities and interact meaningfully with other live participants in the exercise. The VRF did not seem to suffer as a result of background noise during all but one of the scenarios. The one weakness of the VRF was the speech-to-text translation, which depended heavily on the COTS Dragon NaturallySpeaking product. Since everything else depended on this, speech recognition was the greatest single factor in the ability of the VRF to substantially contribute to the scenarios.

For the first three days of the CE, Dragon NaturallySpeaking successfully parsed approximately 26 of 57 commands. During the last two days of CE, an operator substituted for the speech recognition system and typed in the spoken commands. The human team leaders using the VRF in this fashion were able to command their fire teams and participate in the scenarios relatively effectively.

The following improvements were identified as being needed:

- Commands should be pre-emptive, such that issuing a new command cancels out the existing behavior.
- Separate “Move to ___” and “Move out” commands should not be required to implement a move behavior.
- Other COTS speech recognition systems should be evaluated for use in the VRF.
- The capability to select entities by voice commands should be added.

CE Command, Control, and Coordination

The DISAF Operator and Exercise Controller should not have the additional workload of implementing “work-arounds” for capabilities that do not work. The scenarios were designed to provide maximum activity and minimum distractions for the trainees. The DISAF Operator and the Exercise Controller were fully employed controlling scenario execution without having additional responsibilities.

The overall CE schedule, starting with a rehearsal (scenario walk through) on the first day following integration, with a full dress rehearsal with soldiers scheduled for the second day following integration, worked well. This scheduling afforded the opportunity for contractors to verify that their devices/capabilities worked with each other in the context of the scenarios and the expected level of activity. It also allowed further integration of several devices/capabilities and the opportunity to fine tune internal events within most of the scenarios.

Careful attention needs to be paid to exactly how each system will function during the exercises and exactly what support will be required to insure proper functioning. This will likely require low-level “talk-throughs” of the scenarios at pre-CE planning meetings.

The Exercise Controller and the AAR Leader should not be the same person. Using the Exercise Controller to portray the platoon leader and orchestrate scenario events worked well during the scenario execution, but it did not permit adequate planning time for each AAR. The result was that the AARs were conducted "on the fly", with minimal preparation. Either a "military leader" (a platoon leader or platoon sergeant if the exercise element will be a squad) should be tasked as part of the troop requirement to support the exercise, or an AAR Leader should be obtained from another source. This would permit an additional set of "eyes" on the performance of the squad and allow the squad to receive their AAR from a "green-suiter", adding to the validity of the AAR.

A single individual should maintain control over the scenarios and be responsible for their doctrinal correctness. He must be the honest broker to ensure that the scenarios are realistic and doctrinally based; and that the OPFOR play is equally realistic yet tempered to achieve the focus of the CE - assessing new devices/capabilities.

The soldiers should be forced to employ realistic tactics and doctrine for the situation in each scenario, and still exercise the devices/capabilities. For example, if part of a unit is represented by DISAF entities, then the unit should not be allowed to consistently place these entities in the most dangerous positions. Actual soldiers (immersed players) need to be actively

involved in all portions of scenario execution so they can provide a fair and accurate assessment of the various devices/capabilities.

Role Players

The platoon leader. The procedure of having the platoon leader (role-player) brief the mission to the entire squad should be reconsidered. Have the platoon leader brief the squad leader, and then have the squad leader brief the squad. The platoon leader should not micromanage the squad action. The platoon leader should frequently ask for updates if the squad leader is not initiating reports, but the platoon leader should not manage the squad.

OPFOR sniper. All CE scenarios have employed a single live human, using a desktop simulator, in the role of an enemy soldier or sniper. This is in addition to DISAF OPFOR. The live human provides a level of creativity and flexibility in the scenarios that DISAF cannot match. In practice, this role player is invariably and hotly criticized. What one observer saw as "egregious gamesmanship which degraded many aspects of the exercises and data collection," another saw as appropriate demonstration of a deficiency of the virtual simulation, i.e., "failure for not providing the squad the necessary tools to clear a room (flash-bang devices or hand grenades) that the squad would have in real life." The human OPFOR should be given written guidelines that clarify the desired actions and events that should transpire by the exercise participants so he can take actions to lead them in that direction.

Dynamic Terrain

The DTServer functioned as planned, computing wall breaches, transmitting the results to compliant simulators, and transmitting rubble entity state protocol data units. The major problem for all STO partners was the lack of definitive documentation of the DTServer message interface. The following activities are recommended during FY 02 to improve the DT Server.

- Make the DTServer more robust, eliminating software crashes.
- Document all software.
- Create the capability, using ARL dynamic terrain algorithms, to pre-damage a database, store the results, and distribute to compliant simulators using SEDRIS technology.

ODT

It is important for all of the members of a fire team to be able to move at the same speed through the VE. Therefore, speed on the SVS and the ODT should be matched.

The soldiers need more time to become comfortable with moving on the ODT. More training time, perhaps two twenty-minute sessions, should be given to the soldiers who will use the ODT.

Soldiers on the ODT can side step, and with the HMD, they can observe the VE better than soldiers in the SVS can. Therefore, in scenarios where those capabilities are important, the squad leader should be the one on the ODT.

The visualization system for the ODT, the DISim, did not work well the first two days of scenario runs. Problems encountered included network interface unit crashes, visualization system freezes, and the inability of the soldier to aim the weapon. These problems prevented some scenario runs from running to completion the first two days of scenario runs, and prevented the soldier from engaging targets. The final two days of scenario runs were more successful. Most scenarios ran to completion, and showed the utility of the ODT. Visitors remarked on the utility of the HMD for visualization, and want to investigate using the HMD method with the SVS rifle-joystick locomotion method. For FY 02, DISim needs to be made more robust, eliminating software crashes in DI, and rifle target tracking and engagement need to be improved.

System Integration

Integration time at Fort Benning went by very quickly and once dry runs were started on Thursday, they took all day and little further integration was possible. The schedule should include time to make software revisions to correct problems identified.

While a dry run integration testing session took place in Orlando in August, it was difficult to measure success or identify problems because no scenarios were used at that time. An actual scenario or scenarios should be available as part of this dry run next year.

Discussion of Results

Overall, the VE STO FY 2001 CE was a success. It provided a realistic and challenging test of the systems and capabilities under development, and the results identified both accomplishments and areas in which improvements and corrections are required. The capabilities under development generally performed well, not just as independent systems, but as coordinated components of a larger system. For example, the holes created by the DTServer appeared in the SVS and AAR system, and DISAF could move and see through them. Of course, their interaction was not problem free and not all aspects of all systems worked. However, the scenarios were generally run as planned, with some last-minute changes. When systems did not work, the causes could usually be identified, and in some cases corrected, during the CE. Problems that could not be corrected immediately were identified as high priority items for future development.

Simulator Capabilities

It was somewhat surprising that overall soldier ratings of simulator capability were slightly but non-significantly lower than they had been two years ago. While capabilities have been added to the SVSs, the basic characteristics remain the same. Given the small number of soldiers performing the ratings and the variability of their responses, it would be premature to leap to any conclusions about trends. One possible explanation is that as capabilities have been added to the SVS and to the SSE network, system performance has deteriorated. A second possibility is that as the scenarios were more challenging and complicated than those used two years ago. They pushed the soldiers to try to perform more complicated tasks in the simulators, and therefore they were more likely to encounter the limits of the simulators. The unavailability of hand grenades, for example, made it extremely difficult to clear the high rise building. Finally, the impact of the increasing sophistication of computer and video games may have caused this year's soldiers to have higher standards for simulator performance. The simulator capabilities are being compared with increasingly realistic and sophisticated commercial products. This has, in effect raised the standards by which automated entities and environments are judged.

Some soldier interface needs are recurring. The most prominent ones are the need for better sound localization, more accurate weapons (particularly when in the prone position), and improved arrangement of cables within the simulator. Soldiers reported having difficulty localizing friendly and enemy fire by sound. It is not clear if this reflects limitations in the realism of the SVS audio system, limitations imposed by the use of the ASTi™ Radio headsets (which covered one ear), or is merely a realistic representation of the difficulties localizing sounds in an urban environment. The SVS weapons are reasonably accurate at close range, but soldiers cannot engage targets as accurately as they would in the real world. Since weapons tracking accuracy is inversely related to the distance between the weapon and a sensor mounted about the soldier's head, the prone firing position, which would be the most accurate firing position in the real world, is the least accurate in the SVS. Three cables are required to fully connect the soldier to the virtual simulation (ASTi™ radio, head tracker, and weapon). It was easy to become entangled in these cables, particularly when moving into and out of the prone position.

Hand grenades are a key part of the conduct of MOUT operations and should, if possible, be added to the SVS capabilities. The capability to use simulated binoculars should also be useful in overcoming the limited resolution of the SVS visual displays.

Training Effectiveness

In the absence of objective measures of task performance, the only available indication of learning during the exercises was the self-reports of the Squad and Fire Team Leaders. These were quite positive, with the majority of the soldiers reporting improvement on each of the eleven tasks. These ratings were substantially higher than those obtained in 1999. Training effectiveness, even perceived training effectiveness, is a combination of factors, and reflects not only the simulation technologies, but also other factors such as the scenarios and AAR quality. If these results can be replicated in the future with objective measures of performance, it will establish the effectiveness of the VE as a means for training dismounted Infantry.

AAR System

Soldier ratings of and comments on the AAR system were very positive. In fact, that the soldiers gave good ratings to one aspect, voice playback, which never reproduced the voice communications intelligibly. It appears that the soldiers were generally favorable toward the AAR system, and were consequently unwilling to give any of its aspects a low rating. Of the problems identified, the failure of the audio playback system is the most critical. The second most critical is the inability to determine when soldiers in the SVSs have been killed. Several other fixes and improvements, described previously, were also identified. The AAR leader and the Exercise Controller should not be the same person in future exercises. This workload allocation scheme allowed no time for AAR preparation.

Voice Control of DISAF

This did not appear to work well at all, although it is likely that most of the problems stem from a single COTS component, the speech recognition software. When the speech recognition system was turned off and an operator (without telling the fire team leader) typed the commands issued by the Fire Team B Leader into the system, the DISAF performed appropriately. Changing to a voice recognition system that permits the use of a smaller vocabulary may very well go far toward solving the problem.

Dynamic Terrain

The hole blowing capability worked well. Capabilities need to be expanded to include different munitions and different building materials, not just an AT-8 firing at a concrete block wall. The resulting rubble did not have a realistic appearance. Soldiers did not agree that the rubble impeded their movement or the movement of DISAF.

DISAF Performance

While new behaviors were added to the DISAF repertoire and they appeared to be performed well, overall soldier ratings of SAF performance were the same as they were two years ago. Several factors may be contributing. First, the scenarios are more complex, and DISAF is being required to perform more, and more complex, tasks. Two years ago, DISAF could only enter one building in the McKenna MOUT site. This year, they could enter all of the buildings in two different terrain databases. Second, changes to DISAF, which made the operator's job easier, the IIM, were not apparent to the soldiers who rated DISAF performance. Two years ago, building and room clearing behavior had to be plotted for each individual DISAF entity. This year, it was performed automatically. Third, two years ago DISAF was commanded by giving voice commands to a SAF operator, who controlled the SAF. Voice control, which did not work well, may have been, from the perspective of the soldiers, a step backwards. Finally, as with the ratings of simulator capabilities, there is the impact of soldier experience with increasingly sophisticated computer and video games.

Locomotion Interfaces

The CE revealed several areas where the locomotion interfaces (ODT and SVS) need improvement. The "working area" of the ODT needs to be larger. The mechanical linkage that locates the user on the active surface needs to be replaced with a sensor that does not restrict the user to being upright. The cables that go to the HMD and the ASTi™ radio need to be run differently so that they do not interfere with the user's movements. These modifications will allow ODT users to take longer – more natural – strides, crouch, kneel, go prone, and crawl. In addition, soldiers need a means for aiming their weapon while wearing the HMD. Desirable areas of the SVS locomotion improvement include providing users with the ability to side step, vary the speed at which they move through the VE, and the capability to track the user's position accurately anywhere within the SVS.

Simulator Sickness

The occurrence of simulator sickness symptoms was very low, equal to about 2/3 of one slight symptom per soldier. This likely results from the use of short scenarios (approximately 20 minutes each) separated by non-immersive activities, and the use of rear-projection displays rather than HMDs on the SVSs (the ODT used an HMD). Simulator sickness does not seem to be an obstacle to longer-duration scenarios during the next CE.

Future Directions

The VE STO will continue for one more year. During that year, the effort will focus on correcting shortcomings and developing the higher-priority enhancements identified through the 2001 CE. Prior to the end of FY 02, a final CE will be held at Fort Benning.

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Appendix A: List of Acronyms

AAR	After Action Review
ARI	U.S. Army Research Institute for the Behavioral and Social Sciences
ARI-IFRU	U.S. Army Research Institute, Infantry Forces Research Unit
ARI-SSRU	U.S. Army Research Institute, Simulator Systems Research Unit
ARL-CISD	U.S. Army Research Laboratory, Computational and Information Sciences Directorate
ARL-HRED	U.S. Army Research Laboratory, Human Research and Engineering Directorate
AUSA	Association of the United States Army
CGF	Computer-Generated Forces
CIS	Combat Instruction Sets
COTS	Commercial-off-the-Shelf
CTDB	Compact Terrain Database
CE	Culminating Event
COB	Civilian on the Battlefield
DBBL	Dismounted BattleSpace BattleLab
DI	Dismounted Infantry
DIS	Distributed Interactive Simulation
DISAF	Dismounted Infantry Semi-Automated Forces
DT	Dynamic Terrain
DTServer	Dynamic Terrain Server
DVD	Digital Video Disc
DWN	Dismounted Warrior Network
DWN ERT	Dismounted Warrior Network Enhancements for Restricted Terrain
FITT	Fully Immersive Team Trainer
GUI	Graphical User Interface
HLA	High Level Architecture
HMD	Helmet Mounted Display
I2	Image Intensification
IC	Individual Combatant
IIM	Immediate Intervention Manager
I-Port	Individual Portal
IST	University of Central Florida Institute for Simulation and Training
LWTB	Land Warrior Test Bed
MES	Multiple Elevation Surface
ModSAF	Modular SAF
MOS	Military Occupational Specialty
MOUT	Military Operations in Urban Terrain
MPTT	Mission Planning and Training Tool
NVG	Night Vision Goggles
O/C	Observer/Controller
ODT	Omni-Directional Treadmill
OOTW	Operations Other Than War
OPFOR	Opposing Forces

PDU	Protocol Data Unit
PVD	Plan View Display
R&D	Research and Development
RGD	RealGuy Desktop simulator
RGI	RealGuy Immersive simulator
SAF	Semi-Automated Forces
SASO	Support and Sustainment Operations
SAW	Squad Automatic Weapon
SBIR	Small Business Innovative Research
SIMNET	Simulation Network
SSE	Squad Synthetic Environment
STO	Science and Technology Objective
SVS	Soldier Visualization Station
SVS2	Soldier Visualization Station, Version 2
STRICOM	U.S. Army Simulation, Training, and Instrumentation Command
TCP	Transmission Control Protocol
TDC	Technology Development Center
TRADOC	U.S. Army Training and Doctrine Command
UDP	User Datagram Protocol
VE	Virtual Environment
VICS	Virtual Individual Combat Simulator
VRF	Voice Recognition Federate

Appendix B. Culminating Event Scenarios

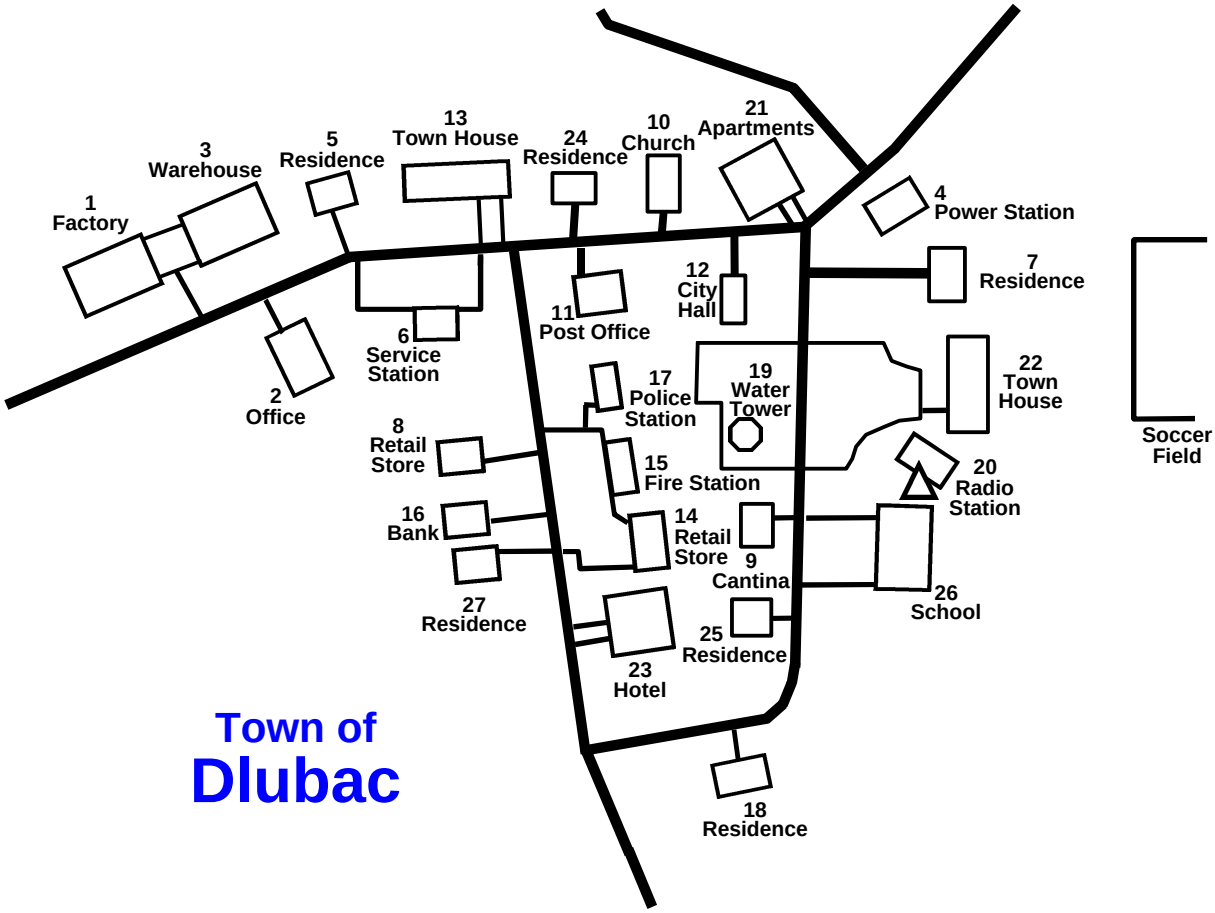
This appendix contains the General Mission Statement that applies to all scenarios as well as the Mission Planning Briefing and Scenario Description for each scenario. Scenarios are not numbered consecutively. Scenarios 6 and 7 contain an additional map showing the DISAF commands and waypoints which could be used by the Fire Team B leader.

Appendix B Table of Contents

General Mission Statement

Associated Press
Dlubac, El Polksa

The U.N. Protection Force continues to closely monitor conditions in the town of Dlubac located in the providence of El Polksa. Rebel forces from the radical nationalist group Black Sabbath have been linked to several terrorist bombings and attacks on the nearby towns. The strategic importance of Dlubac, overlooking one of the major routes entering El Polksa, makes this town a prime target for rebel activities. The U.S. 1-11th Infantry Battalion attached to the U.N. Protection Force has been tasked with coordinating U.N. activities within the region.



Mission Planning Briefing
Scenario #4

Your unit is always the 2d Squad of the 2d Platoon.

Enemy Situation: Enemy presence is considered light, capable of conducting military operations in the immediate region with forces less than platoon-size, supported by mortars. There is no heavy threat. Last reported enemy activity in the region was 2 nights ago when a squad-sized raid was conducted in the neighboring town of Polo, 3 kilometers to the northwest.

Mission of Higher Units: The company has occupied the town of Dlubac (pronounced d·lü·b k). The company commander has ordered the platoons to establish a hasty defense along the perimeter of the town until daylight, when the town can be thoroughly cleared. 2d Platoon, your platoon, is securing the northern sector of the town. 1st Squad is on the left in Buildings 3 (Warehouse) and 1 (Factory). 3d Squad is on the right in Buildings 13 (Townhouse), 24 (Residence), and 10 (Church). The 2d Squad is the platoon reserve. The platoon mission is to maintain the peace in their sector. The platoon command post is Building 17, the Police Station. The town population of Dlubac is considered to be overall friendly. However, there may be insurgents and insurgent sympathizers within the town's population.

Your Mission: The platoon leader has just ordered your squad, the 2d Squad, to conduct a roving squad-size patrol. The start point is inside Building 17, the Police Station, the platoon CP (see map). The route is counter-clockwise along the circular road network. The squad is to move in blackout, with no white lights.

Rules of Engagement: The ROE is restrictive - only return fire after fired upon. Building 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. As a result, it may be fired on in self-defense, if necessary.

Your immediate task is to brief your squad members and organize the squad for the roving patrol. Call signs remain constant.

What are your questions?

The scenario will begin once you have briefed your subordinates and the patrol is preparing to deploy from the platoon CP location.

Scenario #4: Roving Patrol

System Capabilities Used During this Scenario	Tactical lights
	Exterior lighting
	Interior lighting
	Rubble
	Omni-Directional Treadmill (ODT)
Time of Day: Night	After Action Review (AAR) System
Weather: Light rain	Tactically Correct Default Behavior (TCDB)
Wind effect: 5-10 mph	Mission Planning Training Tool (MPTT)
Wind direction: North	

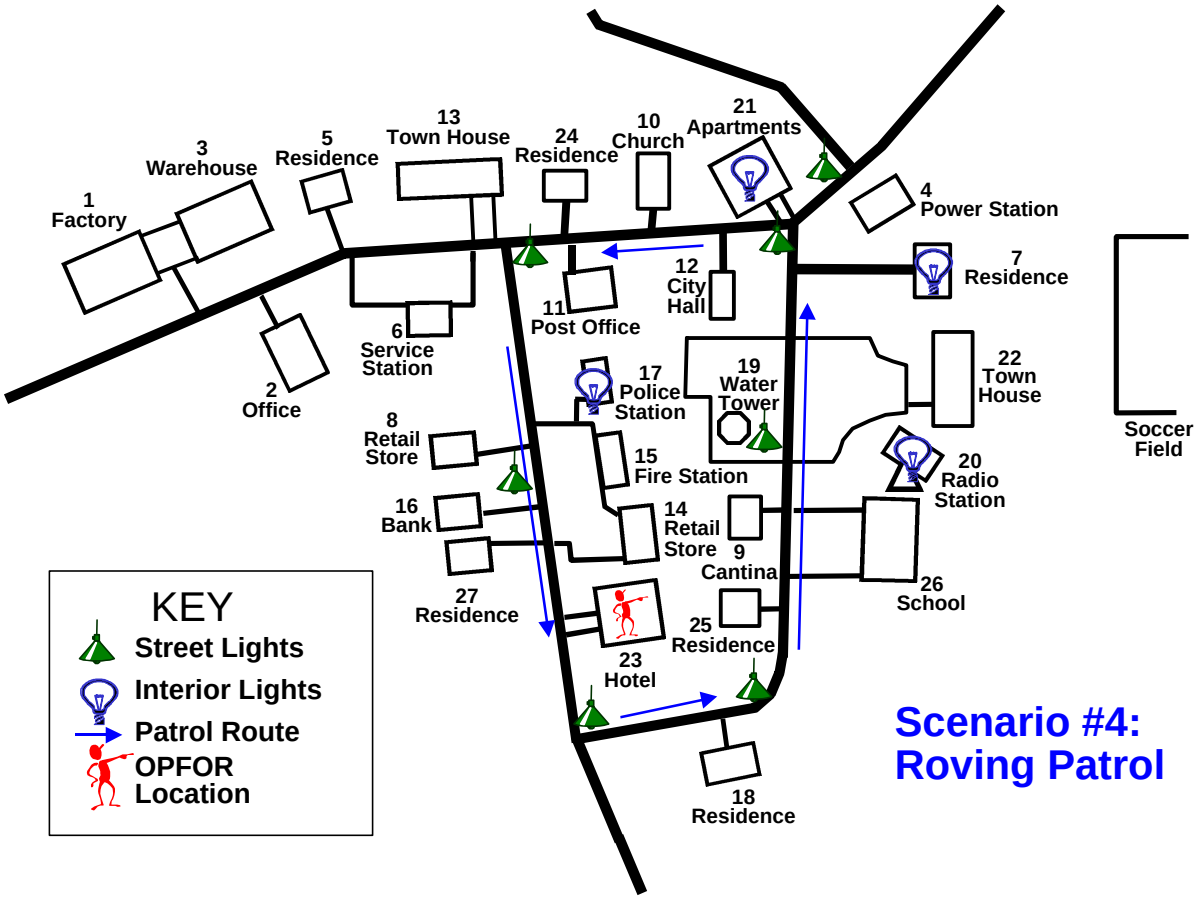
The unit is always the 2d Squad of the 2d Platoon.

Mission Overview: The company has occupied the town of Dlubac (pronounced d·lü·b k). The commander has ordered the platoons to establish a hasty defense along the perimeter of the town until daylight, when the town can be thoroughly cleared. 2d PLT is securing the northern sector of the town. 1st Squad is on the left in Buildings 3 (Warehouse) and 1 (Factory). 3d Squad is on the right in Buildings 13 (Townhouse), 24 (Residence), and 10 (Church). The 2d Squad is the platoon reserve. The platoon mission is to maintain the peace in their sector. The platoon leader has ordered the 2d Squad to conduct a roving squad-size patrol. The squad is to move in blackout, with no white lights. The ROE restrictive - only return fire after fired upon. Building 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. As a result, it may be fired on in self-defense, if necessary.

Prior to Beginning Scenario	
1.	Streetlights are on.
2.	Interior lights are on in Buildings 17 (Police Station), 20 (Radio Station), 7 (Residence), 21 (Apartments), and Building 23 (Hotel).
3.	Add rubble to Buildings 16 (Bank), 27 (Residence), and 23 (Hotel).
4.	Add 2 live OPFOR in Building 23 (Hotel). 1 OPFOR is immersed.
5.	Position 1 COB to walk past 2d Squad from Building 15 (Retail Store) to Building 17 (Police Station).
6.	Add 1 dead OPFOR near stairwell landing in Building 23 (Hotel).
7.	Add Policeman in stairwell between Ground and 1st Floor of Building 23 (Hotel).

Scenario: This scenario takes place during darkness with a new moon. The operation order (OPORD) has been issued by the platoon leader. The scenario begins with the 2d Squad at the platoon command post in Building 17 (Police Station), preparing to begin the squad-sized roving security patrol. The route is counter-clockwise along the circular road network (see map). As the squad assembles for the roving patrol outside Building 17 (Police Station), a DISAF civilian will walk past them from Building 8 (Retail Store) to Building 17 (Police Station). Before the squad reaches Building 8 (Retail Store), the squad leader will receive a radio call from the platoon leader stating that a Civilian on the battlefield (COB) had just informed him that he saw 3 armed people entering Building 23 (Hotel) and heard gunfire. The platoon leader should remind the squad leader of the ROE. As the squad moves in the vicinity of Building 16 (Bank),

they come under fire by OPFOR in Building 23 (Hotel). One OPFOR is visible from the windows. The squad should take cover and return fire. Squad leader should report this action. If the squad leader fails to report, the platoon leader will ask for a SITREP.) The platoon leader: (1) orders the squad to close with and destroy the enemy; (2) states that no smoke or illumination is available; (3) recommends shooting out selected street lights to aid his movement; and (4) authorizes the use of TAC lights once inside the building. The squad assaults the hotel. As assault begins, the platoon leader calls and states that a civilian police officer, working as hotel security, has killed 1 of the OPFOR and limited the OPFOR to the ground floor. Hostage situation is unknown at this time. The squad must kill the 2 remaining OPFOR inside the building. The outcome of this scenario will depend on the squad leader. The squad leader must keep the platoon leader informed. If he doesn't, the platoon leader will repeatedly ask for SITREPs. At the conclusion of the action, the platoon leader will direct the squad to evacuate all casualties to the platoon casualty collection point, the platoon CP. ENDEX will occur at that point.



Mission Planning Briefing
Scenario #6:

Your unit is always the 2d Squad of the 2d Platoon.

Enemy Situation: Enemy presence is considered light, capable of conducting military operations in the immediate region with forces less than platoon-size. There is no mechanized, motorized, or indirect fire threat. Yesterday, a platoon-sized force was caught in the open moving 4 kilometers to the southwest of Dlubac. In the ensuing firefight, it was seriously mauled. Most of the enemy force was destroyed. However, survivors may have infiltrated the town.

Mission of Higher Units: The company is defending the town of Dlubac (pronounced d·lü·b k). The 2d Platoon, your platoon, is the company reserve. 1st Squad is manning Checkpoint #1 on the road entrance adjacent to Building 4 (Power House) at the northeast corner of the town. 3d Squad is manning Checkpoint #2 on the road entrance adjacent to Building 23 (Hotel) at the southern corner of the town. The platoon mission is to maintain the peace. The town population of Dlubac is considered to be friendly. However, there may be insurgents and insurgent sympathizers within the town's population. Dlubac has a police force. It is a local militia force. However, since it is made up of local residents, it should not be considered a trained military force.

Your Mission: The 2d Squad, your squad, is the platoon reserve. It has just been ordered to replace the 1st Squad at Checkpoint #1. The start point is inside Building 17, the Police Station, your platoon CP (see map). Travel should be restricted to the road network.

Rules of Engagement: The ROE is restrictive - only return fire after fired upon. Building 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. As a result, it may be fired on in self-defense, if necessary.

Your immediate task is to brief your squad members and organize the squad to move to the checkpoint. Call signs remain constant.

What are your questions?

The scenario will begin once you have briefed your subordinates and the patrol is preparing to deploy from inside the platoon CP location.

Scenario #6: Hostage Rescue

System Capabilities Used During this Scenario	Tactical lights
	Exterior lighting
	Interior lighting
	Rubble
	Omni-Directional Treadmill (ODT)
Time of Day: Night	After Action Review (AAR) System
Weather: Light Fog	Voice Recognition/Synthesis
Wind effect: 1-2 mph	Tactically Correct Default Behavior (TCDB)
Wind Direction: S.W.	

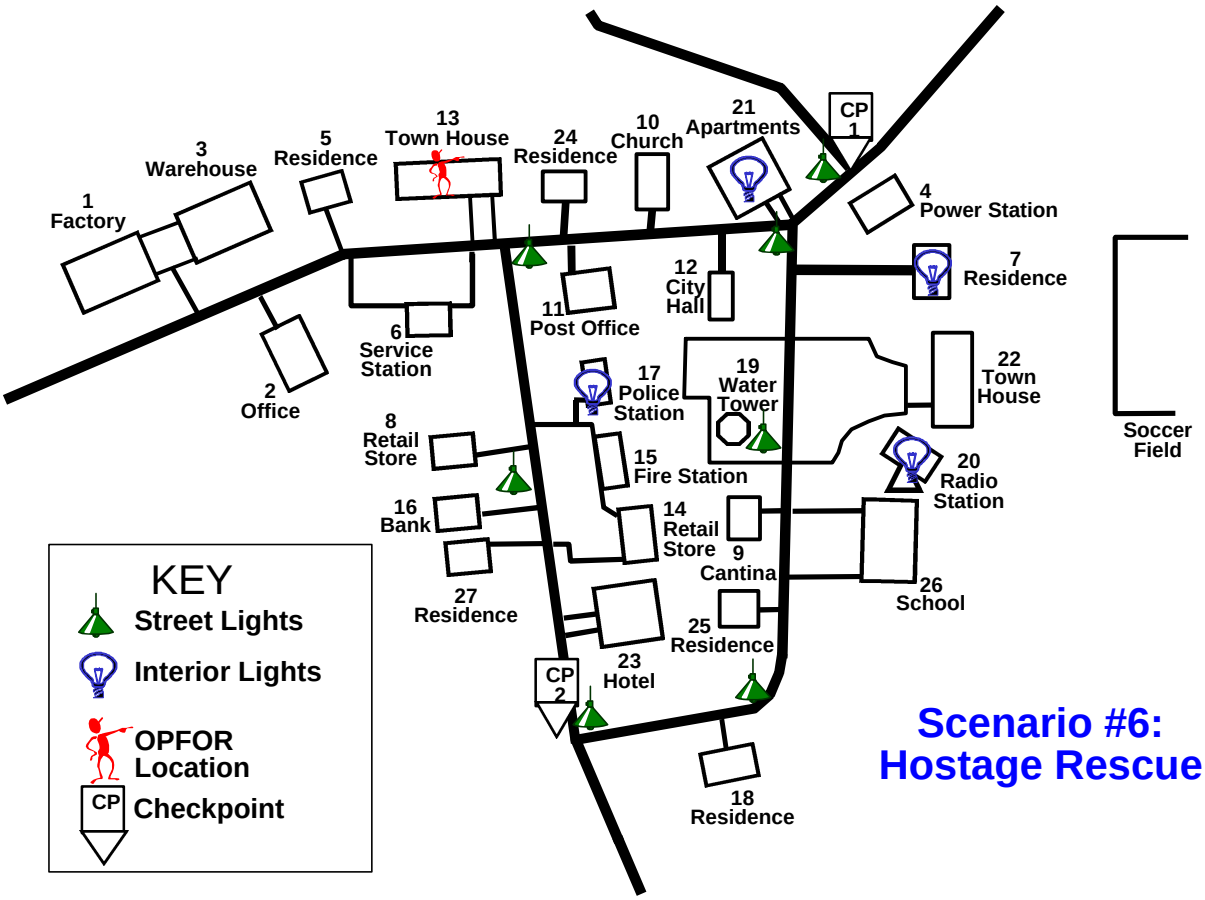
The unit is always the 2d Squad of the 2d Platoon.

Mission Overview: The company is defending the town of Dlubac (pronounced d·lü·b k). The 2d Platoon is the company reserve. 1st Squad is manning Checkpoint #1 on the road entrance adjacent to Building 4 (Power House) at the northeast corner of the town. 3d Squad is manning Checkpoint #2 on the road entrance adjacent to Building 23 (Hotel) at the southern corner of the town. The 2d Squad is the platoon reserve, but has just been ordered to conduct a deliberate attack on Building 13 (Town House). The ROE is restrictive-only fire on confirmed targets. Building 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. As a result, it may be fired on in self-defense, if necessary.

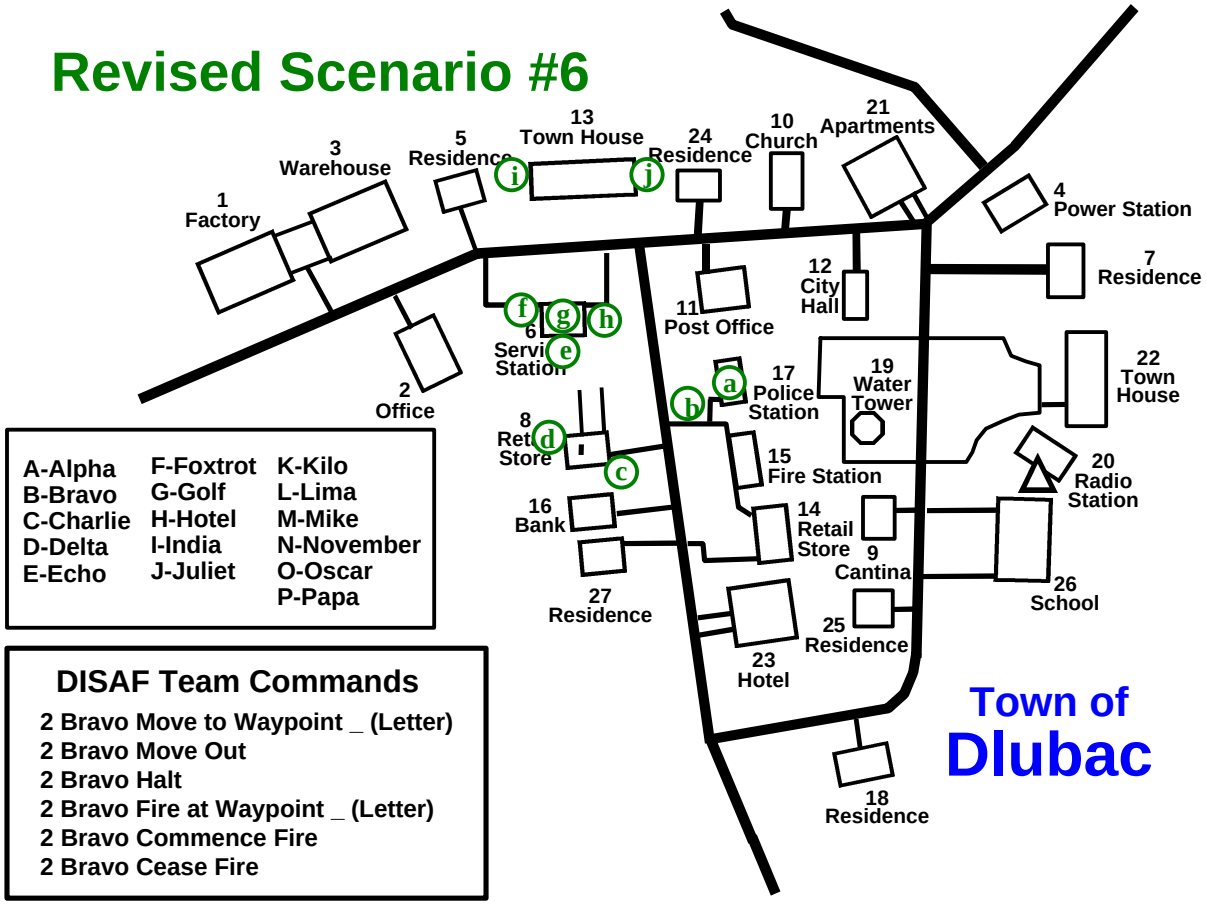
Prior to Beginning Scenario	
1.	The streetlights are on.
2.	Interior lights are on in Buildings 17 (Police Station), 21 (Apartments), 7 (Residence), and 20 (Radio Station).
3.	Add rubble to Buildings 13 (Town House) 24 (Residence), 11 (Post Office), and 6 (Service Station).
4.	Add 3 gunshot sounds as 2d Squad approaches Checkpoint #1
5.	Add 2 OPFOR in Building 13 (Town House). 1 OPFOR is immersed (for tracer fire).
6.	Add 3 "police" (RBD soldier_dcu) located outside at the corners of Buildings 24 (Residence), 5 (Residence) and 6 (Service Station) forming a cordon around Building 13 (Town House).
7.	Add 2 civilians on the battlefield (COBs) as hostages in Building 13 (Town House).
8.	Add DISAF friendly sniper on roof of Building 23 (Hotel)
9.	Identify role player for sniper communications reports.
10.	Add 2 dead OPFOR in Building 13 (Town House).
11.	DISAF 3d Squad at Checkpoint #2
10.	DISAF 1st Squad fire team visible at Checkpoint #1.

Scenario: This scenario takes place at night. The operation order has been issued by the platoon leader. The scenario begins with the 2d Squad at the 2d PLT command post in Building 17 (Police Station), preparing to conduct a deliberate attack on Building 13 (Town House). 2-3

armed OPFOR have seized hostages and are located in the Building (2 OPFOR and 3 COBs will be positioned in Building 13). It is estimated that there are 2 to 3 COB being held hostage. The police chief has requested assistance. The police have surrounded the building, but cannot gain entry (3 RBD_dcu as police placed around building). The 2d Squad mission is to assault Building 13 (Town House), free the hostages, and neutralize the enemy threat. The platoon leader: (1) recommends shooting out selected street lights to aid his movement; (2) tells the squad leader that there is no smoke to cover his movement; (3) tells the squad leader no illumination is available; and (4) authorizes the use of TAC lights once inside the building. He also attaches the platoon sniper to the squad. The sniper is located on the roof of Building 23 (Hotel). His call sign is S01. The 2d Squad will not to violate the ROE. (The squad leader should report when he arrives on site, commences the assault, makes contact with enemy forces, and when his mission is completed. If the squad leader does not report, the platoon leader will ask for repeated SITREPs.) Once contact is made, the platoon leader should remind the squad leader of the ROE. Once the assault begins, the OPFOR free play. The OPFOR will not harm the hostages. ENDEX will occur when the squad can no longer continue the mission or when Building 13 (Town House) is cleared. If the building is cleared, the platoon leader will direct the squad to evacuate all casualties to the platoon casualty collection point, the platoon CP. ENDEX will occur at that time.



Revised Scenario #6



A-Alpha	F-Foxtrot	K-Kilo
B-Bravo	G-Golf	L-Lima
C-Charlie	H-Hotel	M-Mike
D-Delta	I-India	N-November
E-Echo	J-Juliet	O-Oscar
		P-Papa

DISAF Team Commands

2 Bravo Move to Waypoint _ (Letter)
2 Bravo Move Out
2 Bravo Halt
2 Bravo Fire at Waypoint _ (Letter)
2 Bravo Commence Fire
2 Bravo Cease Fire

Mission Planning Briefing
Scenario #7:

Your unit is always the 2d Squad of the 2d Platoon.

Enemy Situation: Enemy presence is considered light, capable of conducting military operations in the immediate region with forces less than squad-size. There is no mechanized or motorized or indirect fire threat. Last reported enemy activity in the region was a squad-sized raid conducted in the neighboring town of Polo, 3 kilometers to the northwest, 2 nights ago. The town population of Dlubac (pronounced d·lü·b k) is considered to be friendly. However, there may be insurgents and insurgent sympathizers within the town's population.

Mission of Higher Units: The 1st and 3d Platoons have established roving patrols throughout the local territory to counter any enemy movement in the region. The 2d PLT, your platoon, is the company reserve located in the town of Dlubac. Dlubac is considered a friendly town. Town security has been left up to the regional militia forces cordoning the town with local patrols. They are located outside the town limits. 2d Platoon has established a visible presence in the town. 1st Squad is manning Checkpoint #1 on the road entrance adjacent to Bldg. 4 (Power House) at the northeast corner of the town. 3d Squad is manning Checkpoint #2 on the road entrance adjacent to Bldg. 23 (Hotel) at the southern corner of the town.

Your Mission: The 2d Squad, your squad, is the platoon reserve. It has just been ordered to replace the 1st Squad at Checkpoint #1 now that they have rested. The start point is Bldg. 17, the Police Station, your platoon CP (see map). Travel should be restricted to the road network.

Rules of Engagement: The ROE is restrictive - only return fire after fired upon. Building 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. As a result, it may be fired on in self-defense, if necessary.

Your immediate task is to brief your squad members and organize the squad to move to the checkpoint. Call signs remain constant.

What are your questions?

The scenario will begin once you have briefed your subordinates and the patrol is preparing to deploy from the platoon CP location.

Scenario #7: Support Operations Checkpoint

System Capabilities Used During this Scenario	Tactical lights
	Streetlight
	Interior lighting
	Rubble
	Voice Recognition/Synthesis
Time of Day: First light	Tactically Correct Default Behavior (TCDB)
Weather: Clear	After Action Review (AAR) System
Wind effect: 10 mph	
Wind Direction: West	

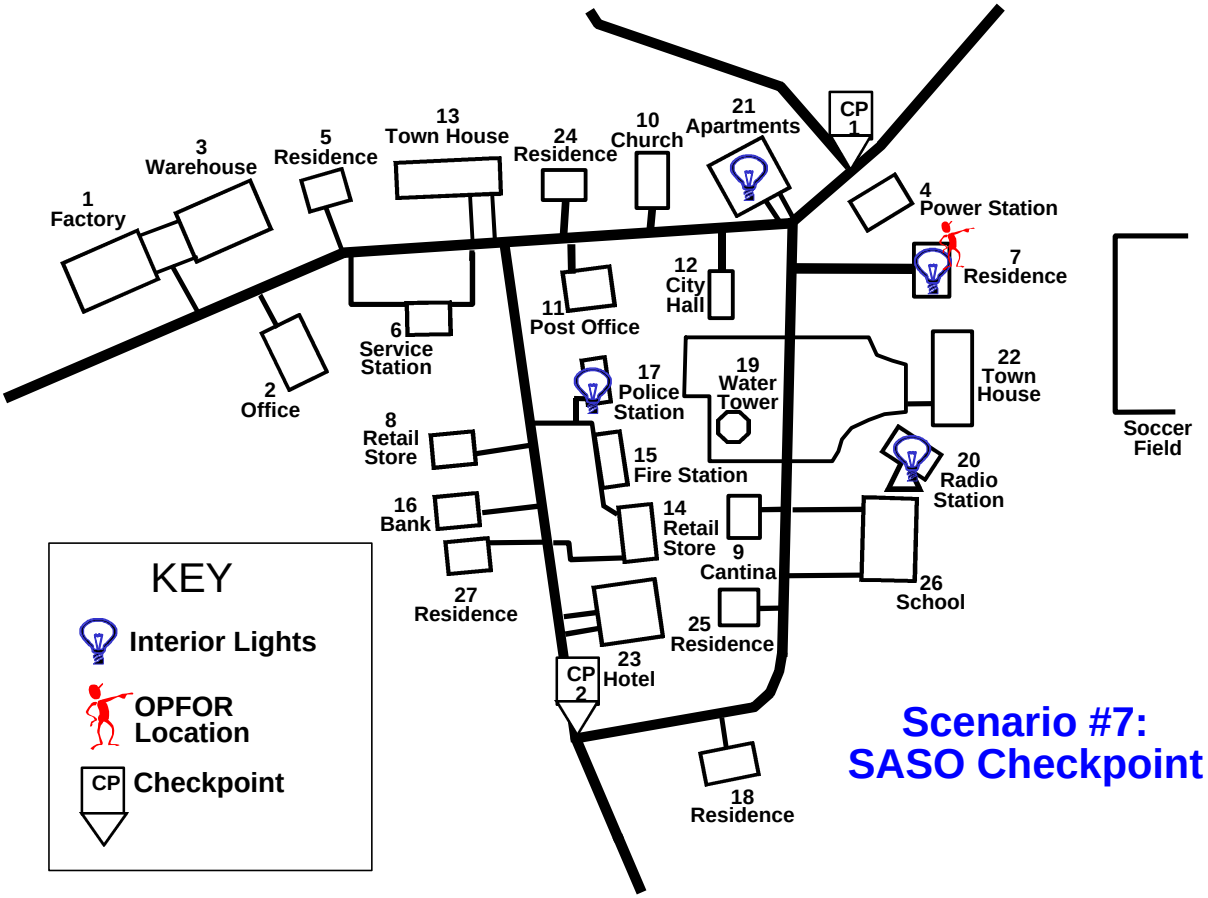
The unit is always the 2d Squad of the 2d Platoon.

Mission Overview: The company is defending the town of Dlubac (pronounced d·lü·b k). The 2d Platoon is the company reserve. The platoon mission is to maintain the peace and control personnel entering and leaving the town. 1st Squad is manning Checkpoint #1 on the road entrance adjacent to Building 4 (Power House) at the northeast corner of the town. 3d Squad is manning Checkpoint #2 on the road entrance adjacent to Building 23 (Hotel) at the southern corner of the town. The 2d Squad is the platoon reserve, but has just been ordered to replace the 1st Squad at Checkpoint #1 now that they have rested. The platoon mission is to maintain the peace. The ROE is restrictive-only return fire after fired upon. Building 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. As a result, it may be fired on in self-defense, if necessary.

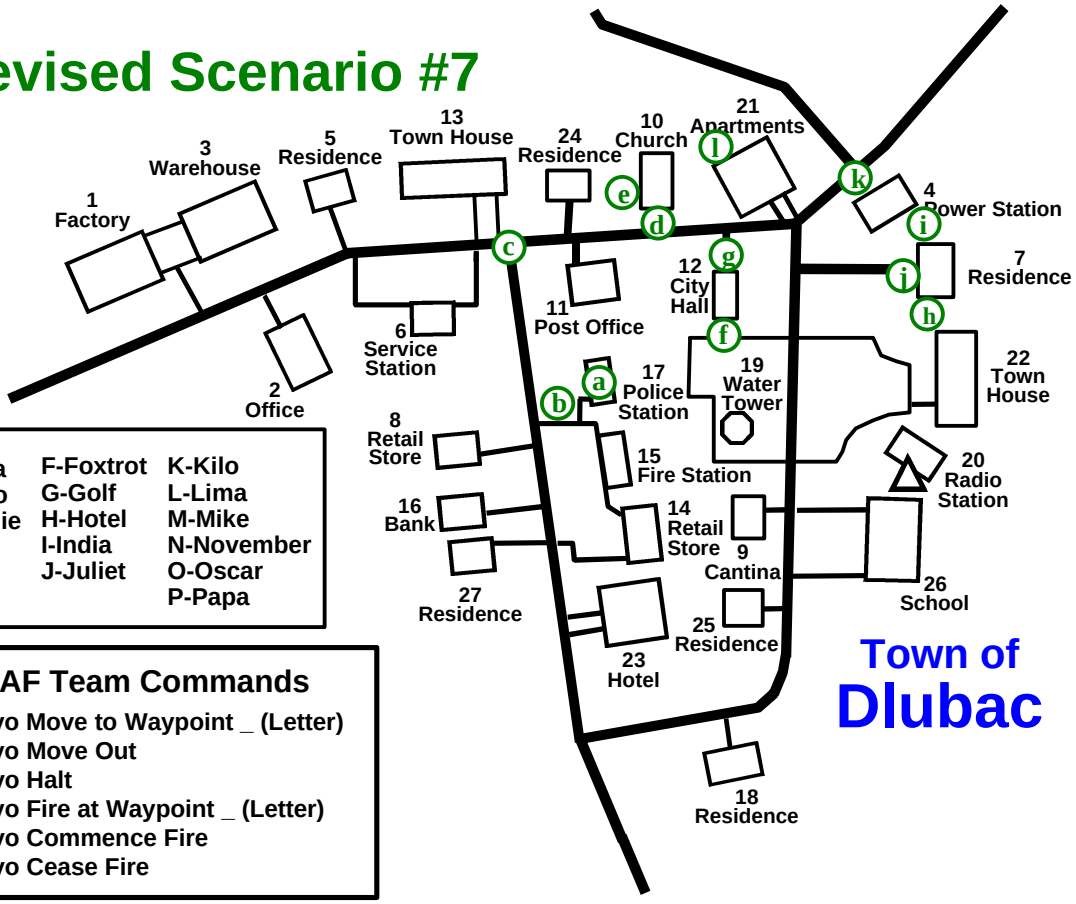
Prior to Beginning Scenario	
1.	Interior lights are on in Buildings 17 (Police Station) and Building 4 (Power Station).
2.	Add rubble to Building 7 (Residence).
3.	Add DISAF fire team at Checkpoint #1. Moves defensively when firing starts.
4.	Add 1 DISAF civilian on the battlefield (COBs) moving through Checkpoint #1 from Building 13 (Town House) out of town as squad forms to move out.
5.	Add 2 DISAF civilians on the battlefield (COBs) moving through Checkpoint #1. One will stop to talk to soldier manning checkpoint. One will move to Building 13 (Town House).
6.	Add bus passing through Checkpoint #1 to BLDG 9 (Cantina) as squad approaches.
7.	Add 1 immersed OPFOR in Building 7 (Residence).
8.	SAF 1st Squad fire team provides support by fire positions.
9.	SAF 3d Squad moves from southwest to take up support by fire positions.
10.	Ensure interior lights in Building 7 (Residence) are on.

Scenario: This scenario takes place at first light. The operation order (OPORD) has been issued by the platoon leader. The scenario begins with the 2d Squad at the 2d Platoon command post in Building 17 (Police Station), preparing to replace the 1st Squad at Checkpoint #1. The squad departs for Checkpoint #1. As the squad approaches Checkpoint #1, the squad leader will receive a radio call from the platoon leader stating that a COB had just informed him that he saw a man entering Building 7 (Residence), armed with a rifle and orders the 2d Squad to that

location to investigate. A platoon leader call to the 1st Squad Leader notifying him of the change of 2d Squad's mission will serve to reinforce the scenario. While this exchange is going on, several COBs and vehicles move through Checkpoint #1. The platoon leader directs the 2d Squad Leader to clear Building 7 (Residence), and report his findings. As the 2d Squad nears Building 7 (Residence), they come under fire by a sniper. (If the squad leader fails to report, the platoon leader asks for a SITREP.) The platoon leader directs the squad to fix the sniper in the building until the 3d Squad (all DISAF) arrives. After the 3d Squad arrives, they will provide support by fire for the 2d Squad's assault on Building 7 (Residence). The platoon leader tells the squad leader: (1) authorizes the use of TAC lights once inside the building; (2) and, tells 2d Squad leader to position his B TM on the south side of Building 12 (City Hall) to support his movement. The squad leader should report when he arrives on site, and when 3d Squad arrives. If the squad leader does not report, the platoon leader will ask for a SITREP. ENDEX will occur when the squad can no longer continue the mission or when Building 7 (Residence) is cleared. If the building is cleared, the platoon leader will direct the squad to evacuate all casualties to the platoon casualty collection point, the platoon CP. ENDEX will occur at that time.



Revised Scenario #7



A-Alpha	F-Foxtrot	K-Kilo
B-Bravo	G-Golf	L-Lima
C-Charlie	H-Hotel	M-Mike
D-Delta	I-India	N-November
E-Echo	J-Juliet	O-Oscar
		P-Papa

DISAF Team Commands

2 Bravo Move to Waypoint _ (Letter)
2 Bravo Move Out
2 Bravo Halt
2 Bravo Fire at Waypoint _ (Letter)
2 Bravo Commence Fire
2 Bravo Cease Fire

Mission Planning Briefing
Scenario #10:

Your unit is always the 2d Squad of the 2d Platoon.

Enemy Situation: Enemy forces have withdrawn from the town of Dlubac (pronounced d·lü·b k). There may still be insurgents and insurgent sympathizers within the town's population. Enemy presence is considered light, capable of conducting military operations in the immediate region with squad-size forces. There is no mechanized or motorized or indirect fire threat. Last reported enemy activity in the region was sniper fire in the neighboring town of Tuskin, 8 kilometers to the northwest, 3 days ago.

Mission of Higher Units: The company has occupied the town of Dlubac. The CO CDR has ordered the platoons to establish a defense along the perimeter of the town. 3d PLT has established its sector along the north and east sides of the town from Bldg. 1 (Factory) to Bldg. 22 (Townhouse). 1st PLT has established its sector in the south and west sides of the town from Bldg. 26 (School) to Bldg. 2 (Office). 2d PLT, your platoon, is the company reserve. Its mission is to provide 1 squad to man a checkpoint on the northeast side of town and conduct a squad-sized roving patrol to establish a presence. The 1st Squad is at Checkpoint #1. 3d Squad is conducting a roving patrol of the town.

Your Mission: 2d Squad, your squad, is the platoon reserve located at the platoon command post in Bldg. 17 (Police Station).

Rules of Engagement: Since the overall town population of Dlubac is considered friendly, the rules of engagement are very restrictive. There will be no weapon firing within the town except in self-defense or in defense of the town against a confirmed enemy presence. Self-defense is defined as a serious threat to life or limb. A serious threat is considered gunfire or the presence of an uncontrolled mob armed with life-threatening weapons such as knives, pikes, metal poles, etc. Every effort must be made to disarm the situation prior to the use of deadly force. Bldg. 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. As a result, it may be fired on in self-defense, if necessary. Weapons control status is white.

Your immediate task is to brief your squad members and organize the squad to move to the checkpoint. Call signs remain constant.

What are your questions?

The scenario will begin once you have briefed your subordinates and the patrol is preparing to deploy from the platoon CP location.

Scenario #10: Crowd Control

System Capabilities Used During this Scenario	Mission Planning Training Tool (MPTT)
	After Action Review (AAR) System
	Omni-Directional Treadmill (ODT)
	Rubble
	Tactical lights
Time of Day: Noon	Voice Recognition/Synthesis
Weather: Light rain	Tactically Correct Default Behavior (TCDB)
Wind effect: 5-7 mph	
Wind direction: NW	

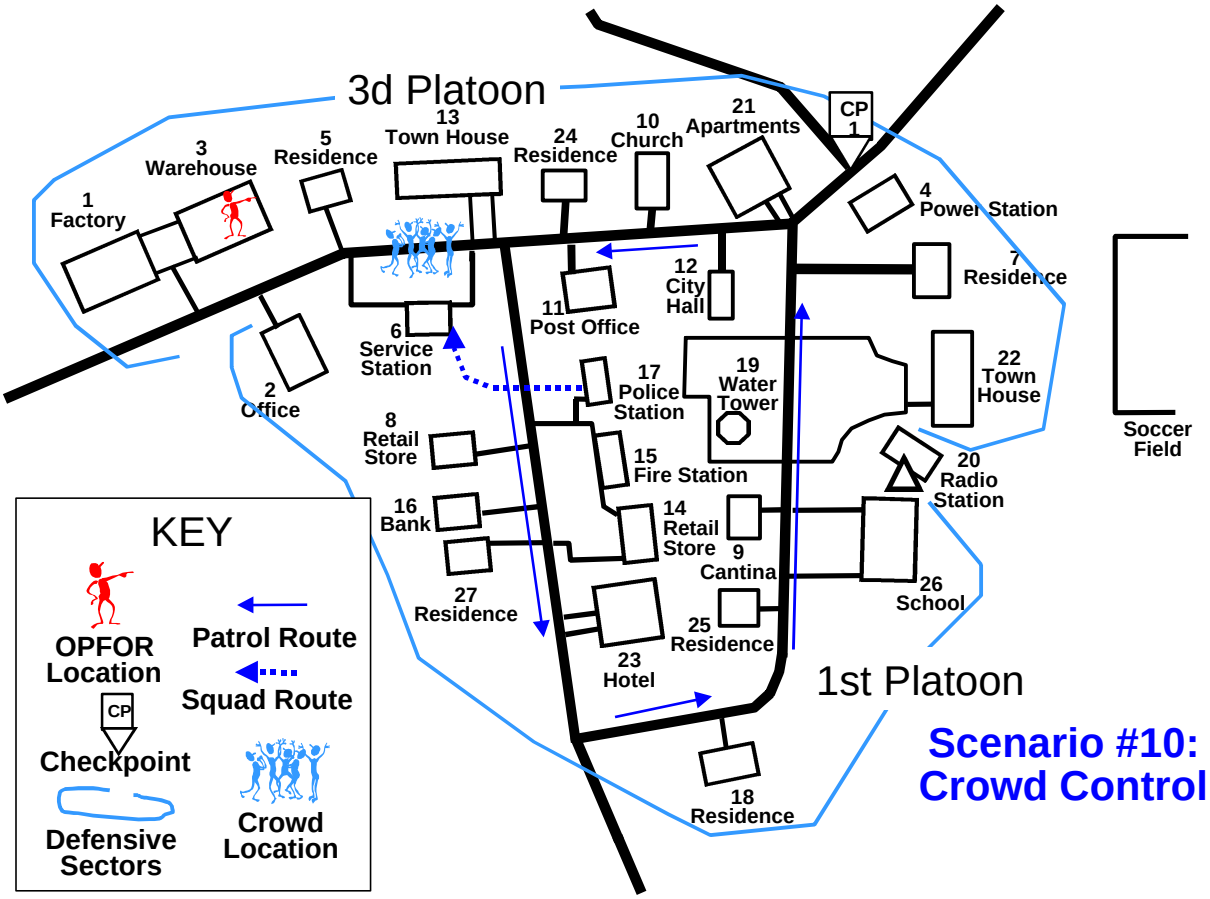
The unit is always the 2d Squad of the 2d Platoon.

Mission Overview: The company has occupied the town of Dlubac (pronounced d·lü·b k). The company commander has ordered the platoons to establish a defense along the perimeter of the town. 3d PLT has established its sector along the north and east sides of the town from Building 1 (Factory) to Building 22 (Townhouse). 1st PLT has established its sector in the south and west sides of the town from Building 26 (School) to Building 2 (Office). 2d PLT is the company reserve. Its mission is to provide 1 squad to man Checkpoint #1 on the northeast side of town to control movement into and from the town and conduct a squad-sized roving patrol to establish a presence. The 1st Squad is at Checkpoint #1. The 3d Squad is conducting a roving patrol of the town. The 2d Squad is the platoon reserve located at the platoon command post/casualty collection point (CP/CCP) in Building 17 (Police Station). The ROE restrictive - only return fire after fired upon. Building 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. As a result, it may be fired on in self-defense, if necessary.

Prior to Beginning Scenario	
1.	Interior lights are on in Buildings 17 (Police Station), 6 (Service Station), and 5 (Residence).
2.	Add rubble to Building 6 (Service Station) and Building 3 (Warehouse)
3.	Add 2 live OPFOR in Building 3 (Warehouse). 1 OPFOR is immersed.
4.	Add burning car in street north of Building 6 (Service Station) vicinity of "crowd".
5.	Add 8-9 person crowd of COBs in street north of Building 6 (Service Station) (Use female_jasmine, male_chris, and male_max).
6.	Add SAF 3d Squad located to the east of crowd at the intersection of Buildings 13 (Town House) and 11 (Post Office).
7.	Split 1 4-man group from crowd to head west, then disperse when fired on. 1 dies.
8.	Add 3 shots fired as crowd moves toward Building 3 (Warehouse)
9.	Identify role player for 3d Squad Leader communications reports.
10.	Ensure interior lights in Building 3 (Warehouse) are on.

Scenario: The scenario is run at noon. The operation order has been issued by the platoon leader. The scenario begins with 2d Squad located at the platoon command post/casualty collection point (CP/CCP) in Building 17 (Police Station). The platoon leader calls and informs

2d Squad Leader that 3d Squad has reported a large crowd of approximately 8-9 civilians forming in the north end of the Building 6 (Service Station) parking lot. No weapons have been reported. The crowd is gathered around a burning car at the intersection of the service station parking lot and the main road. The platoon leader directs the 2d Squad to approach the intersection by traveling west, then north to Building 6 (Service Station). The platoon leader wants the 2d Squad to come up along the east side of the building to let the crowd see the squad. He intends for a show of force. 3d Squad is already located to the east, at the intersection of Buildings 13 (Town House) and 11 (Post Office). As the 2d Squad arrives, the crowd divides with one group staying around the burning car. The second group starts moving west along the main street. (The squad leader should report both 2d Squad's arrival on site and the movement of the crowd to the platoon leader. If the squad leader does not report, the 3d Squad Leader will make the report to the platoon leader.) The platoon leader will direct the 3d Squad to remain in place and observe the group of civilians at the burning car. 2d Squad is to keep the departing group under observation, paralleling its movement by about 50 meters. As the 2d Squad nears Building 3 (Warehouse), they come under fire from 2 OPFOR. The crowd disperses into adjacent buildings at the sound of the gunfire. One civilian is killed. (The squad leader should report this to the platoon leader. If the squad leader does not report, the platoon leader will ask for a SITREP.) The platoon leader: (1) orders the squad to close with and destroy the enemy; (2) tells the squad leader no smoke is available to cover his movement; and (3) authorizes the use of TAC lights once inside the building. The squad maneuvers to and assaults the building. The squad must kill the 2 OPFOR snipers. Once the assault begins, the squad leader will become a casualty. The alpha team leader must take charge. If the alpha team leader does not notice the squad leader becoming a casualty, the platoon leader will call and alert the alpha team leader that he has a report that the squad leader was killed. If the alpha team leader knows the squad leader was killed, he should report this to the platoon leader. If the alpha team leader does not report, the platoon leader will ask for a SITREP. This scenario will allow free play for friendly and OPFOR movement. The outcome of this scenario will depend on the alpha team leader assuming control and managing the squad. The alpha team leader must keep the platoon leader informed. If he doesn't, the platoon leader will repeatedly ask for SITREPs. ENDEX will occur when the building is secured or the squad suffers enough casualties that it can no longer perform its mission. If the squad cannot complete the mission due to casualties, the platoon leader will notify the 3d Squad to assume the mission and place the 2d Squad in support. The platoon leader will direct the squad to evacuate all casualties to the platoon casualty collection point, the platoon CP. ENDEX will occur at that point.


3d Platoon
1 Factory
3 Warehouse
5 Residence
13 Town House
24 Residence
10 Church
21 Apartments
CP 1
4 Power Station
7 Residence
12 City Hall
11 Post Office
6 Service Station
2 Office
17 Police Station
19 Water Tower
22 Town House
Soccer Field
8 Retail Store
15 Fire Station
20 Radio Station
16 Bank
14 Retail Store
9 Cantina
26 School
27 Residence
25 Residence
23 Hotel
1st Platoon
18 Residence
KEY
OPFOR Location
Patrol Route
Squad Route
CP
Checkpoint
Defensive Sectors
Crowd Location
Scenario #10:
Crowd Control

Mission Planning Briefing
Scenario #11:

Your unit is always the 2d Squad of the 2d Platoon.

Enemy Situation: Enemy forces have withdrawn from the town of Dlubac (pronounced d·lü·b k). Enemy presence was less than squad-size. Last reported enemy activity in the region was the laying of mines on the road leading to the town of Ursula, 6 kilometers to the west. The town population of Dlubac is considered to be friendly. However, there may be insurgents and insurgent sympathizers within the town's population.

Mission of Higher Units: The company has occupied Dlubac. The CO CDR has ordered the platoons to establish a defense along the perimeter of the town. 3d PLT has established its sector along the north and east from Bldg. 1 (Factory) to Bldg. 22 (Townhouse). 1st PLT has established its sector in the south and west from Bldg. 26 (School) to Bldg 2 (Office). The 2d PLT, your platoon, is the company reserve. The 2d PLT's mission is to maintain the peace and order within the town. To accomplish this, the platoon has established a squad-sized checkpoint on the northeast side of town to control movement into and from the town and is conducting a squad-sized roving patrol to establish a presence. 1st Squad is manning Checkpoint #1. 3d Squad is conducting the roving patrol along the interior road network.

Your Mission: 2d Squad, your squad, is the platoon reserve located at the platoon command post in Bldg. 17 (Police Station).

Rules of Engagement: Since the overall population of Dlubac is considered friendly, the rules of engagement are very restrictive. There will be no weapon firing within the town limits except in self-defense or in defense of the town against a confirmed enemy presence. Enemy targets must be positively identified. Self-defense is defined as a serious threat to life or limb. A serious threat is considered gunfire or the presence of an uncontrolled mob armed with life-threatening weapons such as knives, pikes, metal poles, etc. Every effort must be made to disarm the situation prior to the use of deadly force. Bldg. 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. As a result, it may be fired on in self-defense, if necessary. Weapons control status is white.

Your immediate task is to brief your squad members on the current situation. Call signs remain constant.

What are your questions?

The scenario will begin once you have briefed your subordinates and the patrol is preparing to deploy from the platoon CP location.

Scenario #11: Downed Helicopter

System Capabilities Used During this Scenario	After Action Review (AAR) System
	Rubble
	Voice Recognition/Synthesis
	Omni-Directional Treadmill (ODT)
	Interior lighting
Time of Day: Day	Tactically Correct Default Behavior (TCDB)
Weather: Light rain	
Wind effect: 5-10 mph	
Wind Direction: East	

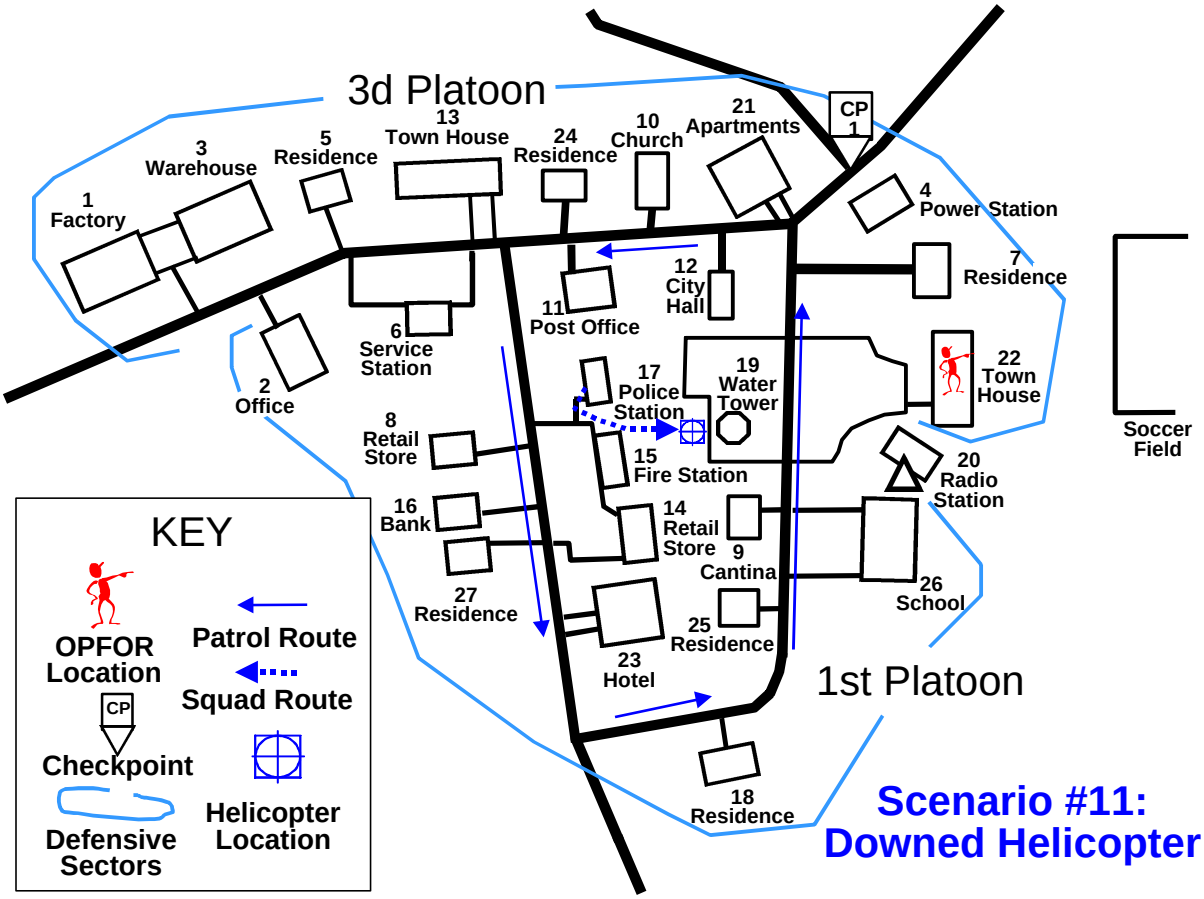
The unit is always the 2d Squad of the 2d Platoon.

Mission Overview: The company has secured the town of Dlubac (pronounced d·lü·b k). The company commander has ordered the platoons to establish a defense along the perimeter of the town. The 3d Platoon has established its sector along the north and east sides of the town from Building 1 (Factory) to Building 22 (Townhouse). Building 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. As a result, it may be fired on in self-defense, if necessary. The 1st Platoon has established its sector in the south and west sides of the town from Building 26 (School) to Building 2 (Office). The 2d Platoon is the company reserve. Its mission is to provide 1 squad to man Checkpoint #1 on the northeast side of town to control movement into and from the town and conduct a squad-sized roving patrol to establish a presence. 1st Squad is manning Checkpoint #1. 3d Squad is conducting the roving patrol along the interior road network. The 2d Squad is the platoon reserve since it just completed the roving patrol mission and was relieved by 3d Squad. The platoon mission is to maintain the peace and order within the town. All indirect fires and MEDEVAC vehicles are requested through the platoon leader. The ROE is restrictive - only return fire after fired upon.

Prior to Beginning Scenario	
1.	Interior lights are on in Buildings 17 (Police Station) and Building 22 (Town House).
2	SAF 3d SQD at Checkpoint #2 moving from BLDG 13 to BLDG 23, then drag and drop.
3.	SAF fire team at Checkpoint #1
4.	SAF fire team from 1st Squad moves from inside BLDG 2 to on-line fire-by-support positions
5.	Add burning helicopter crashed west of, but adjacent to, the water tower.
6.	Loud explosion can be heard while 2d Squad is in Building 17 (Police Station).
7.	Add rubble to Buildings 9 (Cantina), 26 (School), 20 (Radio Station), and 22 (Town House).
8.	Add 1 immersed OPFOR Sniper in Building 22 (Town House).
9.	Add 5 prone (injured and dead) friendly SAF personnel lying on the ground on the west side of the helicopter.
10.	Add SAF Medic to 2d Squad at the Police Station. He will accompany squad to the downed helicopter. A role player must be identified to portray Medic calling

	squad leader on radio to report "that there are 3 injured and 2 dead friendly personnel present. Request MEDEVAC immediately." He must also stand by to respond to a radio call from squad leader reporting that the MEDEVAC is en route, ETA is 10 minutes" and give a "Roger out."
11.	Identify role player to replicate 1st SQD LDR responding to PLT LDR and when reporting his unit in position to 2d SQD LDR.

Scenario: This scenario takes place early morning. The operation order has been issued by the platoon leader. The scenario begins with the 2d Squad at the platoon command post in Building 17 (Police Station), eating/resting after just completing its patrol. A loud explosion breaks the silence. The platoon leader calls the 2d Squad Leader and informs him that a Blackhawk Helicopter has crashed just outside next to the water tower behind Building 17 (Police Station). He orders the 2d Squad to secure the downed helicopter. The medic will join the 2d Squad enroute. The downed helicopter will be crashed on the northwest side of the water tower with fire and smoke present. 5 friendly personnel are visible lying on the ground on the western side of the helicopter. The squad reaches the crash site. The SAF medic immediately moves to and around the helicopter crew. He gets on a radio and states that there are 3 injured and 2 dead friendly personnel present. He asks for help treating the injured personnel and tells the squad leader that a MEDEVAC is needed ASAP. If the squad leader fails to report his arrival on site or fails to request a MEDEVAC, the platoon leader asks for a SITREP. The platoon leader states that a MEDEVAC is enroute, estimated time of arrival (ETA) is 10 minutes. After the conversation ends, 1 OPFOR in Building 22 (Town House) starts sniping at the 2d Squad and wounds one DISAF soldier. If the squad leader fails to report, the platoon leader asks for a SITREP. The platoon leader directs the 2d Squad to initially remain in place, protect the injured personnel, and orient fires on the sniper. He states that a fire team from1st Squad will move to provide support. Once the 1st Squad fire team arrives, 2d Squad will assault and clear Building 22 (Town House). They will be arriving from the northwest and will take up fire-by-support positions near Building 2 (Power Station). They will call for instructions once they are in position. This scenario will allow free play for friendly movement. ENDEX will occur when 2d Squad can no longer continue the mission or when Building 22 (Town House) is cleared. If the building is cleared, the platoon leader will direct the squad to evacuate all casualties to the platoon casualty collection point, the platoon CP. ENDEX will occur at that time.


3d Platoon
1 Factory
3 Warehouse
5 Residence
13 Town House
24 Residence
10 Church
21 Apartments
CP 1
4 Power Station
7 Residence
12 City Hall
11 Post Office
6 Service Station
2 Office
17 Police Station
19 Water Tower
22 Town House
Soccer Field
8 Retail Store
15 Fire Station
20 Radio Station
16 Bank
14 Retail Store
9 Cantina
26 School
27 Residence
25 Residence
23 Hotel
1st Platoon
18 Residence
KEY
OPFOR Location
Patrol Route
Squad Route
CP
Checkpoint
Helicopter Location
Defensive Sectors
Scenario #11:
Downed Helicopter

Mission Planning Briefing
Scenario #13:

Your unit is always the 2d Squad of the 2d Platoon.

Enemy Situation: Enemy forces have seized the town of Dlubac (pronounced d·lü·b k). Enemy presence is considered light, at platoon strength. 1-4 enemy personnel have been found defending any given building. There is no mechanized or motorized or indirect fire threat.

Mission of Higher Units: Your company has completed its initial assault on the town and established an overall front line trace (see map). 1st PLT is on the right in Bldgs. 2 (Office) and 6 (Service Station), preparing to assault Bldgs. 8 (Retail Store), 16 (Bank), and 27 (Residence), respectively. 3d PLT, the main effort, is in the center in Bldgs. 11 (Post Office) and 12 (City Hall), preparing to assault Bldgs 17 (Police Station), 15 (Fire Station), 9 (Cantina), and 14 (Retail Store), respectively. 2d Platoon, your platoon, is on the left. It has secured Bldgs. 4 (Power House), 7 (Residence), and 22 (Town House). Bldg. 21 has also already been secured. The platoon is currently in Bldg. 22 (Town House), preparing to assault Bldg. 20 (Radio Station). Resistance has been light (2-3 enemy soldiers in any building). The 2d PLT LDR has instructed that for the assault on Building 20 (Radio Station), the 1st Squad (DISAF) will support by fire from the vicinity of Bldg. 22 (Town House). 1st Squad will provide on-order AT-8 fire to establish a breach in Bldg. 20 (Radio Station). 1st Squad will follow on order; and clear Bldg. 20 (Radio Station), on order. 3d Squad is the platoon reserve.

Your Mission: 2d Squad, your squad, will conduct the initial assault, gain entry, then secure Bldg. 20 (Radio Station). You must coordinate with the PLT LDR to obtain the 1st Squad AT-8 fire. The PLT LDR has authorized the use of TAC lights once inside the building to reduce possible civilian casualties.

Rules of Engagement: The town population of Dlubac is considered to be friendly. However, enemy forces are located within the town. The rules of engagement are very restrictive. There will be no weapon firing within the town except in self-defense or in defense of the town against a confirmed enemy presence. Self-defense is defined as a serious threat to life or limb. Bldg. 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. As a result, it may be fired on in self-defense, if necessary. Weapons control status is yellow.

Your immediate task is to brief your squad members and organize the squad to complete the mission. Call signs remain constant.

What are your questions?

The scenario will begin once you have briefed your subordinates.

Scenario #13: Assault/Clear Building (Wall)

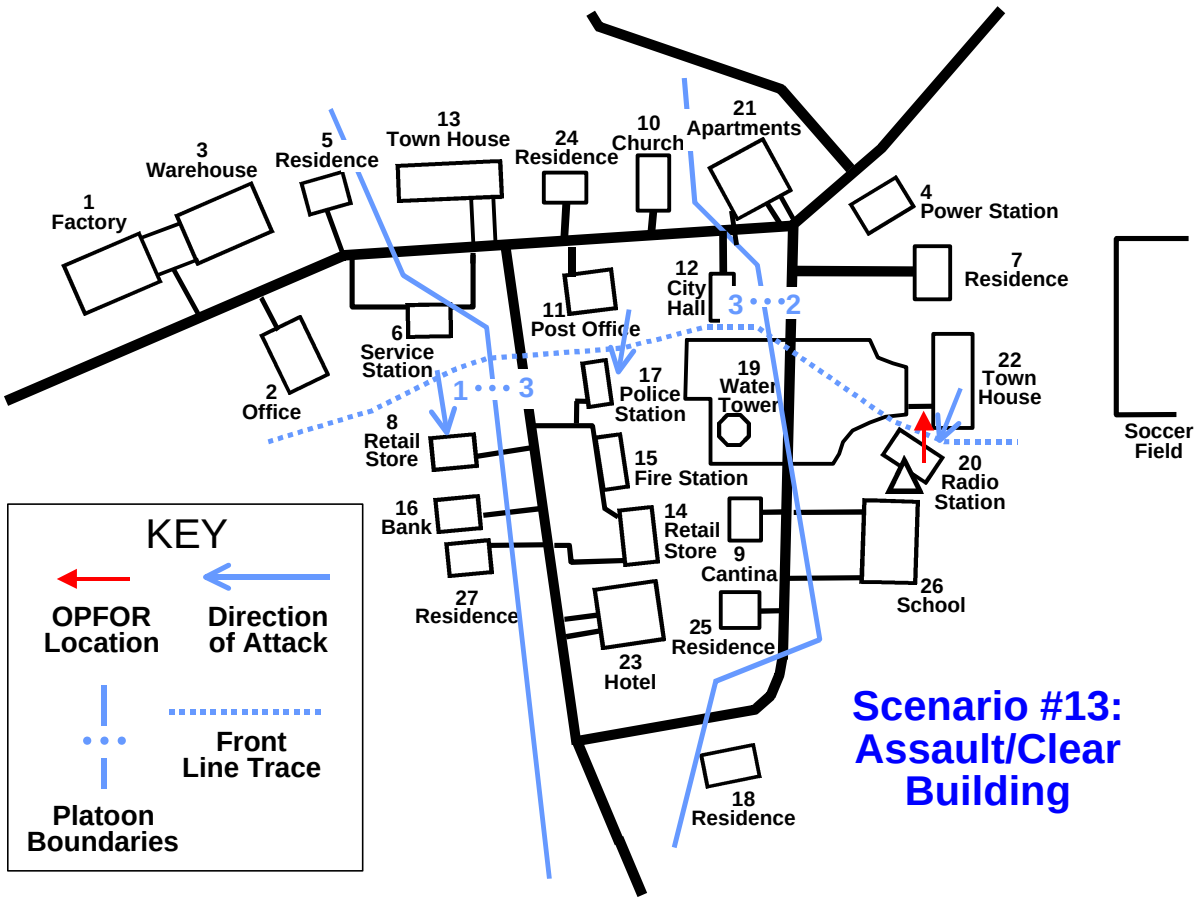
System Capabilities Used During this Scenario	Blow hole (AT-8)
	Rubble
	Omni-Directional Treadmill (ODT)
	Mission Planning Training Tool (MPTT)
	After Action Review (AAR) System
Time of Day: Noon	Voice Recognition/Synthesis
Weather: Clear	Tactically Correct Default Behavior (TCDB)
Wind effect: 2-5 mph	Tactical Lights
Wind Direction: N.W.	AT-8 fires

The unit is always the 2d Squad of the 2d Platoon.

Mission Overview: The company has completed its initial assault on the town of Dlubac (pronounced d·lü·b k) and established an overall front line trace. The company is attacking from north to south. The town is divided along the two long axes formed by the circular road network in the center of town (see map). 1st PLT is on the right in BLDGs 2 (Office) and 6 (Service Station), preparing to assault BLDGs 8 (Retail Store), 16 (Bank), and 27 (Residence), respectively. 3d PLT, the main effort, is in the center in Buildings 11 (Post Office) and 12 (City Hall), preparing to assault BLDGs 17 (Police Station), 15 (Fire Station), 9 (Cantina), and 14 (Retail Store), respectively. 2d PLT is on the left. It has secured Buildings 4 (Power House), 7 (Residence), and 22 (Town House). Building 21 has also already been secured. The platoon is currently in Building 22 (Town House), preparing to assault Building 20 (Radio Station). Resistance has been light (2-3 enemy soldiers in any building). The 2d PLT LDR has instructed the platoon that for the assault on Building 20 (Radio Station), the 1st Squad (DISAF) will support by fire from the vicinity of Building 22 (Town House). 2d Squad will conduct the initial assault, gain entry, then secure Building 20 (Radio Station). 1st Squad (SAF) will: (1) provide support by fire positions near Building 22 (Town House); (2) provide on-order AT-8 fire to establish a breach in Building 20 (Radio Station) for the 2d Squad; (3) follow 2d Squad on order; and, (4) clear Building 20 (Radio Station), on order. An AT-8 will be used to blow an entry hole into Building 20 (Radio Station). The 2d Squad Leader must coordinate with the platoon leader to obtain the AT-8 fire from the 1st Squad. The platoon leader authorizes the squad leader to use TAC lights once inside the building to reduce possible civilian casualties. The rules of engagement (ROE) restrict firing to return fire only. Building 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. As a result, it may be fired on in self-defense, if necessary.

Prior to Beginning Scenario	
1.	Add rubble to Buildings 22 (Town House) and 20 (Radio Station).
2.	Add 2 OPFOR in Building 20 (Radio Station). 1 OPFOR is dead in preparation of AT-8 blast. 1 OPFOR is immersed (for TAC lights).
3.	Add SAF 1st Squad around Building 22 (Town House) providing fire support into Building 20 (Radio Station).
4.	Establish an AT-8 "blown hole" location in Building 20 (Radio Station). Add rubble immediately after explosion.

Scenario: This scenario takes place at noon. The operation order has been issued by the platoon leader. The scenario begins with the 2d Squad in position next to BLDG 22 (Town House), preparing to assault Building 20 (Radio Station). 1st Squad has established support by fire positions. 3d Squad (notional) is in the rear of BLDG 22 (Town House) as the platoon reserve. 2d Squad is preparing to conduct the assault. The squad must move across open ground to Building 20 (Radio Station). An AT-8 will be used to blow an entry hole. The squad leader must coordinate with the platoon leader to obtain the fire from the 1st Squad. Once the hole is blown, 2d Squad will conduct the assault. The squad must clear and secure the building. If 2d Squad is unable to clear the building, the 2d SQD LDR will call the platoon leader and ask for the 3d Squad to pass through them and continue to clear the building. The first floor of the building will be occupied by 2 OPFOR. One OPFOR will be dead as a result of the breach explosion. Free play will be allowed with the remaining OPFOR. The scenario will run until enough data is collected for an AAR. The squad leader must keep the platoon leader informed. If he doesn't, the platoon leader will repeatedly ask for SITREPs. ENDEX will occur when the squad has secured Building 22 (Town House) or can no longer continue the mission and a battle hand over with the 3d Squad occurs. Once the building is cleared or 3d Squad is deployed to clear Building 22 (Town House), the platoon leader will direct the 2d Squad to evacuate all casualties to the platoon casualty collection point, the platoon CP. ENDEX will occur at that time.



Mission Planning Briefing
Scenario #14:

Your unit is always the 2d Squad of the 2d Platoon.

Enemy Situation: After a prolonged and bitter campaign, enemy forces been forced back to the town of Goldberg. Goldberg is considered an enemy stronghold with both their political and military infrastructure based in the town. The town populace is extremely sympathetic to the rebel cause. Armed enemy presence is considered heavy. There is no mechanized or motorized threat. However, indirect fire, in the form of mortars is available to the enemy.

Mission of Higher Units: The 11th IN BN is conducting a combined air assault and ground assault operation to seize the town. Your company is the main effort conducting the air assault. Two other companies are conducting a simultaneous ground assault. Your CO CDR has ordered 1st PLT to conduct an air assault to seize the 10-story building. 2d PLT will simultaneously conduct an air assault to seize the 20-story high rise building. 3d PLT is the company reserve and is prepared to reinforce 2d PLT, on order. Each platoon will have four helicopters at 30-second intervals. 2d PLT LDR has ordered the 1st Squad to be the security element and will conduct the initial assault. Its mission is to secure the roof with 1 fire team and establish a toehold on the top floor of the building, clearing the steps to the 20th floor for the next squad. Access to the follow-on floors is gained by using the stairwell steps. 2d Squad is second in order. It will pass through the 1st Squad and start to clear the building, floor-by-floor. 3d Squad is to follow the 2d Squad and be prepared to assume clearing responsibilities on order. Once 2d and 3d Squads have passed through, the 1st Squad will follow 3d Squad as the platoon reserve. 1st Squad will be prepared to assume clearing duties, on order. Each squad will leave 2 men on each floor that it clears to secure that floor. The platoon command post will initially be in the shed on the roof of the building. No fires will be placed into the adjacent 10-story building unless a target is positively identified firing on the 2d Platoon. If enemy troop movement is noticed in the 10-story building, the platoon leader will be notified immediately. Even then, coordination must be obtained from the platoon leader to fire into that building.

Your Mission: 2d Squad, your squad, will lead the assault on the 20th floor. 2d Squad will pass through the 1st Squad securing the roof and start to clear the building, floor-by-floor. 2d Squad will leave 2 men on each floor that it clears to secure that floor.

Rules of Engagement: The town population of Goldberg is considered hostile. However, given that the town population is not completely hostile, the rules of engagement remain restrictive. There will be no weapon firing except in self-defense. Self-defense is defined as a serious threat to life or limb. The use of deadly force is authorized. Armed civilians and OPFOR troops actively engaging U.S. soldiers will be fired on. Civilians found to be armed, but not firing on U.S. troops are to be disarmed, detained, and processed through company channels. Weapons control status is yellow.

Your immediate task is to brief your squad members and organize the squad to complete the mission. Call signs remain constant.

What are your questions?

The scenario will begin once you have briefed your subordinates.

Scenario #14: Air Assault/Clear Building (Roof)

System Capabilities Used During this Scenario	Tactical lighting
	After Action Review (AAR) System
	Omni-Directional Treadmill (ODT)
	Voice Recognition/Synthesis
	Tactically Correct Default Behavior (TCDB)
Time of Day: Dawn	
Weather: Clear	
Wind effect: 5 mph	
Wind Direction: N.E.	

This is the Goldberg Scenario

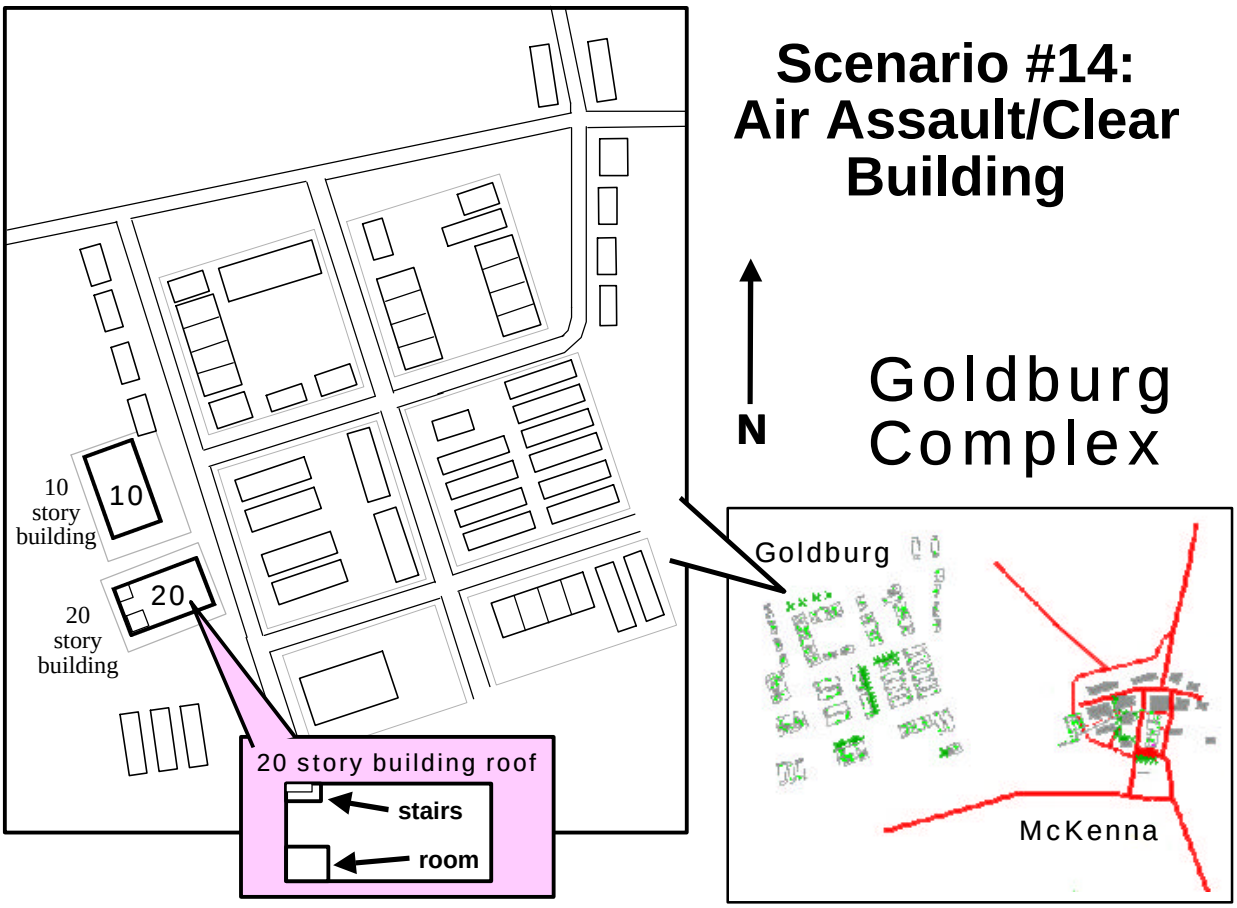
The unit is always the 2d Squad of the 2d Platoon.

Mission Overview: The battalion is conducting a combined air assault and ground assault operation to seize the town of Dlubac (pronounced d·lü·b k). The company is the main effort, conducting the air assault. Two other companies are conducting a simultaneous ground assault. Our company commander has ordered 1st Platoon to conduct an air assault to seize the 10-story building. 2d Platoon will simultaneously conduct an air assault to seize the 20-story high rise building. 3d Platoon is the company reserve and is prepared to reinforce 2d Platoon, on order. Each platoon will have four helicopters at 30-second intervals. 2d Platoon Leader has ordered the 1st Squad to be the security element and will conduct the initial assault. Its mission is to secure the roof with 1 fire team and establish a toehold on the top floor of the building, clearing the steps to the 20th floor for the next squad. Access to the follow-on floors is gained by using the stairwell steps. 2d Squad is second in order. It will pass through the 1st Squad and start to clear the building, floor-by-floor. 3d Squad is to follow the 2d Squad and be prepared to assume clearing responsibilities on order. Once 2d and 3d Squads have passed through, the 1st Squad will follow 3d Squad as the platoon reserve. 1st Squad will be prepared to assume clearing duties, on order. Each squad will leave 2 men on each floor that it clears to secure that floor. The platoon command post will initially be in the shed on the roof of the building. The platoon casualty collection point (CCP) is initially the platoon CP, located on the roof. As floors are cleared past the 10th floor, the CCP will be established on the landing of the last secured floor. The ROE is restrictive. No fires will be placed into the adjacent 10-story building unless a target is positively identified firing on the 2d Platoon. If enemy troop movement is noticed in the 10-story building, the platoon leader will be notified immediately. Even then, coordination must be obtained from the platoon leader to fire into that building. Armed OPFOR personnel in the 20-story high rise building are considered hostile and will be fired on.

Prior to Beginning Scenario	
1.	Add 2 OPFOR, 1 immersed on the 20th floor and 1 SAF on the 19th floor.
2.	Add 2 dead OPFOR on the roof.
3.	No interior lights on either building.
4.	SAF 1st Squad already on the roof (1 fire team) positioned along the roof perimeter. Must be in position when the 2d Squad exits their helicopter.
5.	Be prepared to have SAF 3d Squad moving on stairwell from the 20th floor to the

	19th floor, relieving the 2d Squad.

Scenario: This scenario takes place at dawn. The operation order has been issued by the platoon leader. The scenario begins with an aerial view of building from a high angle, at a distance, with helicopter landing on the roof of the building. Would like helicopter noise added to background. 1 DISAF squad on roof top moving to secure the building top. As the helicopter depart, 2d Squad will then teleport to the roof of the high rise, just outside their helicopter. DISAF players from the 1st Squad are already on the roof. The 2d Squad will move through the 1st Squad and commence clearing the top floor. There will be 2 dead OPFOR on the roof. There will be 2 more live OPFOR on the 20th and 19th floors, respectively. The outcome of this scenario will depend on the squad leader. Friendly and OPFOR "free play" will be allowed from the entry onward. The squad will clear both floors, if it is able to. The squad leader must keep the platoon leader informed. If he doesn't, the platoon leader will repeatedly ask for SITREPs. The use of TAC lights is authorized to assist clearing the various rooms on each floor. Once the 2d Squad has cleared the 20th and 19th floors, respectively (or is unable to continue the mission), the platoon leader will order the 3d Squad to assume the mission. ENDEX will occur when the 2d Squad has cleared both the 20th and 19th floors or is reduced to the point where it is unable to continue the mission.



Mission Planning Briefing
Scenario #16:

Your unit is always the 2d Squad of the 2d Platoon.

Enemy Situation: Enemy forces have seized the town of Dlubac (pronounced d·lü·b k). Enemy presence is considered light, at platoon strength with no mechanized or motorized threat.

Mission of Higher Units: Your company has completed its initial assault on the town and established an overall front line trace. The town is divided along the two long axes formed by the circular road in the center of town (see map). 1st PLT is on the left in Bldg. 27 (Residence), preparing to assault Bldgs. 16 (Bank), 8 (Retail Store), and 6 (Service Station), respectively. 3d PLT is on the right in Bldg. 20 (Radio Station), preparing to assault Bldgs. 22 (Town House), 7 (Residence), and 4 (Power House), respectively. 2d PLT, your platoon, is the main effort, in the center. 1st and 3d Squads have secured Bldgs. 9 (Cantina) and 25 (Residence). Resistance has been light with 1-3 enemy in any given building. The CO CDR has ordered 2d PLT to establish a squad support-by-fire position on the roof of Building 23 (Hotel) to provide immediate supporting fires for 2d PLT and on-call fire support for the rest of the company.

Your Mission: 2d Squad, your squad, has the mission of establishing a squad support-by-fire position on Bldg. 23 (Hotel) to provide immediate supporting fires for 2d PLT and on-call fire support for the rest of the company. The company support will be coordinated through the platoon leader. There will be no firing at targets outside the 2d PLT sector without his approval. The PLT LDR wants all targets positively confirmed prior to engagement. You will report all enemy movements and request permission to engage targets outside the platoon sector.

Rules of Engagement: The town population of Dlubac is considered to be friendly. The enemy attack caught the town population completely by surprise. Many civilians did not have an opportunity to flee and have been caught in the ensuing firefight. As a result, the rules of engagement are very restrictive. There will be no weapon firing within the town limits except at confirmed enemy targets. Additionally, Building 21 (Apartments) is a former hospital. It is now used as apartments to house refugees since the medical staff departed because of the civil unrest. Since it is no longer used as a hospital, it may be fired on, provided the ROE are met. Weapons control status is yellow.

Your immediate task is to brief your squad members and organize the squad to complete the mission. Call signs remain constant.

What are your questions?

The scenario will begin once you have briefed your subordinates.

Scenario #16: Support By Fire

System Capabilities Used During this Scenario	Voice Recognition/Synthesis
	AAR System
	Omni-Directional Treadmill (ODT)
	After Action Review (AAR) System
	Tactically Correct Default Behavior
Time of Day: Day	
Weather: Clear	
Wind effect: 5-10 mph	
Wind Direction: SE	

The unit is always the 2d Squad of the 2d Platoon.

Mission Overview: The company has completed its initial assault of the town of Dlubac (pronounced d·lü·b k). The town is divided along the two long axes formed by the circular road in the center of town (see map). 1st PLT is on the left in Buildings 27 (Residence), preparing to assault Buildings 16 (Bank), 8 (Retail Store), and 6 (Service Station), respectively. 3d PLT is on the right in Building 20 (Radio Station), preparing to assault Buildings 22 (Town House), 7 (Residence), and 4 (Power House), respectively. 3d PLT has responsibility for Building 21. Normally, Building 21 would not be fired on since it is marked as a hospital. However, Building 21 is now used as apartments since the medical staff departed because of the civil unrest. As a result, it may be fired on depending on the ROE. 2d PLT, the main effort, in the center, has secured Buildings 9 (Cantina) and 25 (Residence). Resistance has been light (1-3 enemy in any building). The CO CDR has ordered 2d PLT to establish a squad support-by-fire position in Building 23 (Hotel) to provide immediate supporting fires for 2d PLT and on-call fire support for the rest of the company. This is the mission of the 2d Squad. The company support will be coordinated through the platoon leader. All fires will be coordinated through him. There will be no firing at targets outside the 2d PLT sector without his approval. The platoon leader wants all targets positively confirmed prior to engagement, and the squad leader to report all enemy battlefield movement and request permission to engage targets outside the platoon sector. The ROE are restrictive. There will be no firing on armed civilians on the battlefield (COBs) that are not firing on you. Armed OPFOR personnel are considered hostile and may be fired on.

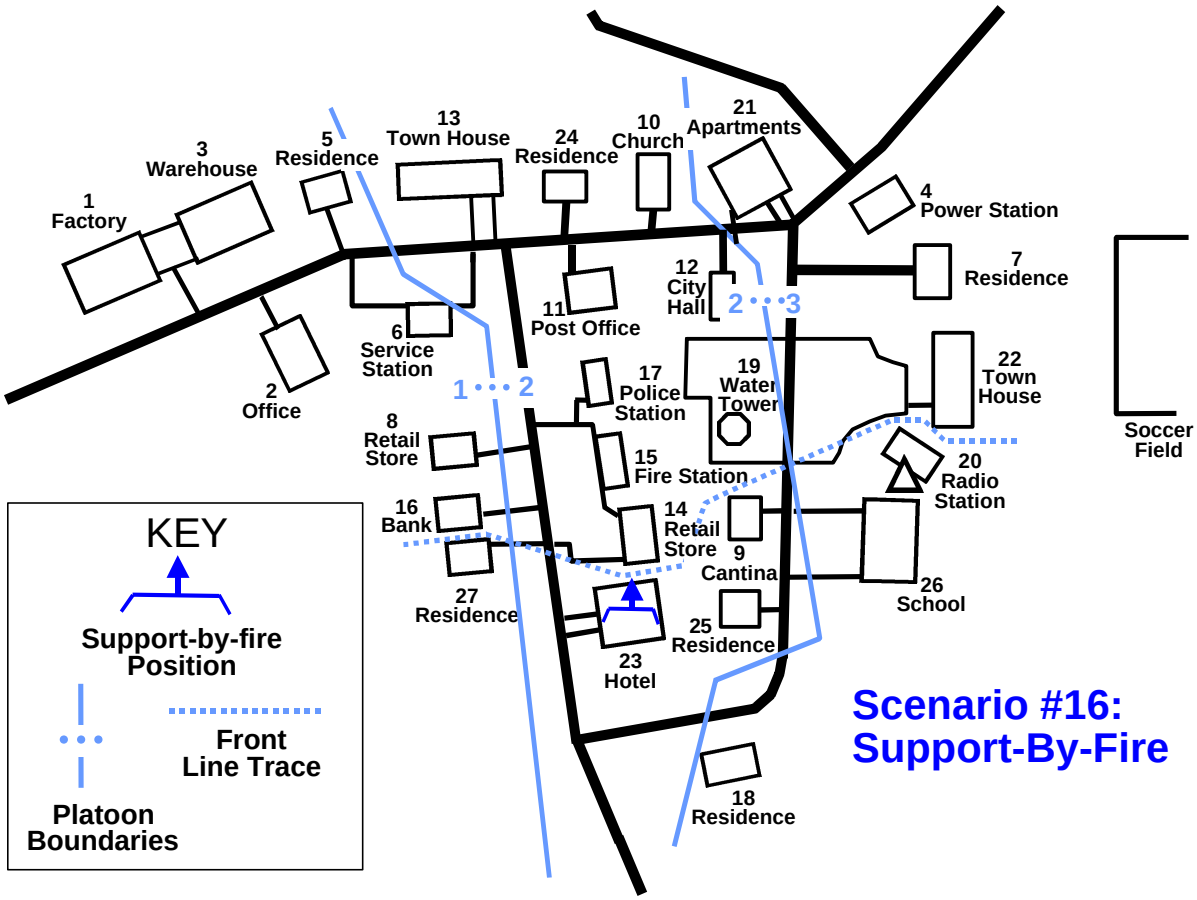
Prior to Beginning Scenario	
1.	The streetlights are off.
2.	No interior lights are on.
3.	Add SAF players. See Table 2.
4.	Add an occasional COB being flushed out of a building and moving to another.
5.	Embedded OPFOR sniper in Bldg 6 (Service Station).
6.	Add periodic explosions and machine gun fire to coincide with on-going battle.

Scenario: This scenario takes place during the day. The OPORD has been issued by the platoon leader. The scenario begins with the 2d Squad in position on the roof of Building 23 (Hotel), preparing to provide fire support for both the platoon and the company. 2d Squad's mission is: (1) to provide specific support by fire within the 2d PLT's sector; and, (2) to provide general support for the company. (3) All fires outside the 2d PLT sector will be coordinated through the

2 PLT LDR. (4) Report all enemy movements. (5) All targets will be positively confirmed; only clearly identified armed OPFOR personnel may be fired on. 1st and 3rd Squads will continue their assault. 2d SQD LDR should call the platoon leader to report all enemy battlefield movement and request permission to engage enemy targets outside the platoon's sector. If he does not, the platoon leader will get back on the net and correct the squad leader's performance. For this scenario, pre-program events in all 3 sectors have been created to establish the flow of the battle (See Table 2). ENDEX will occur after a reasonable amount of time or when the squad leader totally fails to control the fires of his squad.

Table 2. Programmed Moves

Move	Description	AAR View
1	2 CIV from Bldg 9 (Cantina) to Bldg 15 (Fire Station)	From Bldg 23 (Hotel)
2	2 CIV from Bldg 20 (Radio Station) to Bldg 22 (Town House)	From Water Tower
3	1 OPFOR from Bldg 16 (Bank) to Bldg 15 (Fire Station)	From Bldg 23 (Hotel)
4	2 OPFOR from Bldg 22 (Town House) to Bldg 7 (Residence)	From Bldg 23 (Hotel)
5	1 OPFOR from Bldg 16 (Bank) to Bldg 17 (Police Station)	From Bldg 23 (Hotel)
6	1 US fire team from Bldg 20 (Radio Station) to Bldg 22 (Town House)	From Water Tower
7	2 OPFOR from Bldg 8 (Retail Store) to Bldg 6 (Service Station)	From Bldg 23 (Hotel)
8	1 US fire team from Bldg 27 (Residence) to Bldg 16 (Bank)	From Bldg 23 (Hotel)
9	1 US fire team from Bldg 9 (Cantina) to Bldg 14 (Retail Store)	From Bldg 23 (Hotel)
10	1 CIV from Bldg 7 (Residence) to Bldg 4 (Power Station)	From Water Tower
11	2 CIV from Bldg 8 (Retail Store) to Bldg 2 (Office)	From Bldg 23 (Hotel)
12	2 CIV from Bldg 17 (Police Station) to Bldg 12 (City Hall)	From Bldg 23 (Hotel)
13	1 US fire team from Bldg 20 (Radio Station) to Bldg 22 (Town House)	From Water Tower
14	1 OPFOR from Bldg 16 (Bank) to Bldg 12 (City Hall)	From Bldg 23 (Hotel)
15	1 CIV from Bldg 12 (City Hall) to Bldg 11 (Post Office)	From Water Tower
16	1 US fire team from Bldg 14 (Retail Store) to Bldg 15 (Fire Station)	From Water Tower
17	3 CIV from Bldg 12 (City Hall) to Bldg 10 (Church)	From Bldg 23 (Hotel)
18	1 US fire team from Bldg 22 (Town House) to Bldg 7 (Residence)	From Water Tower
19	1 CIV from Bldg 6 (Service Station) to Bldg 13 (Town House)	From Bldg 23 (Hotel)
20	1 US fire team from Bldg 8 (Retail Store) to Bldg 6 (Service Station)	From Bldg 23 (Hotel)
21	2 OPFOR from Bldg 11 (Post Office) to Bldg 10 (Church), then beyond	From Water Tower
22	1 CIV from Bldg 4 (Power Station) to Bldg 21 (Apts)	From Water Tower
23	1 US fire team from Bldg 7 (Residence) to Bldg 4 (Power Station)	From Water Tower
24	1 OPFOR from Bldg 17 (Police Station) to Bldg 6 (Service Station)	From Bldg 23 (Hotel)
25	1 US fire team from Bldg 15 (Fire Station) to Bldg 17 (Police Station)	From Water Tower
26	1 US fire team from Bldg 6 (Service Station) to Bldg 2 (Office)	From Bldg 23 (Hotel)
27	3 OPFOR from Bldg 21 (Apts) to Bldg 24 (Residence), then beyond	From Bldg 23 (Hotel)
28	1 US fire team from Bldg 4 (Power Station) to Bldg 21 (Apts)	From Water Tower
29	1 US fire team from Bldg 2 (Office) to Bldg 3 (Warehouse)	From Bldg 23 (Hotel)
30	1 US fire team from Bldg 12 (City Hall) to Bldg 10 (Church)	From Bldg 23 (Hotel)
ENDEX		


1
Factory
3
Warehouse
5
Residence
13
Town House
24
Residence
10
Church
21
Apartments
4
Power Station
7
Residence
12
City
Hall
2 • • • 3
11
Post Office
6
Service
Station
2
Office
1 • • • 2
17
Police
Station
19
Water
Tower
22
Town
House
Soccer
Field
8
Retail
Store
15
Fire Station
20
Radio
Station
16
Bank
14
Retail
Store
9
Cantina
26
School
27
Residence
25
Residence
23
Hotel
18
Residence
KEY
Support-by-fire
Position
Front
Line Trace
Platoon
Boundaries
Scenario #16:
Support-By-Fire

Appendix C. Culminating Event Questionnaires

APPENDIX C Table of Contents

Biographical Information Questionnaire

ID_____

Date_____

Please fill in the blank or mark or circle the appropriate response.

1. What is your age? _____ Years 2. MOS _____ 3. Rank _____

4. Time in service: Years _____ Months _____

5. What is your current duty position? _____

How long in this position ? _____

6. What Army training courses have you completed? Check all that apply.

____ OSUT/AIT _____ PLDC _____BNCOC

____ BFV Leader Course _____ Airborne _____ Ranger

____ Air Assault _____ Combat Life Saver Course _____ Other (specify)

7. How susceptible to motion or car sickness do you feel you are?

0	1	2	3	4	5	6	7
not susceptible	very mildly		average				very highly

8. Do you have normal or corrected to normal 20/20 vision? Yes No

9. Are you color blind? Yes No

10. Are you ___ right handed? ___ left handed?

11. My level of confidence in using computers is

1	2	3	4	5
low		average		high

12. How many hours per week do you use computers? _____ hours per week

13. How many times in the last year have you experienced a virtual reality game or entertainment?

0 1 2 3 4 5 6 7 8 9 10 11 12+

14. How often have you trained at the McKenna MOUT site since basic training (***NOT*** including demonstrations)?

___ not since basic training ___ 1-3 times ___ more than 3 times

15. Have you ever participated in close quarter combat (room clearing) training ***EXCEPT*** for a demonstration?

Yes No

16. Have you ever participated in a demonstration at the McKenna MOUT site?

Yes No

17. Have you ever been in a Virtual Individual Combatant (VIC) simulator at the Land Warrior Test Bed before?

Yes No

If YES, when (approximate month and year) and which one(s)? (Describe if you cannot remember the name)

18. Have you had any <u>other</u> experience with military computer simulations?

Yes No

If yes, please describe briefly or give the names of the simulators.

2001 Simulator Capability Questionnaire

ID Number:_____ Today's Date:_____

Section I. Basic Simulator Capabilities

Please rate your ability to perform each task in the simulator

	Very Good	Good	Poor	Very Poor
1. Move through open areas as a widely separated group.				
2. Move according to directions.				
3. Maneuver around obstacles.				
4. Move in single file.				
5. Maneuver below windows.				
6. Maneuver close to others.				
7. Determine other team/squad team members' positions.				
8. Maintain position relative to other team/squad members.				
9. Maneuver around corners.				
10. Locate assigned areas of observation, e.g. across the street.				
11. Look around corners.				
12. Visually locate the source of enemy fire.				
13. Determine the source of enemy fire by sound.				
14. Distinguish between friendly and enemy fire.				
15. Identify civilians.				
16. Communicate enemy location to team member.				
17. Take hasty defensive positions.				
18. Aim weapon.				
19. Fire weapon in short bursts.				
20. Fire weapon accurately.				
21. Identify covered and concealed routes.				
22. Identify areas that mask supporting fires.				
23. Coordinate with other squad members.				
24. Execute the assault as planned.				
25. Move quickly to the point of attack.				
26. Assume defensive positions.				
27. Identify safe and danger areas.				
28. Locate support team positions.				
29. Locate fire team buddy positions.				
30. Take position to one side of the doorway.				
31. Move quickly through doorways.				
32. Take a tactical position while within a room.				
33. Scan the room quickly for hostile combatants.				
34. Engage targets within a room.				
35. Identify non-combatants within a room.				
36. Move past furniture in a room.				
37. Maneuver past other personnel in a room.				
38. Understand verbal commands.				

Please rate your ability to perform each task in the simulator	Very Good	Good	Poor	Very Poor
39. Identify sector responsibility.				
40. Communicate SPOT reports to squad leader.				
41. Execute planned route.				
42. Identify assigned sectors of observation.				
43. Move close to walls.				
44. Scan from side-to-side.				
45. Scan vertically.				
46. Identify enemy soldiers.				
47. Estimate distances from self to a distant object.				
48. Climb up or down stairs.				
49. Climb up or down ladders.				
50. Move through sewers.	**NA**	**NA**	**NA**	**NA**
51. Locate enemy soldiers inside buildings firing at your unit.				
52. Determine the direction enemy rounds are coming from.				

Section II: Dynamic Terrain Server					
Indicate how much you agree or disagree with each of the following statements.					
	Strongly Agree	**Agree**	**Neither Agree Nor Disagree**	**Disagree**	**Strongly Disagree**
1. The rubble effect realistically portrays that found in a MOUT environment.					
2. I was able to distinguish rubble from a distance.					
3. The effects of simulated rubble noticeably impeded movement.					
4. The simulated rubble noticeably impeded both SAF and immersed players.					
5. The effect created by the blow hole (AT-8 fire) is realistic.					
6. The blow hole (AT-8 fire) created a hole exactly where it was to be placed.					
7. The sound simulation of the blow hole "burst" (AT-8 fire) was realistic.					
8. The flash simulation of the blow hole "bursts" (AT-8 fire) was realistic.					
9. There is no impact or tactical advantage to blowing a hole in a building ceiling or floor.					
10. The rubble effect worked well in conjunction with the effects of the blow hole.					
11. Battlefield environment (wrecked vehicles, building damage, civilians and vehicles moving about, etc.) was realistically portrayed.					

Section III: SVS Enhancements					
Indicate how much you agree or disagree with each of the following statements.					
	Strongly Agree	**Agree**	**Neither Agree Nor Disagree**	**Disagree**	**Strongly Disagree**
1. The inability to throw grenades adversely impacted my fighting ability.					
2. The inability to use hand-held illumination (flares) adversely impacted my fighting ability.					
3. The inability to use flash-bang grenades to help clear rooms adversely impacted my fighting ability.					
4. The inability to employ tactical hand-held smoke grenades adversely impacted my fighting ability.					
5. The use of tac lights greatly aided in reducing possible civilian casualties.					
6. Time of day was accurately reflected by the amount of light demonstrated on the simulator.					
7. Shadows were used to accurately depict the correct time of day.					

Section IV: Other Training Tools					
Please assess the following training tools					
	Strongly Agree	**Agree**	**Neither Agree Nor Disagree**	**Disagree**	**Strongly Disagree**
1. The after-action review (AAR) system helped me understand what occurred during the exercise.					
2. The after-action review (AAR) system should be incorporated into all simulator training.					
3. The mission planning and training tool (MPTT) was an effective rehearsal tool.					
4. The MPTT will make an effective mission planning tool.					
5. Street lights were realistic.					
6. Street lights were realistically placed (not too high or too low).					
7. There were an adequate number of street lights, replicating real life.					
8. Shooting out street lights to reduce their impact on the mission was realistic.					
9. The use of shadows under street lights enhanced the realism.					

	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
10. Building interior lights were realistic.					
11. Shooting out building interior lights to reduce their impact on the mission was realistic.					
12. Night conditions were accurately portrayed in the simulator.					
13. I was able to easily distinguish the difference between lit interior rooms from non-lit rooms.					

Semi-Automated Force (SAF) Performance Questionnaire

ID Number: _____ **Today's Date:** _____

Leadership position held during today's exercise (*Check one*):

_____ **Squad Leader** _____ **Alpha Team Leader** _____ **Bravo Team Leader**

How well did the semi-automated force fire teams perform the following tasks in today's exercises compared with soldiers in the simulators?

SAF players were...	Much worse than soldiers	Slightly worse than soldiers	About the same as soldiers	Slightly better than soldiers	Much better than soldiers
1. Move through open areas.					
2. Maintain position relative to other squad or team members.					
3. Communicate information to squad leader.					
4. Locate known or suspected enemy positions.					
5. Clear a room.					
6. Clear a building.					
7. Distinguish between friendly and enemy positions.					
8. Take hasty defensive positions.					
9. Fire weapons automatically.					
10. Move to designated location.					
11. Change formation.					
12. Support by fire.					
13. Deliver suppressive fire.					
14. Perform fire and movement.					
15. React to contact					
16. React to ambush.					
17. Move through built-up areas.					
18. Move through sewer.	NA	NA	NA	NA	NA

Training Effectiveness Questionnaire

ID Number: _____ **Today's Date:** _____

Position Held During Today's Exercise (*Check one*):
_____ **Squad Leader** _____ **Alpha Team Leader** _____ **Bravo Team Leader**

As a result of today's exercises, my ability to perform the following tasks was changed as follows.	No Improve-ment	Slight Improve-ment	Moderate Improve-ment	Vast Improve-ment
1. React to Contact Battle Drill.				
2. Assess the tactical situation.				
3. Control of squad/fire team movement during the assault.				
4. Locate known or suspected enemy positions.				
5. Clear a room.				
6. Clear a building.				
7. Control squad or fire team movement while ***NOT*** in contact with the enemy.				
8. Plan a tactical operation.				
9. Control your squad or fire team.				
10. Coordinate activities with your chain of command.				
11. Squad/fire team communication and coordination.				

Please select the block that best captures your impression of the scenarios.	Not Very Realistic	Slightly Realistic	Fairly Realistic	Very Realistic
1. Was your mission realistic?				
2. Were the events that occurred during each scenario realistic?				
3. Were force ratios (sizes) realistic?				
4. Were enemy actions realistic?				
5. Were the distractors (events added to distract your focus) realistic?				
6. What was your overall rating of the 1st scenario?				
7. What was your overall rating of the 2d scenario?				
8. What was your overall rating of the 3d scenario (if applicable)?				
9. What was your overall rating of the 4th scenario (if applicable)?				

2001 Voice Recognition Questionnaire

ID Number:_____ Today's Date:_____

Indicate how much you agree or disagree with each of the following statements.

	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
1. It was easy to give voice commands that SAF could understand.					
2. It was easy to learn to give voice commands to SAF.					
3. It was easy to tell if SAF recognized or understood my voice commands.					
4. Giving voice commands to SAF came naturally.					
5. I frequently gave voice commands that SAF did not recognize.					
6. The SAF responded to my verbal commands.					
7. The verbal responses were appropriate for the various situations.					
8. What percentage of time was SAF unable to recognize your voice commands correctly on the first try? **(circle response)**	<20%	20-39%	40-60%	61-80%	>80%
9. What percentage of time did SAF respond incorrectly to your voice commands? **(circle response)**	<20%	20-39%	40-60%	61-80%	>80%

AFTER ACTION REVIEW (AAR) EVALUATION

ID Number:_____ Today's Date:_____

Please indicate how much you agree or disagree with each of the following statements by placing a check mark in the appropriate cell.

	Strongly Agree	**Agree**	**Neither Agree nor Disagree**	**Disagree**	**Strongly Disagree**
The AAR system was effective in displaying movement outside of buildings.					
The AAR system was effective in displaying movement inside of buildings.					
The AAR system was effective in replaying communications.					
The AAR system made it easy to determine what happened during a mission.					
The AAR system made it easy to determine why things happened the way they did during a mission.					
The AAR system made it easy to determine how to do better in accomplishing the mission.					

AFTER ACTION REVIEW (AAR) EVALUATION

ID Number:_____ Today's Date:_____

Please indicate how much you agree or disagree with each of the following statements by placing a check mark in the appropriate cell.

	Strongly Agree	**Agree**	**Neither Agree nor Disagree**	**Disagree**	**Strongly Disagree**
The AAR system made it easy to determine the order in which key events occurred during the mission.					
The AAR system was more effective than conducting an AAR without any visual or audio playback (just talking)					

What were the best aspects of the AAR system?

What were the worst aspects of the AAR system?

Was anything missing from the AAR system?

How could the AAR system be improved?

Leader Post-Experimental Group Interview

(**Circle:** Squad Leader, Alpha Team Leader, and Bravo Team Leader)

Interviewer_____ **Date:**_____

1. Do you think that the simulators you used today were a useful training tool (that is, did you learn from today's experience)?

What did you learn?

2. Do you think that this training will affect you performance in a real world setting?

3. Where in the Army training system do you think that this type of training would be most appropriate or useful?

4. In today's exercises, friendly and enemy forces were sometimes actual soldiers, and sometimes semi-automated forces (SAF) under the control of an operator. Were you able to identify which were SAF and which were soldiers?

If so, how?

5. Did you do anything differently when interacting with SAF vs. the real soldiers?

If so, what?

6. Did the use of SAF affect what you learned?

If so, what?

7. What additional capabilities do you think SAF should have in order to be effective from a training standpoint?

8. What did you like most about the scenarios?

9. What did you like least about the scenarios?

10. Could these scenarios be used to practice decision-making skills?

Why or why not?

11. Were the after-action reviews (AARs) provided after the exercises helpful?

Why or why not?

12. What additional features do you think the AAR system should have?

13. What part of the simulation (tasks, terrain, etc.) was the most realistic?

14. What part of the simulation (tasks, terrain, etc.) was the least realistic?

15. What was the most difficult task to perform in the simulator?

16. Did you find any aspects of the simulator or simulation distracting?

If so, what?

17. Do you think your lack of familiarity with the simulators affected your performance in the exercises, or did you have enough training?

18. Was the automatic voice recognition helpful when controlling SAF? Does it need additional capabilities? If so, what?

19. What is your overall impression of the night simulation? Were some aspects more realistic than others? If so, what?

ODT Questionnaire

Name:_____ **Date:**_____

Time:_____

Please rate your ability to do the following things on the Omni-Directional Treadmill (ODT). Circle only one response for each item.

Move Naturally				
Very Poor	Poor	Fair	Good	Very Good
Maintain Balance				
Very Poor	Poor	Fair	Good	Very Good
Maneuver Around Obstacles				
Very Poor	Poor	Fair	Good	Very Good
Maneuver Close to Other People in the Virtual Environment				
Very Poor	Poor	Fair	Good	Very Good
Maintain Position Relative to Team Members				
Very Poor	Poor	Fair	Good	Very Good
Maneuver Around Corners				
Very Poor	Poor	Fair	Good	Very Good
Look Around Corners				
Very Poor	Poor	Fair	Good	Very Good
Move Quickly				
Very Poor	Poor	Fair	Good	Very Good
Move Through Doors				
Very Poor	Poor	Fair	Good	Very Good
Move Around Inside Buildings				
Very Poor	Poor	Fair	Good	Very Good
Move Across Open Terrain				
Very Poor	Poor	Fair	Good	Very Good
Move Tactically				
Very Poor	Poor	Fair	Good	Very Good

Please answer the following questions regarding the ODT. Circle only one response for each question.

1. Did your speed of movement through the virtual environment feel correct?				
Never	Hardly Ever	Sometimes	Usually	Always
2. Was your speed				
Too Slow		About Right		Too Fast
3. Did you forget that you were on the ODT during the scenario?				
Never	Hardly Ever	Sometimes	Usually	Always
4. Did you feel safe on the ODT?				
Never	Hardly Ever	Sometimes	Usually	Always
5. Did the ODT cause you to move when you were not ready?				
Never	Hardly Ever	Sometimes	Usually	Always

SVS Questionnaire

Name:_____ **Date:**_____

Time:_____

Please rate your ability to do the following things in the Soldier Visualization System (SVS). Circle only one response for each item.

Move Naturally				
Very Poor	Poor	Fair	Good	Very Good
Maintain Balance				
Very Poor	Poor	Fair	Good	Very Good
Maneuver Around Obstacles				
Very Poor	Poor	Fair	Good	Very Good
Maneuver Close to Other People in the Virtual Environment				
Very Poor	Poor	Fair	Good	Very Good
Maintain Position Relative to Team Members				
Very Poor	Poor	Fair	Good	Very Good
Maneuver Around Corners				
Very Poor	Poor	Fair	Good	Very Good
Look Around Corners				
Very Poor	Poor	Fair	Good	Very Good
Move Quickly				
Very Poor	Poor	Fair	Good	Very Good
Move Through Doors				
Very Poor	Poor	Fair	Good	Very Good
Move Around Inside Buildings				
Very Poor	Poor	Fair	Good	Very Good
Move Across Open Terrain				
Very Poor	Poor	Fair	Good	Very Good
Move Tactically				
Very Poor	Poor	Fair	Good	Very Good

Please answer the following questions regarding the SVS. Circle only one response for each question.

1. Did your speed of movement through the virtual environment feel correct?				
Never	Hardly Ever	Sometimes	Usually	Always
2. Was your speed				
Too Slow		About Right		Too Fast
3. Did you forget that you were in the SVS during the scenario?				
Never	Hardly Ever	Sometimes	Usually	Always
4. Did you feel safe in the SVS?				
Never	Hardly Ever	Sometimes	Usually	Always

Locomotion Systems Debrief

Date:_____

We are looking for information that will help us improve these simulators.

1. What problems did you encounter using the ODT to move through the virtual environment?

2. What are the strengths of the ODT as a device for moving through virtual environments?

3. What are the weaknesses of the ODT as a device for moving through virtual environments?

4. Would a simulator that includes the ODT be useful for Army training or mission rehearsal?

5. Give me examples of how a system that includes the ODT would be used.

6. What problems did you encounter using the SVS to move through the virtual environment?

7. What are the strengths of the SVS as a device for moving through virtual environments?

8. What are the weaknesses of the SVS as a device for moving through virtual environments?

9. Would a simulator that includes the SVS be useful for Army training or mission rehearsal?

10. Give me examples of how a system that includes the SVS would be used.

Date_____ ID_____
Time_____

Symptom Checklist

Instructions: Please indicate the severity of symptoms that apply to you right now by circling the appropriate word.

1. General discomfort	None	Slight	Moderate	Severe
2. Fatigue	None	Slight	Moderate	Severe
3. Headache	None	Slight	Moderate	Severe
4. Eye Strain	None	Slight	Moderate	Severe
5. Difficulty focusing	None	Slight	Moderate	Severe
6. Salivation increased	None	Slight	Moderate	Severe
7. a. Warm Sweating (from temperature or exertion)	None	Slight	Moderate	Severe
b. Cold Sweating (from discomfort or nervousness)	None	Slight	Moderate	Severe
8. Nausea	None	Slight	Moderate	Severe
9. Difficulty concentrating	None	Slight	Moderate	Severe
10. "Fullness of the Head"	None	Slight	Moderate	Severe
11. Blurred Vision	None	Slight	Moderate	Severe
12. a. Dizziness with eyes open	None	Slight	Moderate	Severe
b. Dizziness with eyes closed	None	Slight	Moderate	Severe
13. Vertigo	None	Slight	Moderate	Severe
14. *Stomach awareness	None	Slight	Moderate	Severe
15. Burping	None	Slight	Moderate	Severe

16. Other (describe): _____
_____

* Stomach awareness is usually used to indicate a feeling of discomfort which is just short of nausea.

Appendix D. Daily Schedules

Friday, 21 September

0800 Set-up
0900 Soldiers Arrive
Soldier Welcome and Orientation
0930 Questionnaire Administration
- Biographical Questionnaire
- Symptom Checklist

1000 Train-up: SVS – Move shoot & communicate
1100 Train-up: Multiple Tracks
- ODT – 3 soldiers
- Voice & Gesture control of SAF – Team Leaders
- Mission Background – Squad Leader

1200 Lunch
1300 Familiarization Exercise -- Scenario 7 (SASO Checkpoint)
- Receive orders and plan (10 minutes)
- Move to SVSs and calibrate weapons (10 minutes)
- Conduct exercise (20 minutes)
- Break (10 minutes)
- Repeat Exercise (20 minutes)

1415 Training Exercise 1 – Scenario 6 (Hostage Rescue)
- Receive orders and plan - Use MPTT (10 minutes)
- Move to SVSs and calibrate weapons (10 minutes)
- Conduct exercise (20 minutes)
- AAR (20 minutes)

1515 Training Exercise 2 – Scenario 16 (Support by Fire)
(Same break-out as Training Exercise 1)
1615 Questionnaires & Interviews
1700 Release Soldiers

Monday 24 September and Wednesday, 26 September

0800 Set-up

0900 Soldiers Arrive
Soldier Welcome and Orientation

0930 Questionnaire Administration
- Biographical Questionnaire
- Symptom Checklist

1000 Train-up: SVS – Move shoot & communicate

1100 Train-up: Multiple Tracks
- ODT – 3 soldiers
- Voice & Gesture control of SAF – Team Leaders
- Mission Background – Squad Leader

1200 Lunch

1300 Familiarization Exercise -- Scenario 7 (SASO Checkpoint)
- Receive orders and plan (10 minutes)
- Move to SVSs and calibrate weapons (10 minutes)
- Conduct exercise (20 minutes)
- Break (10 minutes)
- Repeat Exercise (20 minutes)

1415 Training Exercise 1-- Scenario 6 (Hostage Rescue)
- Receive orders and plan -- Use MPTT (10 minutes)
- Move to SVSs and calibrate weapons (10 minutes)
- Conduct exercise (20 minutes)
- AAR (15 minutes)

1510 Training Exercise 2 -- Scenario 16 (Support by Fire)
(Same break-out as Training Exercise 1, except no MPTT use)

1605 Training Exercise 3 – Scenario 13 (Assault and Clear a Building)
(Same break-out as Training Exercise 1)

1700 Release Soldiers

Tuesday, 25 September and Thursday, 27 September

0800 Set-up

0900 Soldiers Arrive
Questionnaire Administration
- Symptom Checklist

0930 Training Exercise 4 – Scenario 4 (Roving Patrol)
- Receive orders and plan -- Use MPTT (10 minutes)
- Move to SVSs and calibrate weapons (10 minutes)
- Conduct exercise (20 minutes)
- AAR (20 minutes)

1030 Training Exercise 5 – Scenario 14 (Air Assault and Clear an Building)
(Same break-out as Training Exercise 4, except no MPTT)

1130

1230 Training Exercise 6 – Scenario 10 (Crowd Control)
(Same break-out as Training Exercise 4)

1330 Training Exercise 7 – Scenario 11 (Downed Helicopter)
(Same break-out as Training Exercise 4, except no MPTT))

1430 Questionnaires & Interviews

1600 Release Soldiers