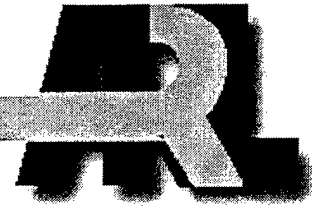


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Situational Awareness and Communication Experiment for Military Operations in Urban Terrain: Experiment I

Elizabeth S. Redden
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ARL-TR-2583

OCTOBER 2001

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ARL-TR-2583

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Abstract

The U.S. Army Research Laboratory and the Soldier and Biological Chemical Command-Natick Soldier Center, Natick, Massachusetts, developed a situational awareness (SA) assessment center (AC) for squad members, fire team leaders, and squad leaders at the McKenna military operations in urban terrain site, Fort Benning, Georgia. The AC was used to conduct a two-phase SA experiment. In Phase I, tactics, techniques, and procedures (TTPs) for the intra-squad radio were evaluated with the goal of selecting the most effective TTP for the intra-squad radio in urban conditions such as those evaluated. Five Army Ranger squads conducted three mini-vignettes five times using different TTPs and a different script each time (a total of 75 trials). The vignettes were scripted (i.e., OpFor activity, platoon leader communication, etc.) and were of short duration to minimize the number of uncontrolled variables. In Phase II, the contribution of the intra-squad radio to the SA of the individual squad members was evaluated. The TTP selected from Phase I was incorporated into Phase II procedures for communications. Each squad conducted each of six different vignettes twice (once with and once without the intra-squad radios) and used a different script each time. The AC methodology content validity index was 0.99, had high face validity, and allowed successful discrimination among a variety of conditions (e.g., day and night, five different TTPs, radio and no radio, etc.). Critical informational requirements were identified by echelon for each of the vignettes. The use of the intra-squad radios significantly increased the SA of the squad.

ACKNOWLEDGMENTS

The authors wish to thank several individuals from the U.S. Army Infantry School and the Human Research and Engineering Directorate of the U.S. Army Research Laboratory (ARL) for their contribution to the study. First, we would like to thank Dan Turner of DD Turner and Associates. Without his assistance, this study would not have been possible. He was the leader in the development of the scripts for the SA vignettes. His extensive combat experience was crucial to the validity of the scripts and questionnaires used. His leadership skills were also instrumental in the smooth running of the experiment. Bill Youngblood's (of Computer Sciences Corporation) assistance in preparing the scripts and in running the platoon headquarters and white cell (simulated command group) was also very valuable. We wish to thank SFC John Corderro-Torres of ARL for developing the operations orders and the fragmentation orders and for acting as the head controller for the evaluator-controllers and Chuck Bonnett of CB Associates for leading and controlling the opposing force during the vignettes. Cindy Holloway, Freddy Heller, Michelle Tonsmiere, Jeff Everett, and Cliff Swiecicki of ARL were also instrumental in the data reduction, questionnaire administration, and editing of the final report. The authors further thank Nancy Nicholas of ARL for technically editing this document.

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SITUATIONAL AWARENESS AND COMMUNICATION EXPERIMENT FOR MILITARY OPERATIONS IN URBAN TERRAIN: EXPERIMENT I

1. Introduction

In today's media-mad, computer-crazed, internet-immanent, information-impacted society, people are bombarded with data. Because so many facts and figures are readily available, people may pay insufficient attention to the items that are of critical importance or they may be unable to understand the implications of the critical information. A person who is capable of attending to the information that is important to his or her work and ignoring the bits of information that are unimportant or irrelevant, comprehending the meaning of the additive or multiplicative implications of the bits of information, and projecting an accurate course of action (COA) with the knowledge gleaned is "situationally aware."

In dynamic environments such as those encountered by the infantryman, many decisions are required across a fairly narrow space of time, and performance depends on a current, continuing analysis of the environment. Digital technologies, new ways of doing business, and new organizational structures are guaranteed to impose new informational processing and decision-making challenges on the ground warrior. Because the infantryman's environment is constantly changing, a major portion of his job becomes obtaining and maintaining good situational awareness (SA). This task is one of the major factors that determine his success or failure. Blackwell and Redden (2000) defined infantry SA as "the warrior's ability to quickly perceive and then discriminate between facets of the tactical environment, to accurately assess and reassess the where, when, and why of that environment, to then know and understand the nature of the tactical situation and to extrapolate near-term courses of action based on this understanding."

1.1 Background

This experiment was conducted under the auspices of the military operations in urban terrain (MOUT) advanced concept technology demonstration (ACTD) program. It was executed by the Human Research and Engineering Directorate of the U.S. Army Research Laboratory (ARL) field element at Fort Benning, Georgia, in conjunction with the MOUT ACTD Technology Program Office. The U.S. Department of Defense initiated the MOUT ACTD program in 1997. Its charter is to seek commercial and government off-the-shelf technologies that satisfy 32 jointly derived requirements specific to operations in "built up" or urban areas. The MOUT ACTD has executed six Army, four Marine Corps, and two joint experiments (JE1 and JE2). For each experiment, a variety of

operationally based factors was evaluated in order to determine the military utility of the technologies. One of the factors evaluated was the influence of specific technologies on the SA of the war fighter. The desire to answer this question served as the origin for this research. The MOUT ACTD program's SA efforts have received significant interest at the highest levels of the Army and internationally as well.

1.2 The Problem

The aviation community has been a leader in recognizing the importance of SA to pilots and has sponsored numerous studies of pilot SA. Other domains have also recognized the importance of SA and have begun to address the issue. For example, Gaba, Howard, and Small (1995) proposed that SA is an equally important characteristic in the intricate, precarious, and dynamic field of anesthesiology because anesthesiology shares these characteristics with aviation. Air traffic control, large-systems operations, and tactical and strategic systems are other occupations in which SA has been recognized to be a critical factor in successful performance (Endsley, 1995). The need to study SA in a wide variety of occupations is clear. In each of the occupations discussed, workers must do more than simply perceive the state of their environment. They must understand the integrated meaning of what they perceive in light of their goals and must project a COA. SA forms a basis for decision making.

Realistic simulators have facilitated the study of SA in the aviation field. The simulators allow rigid control of almost all aspects of the experimental environment. Endsley (1995) suggested that her SA global assessment technique could be used in any domain in which a reasonable simulation of task performance exists. However, simulations that allow assessment of SA are not available for all occupations. Consequently, the ability to use these valuable tools to evaluate SA in environments other than aviation may not currently exist. Rudimentary simulations of the infantryman's environment are available. However, these simulators do not currently replicate all the critical characteristics of the environment. An infantryman's job is to move, shoot, and communicate. He does not operate in a vacuum; rather, he operates as part of a team. Infantrymen are not static, and their SA must be developed during movement and execution of their combat tasks. They also rely on all their senses when they are immersed in their environment to provide SA cues. Even though some "part-task" simulators have been developed, there are currently no simulators available that replicate all the important features needed to realistically evaluate an infantryman's SA.

Redden and Blackwell (2000) successfully evaluated the SA of infantry soldiers in free-play exercises during MOUT ACTD JE1 and JE2. Free-play exercises allow the immersion of the infantrymen in a realistic natural environment. Redden and Blackwell used the questionnaire assessment of knowledge technique to query soldiers about the state of their environment during "freeze" frames in the

vignettes. Their methodology was shown to demonstrate reliability as well as content and face validity. However, the free-play exercises were time consuming, which hampered the ability to run multiple iterations. They also resulted in many uncontrolled variables. These included the tactics, reaction, and motivation of the opposing force (OpFor), the length of time required to complete a vignette, the capabilities of the leadership at platoon and higher levels, and the location of enemy contact. In addition to the uncontrolled variables associated with free-play exercises, it was determined that the tactics, techniques, and procedures (TTPs) used by the soldiers and marines to employ the MOUT ACTD intra-squad radios were not consistent among any of the platoons. There were inconsistencies among the Army platoons because there were no prescribed TTPs. For example, some platoon leaders took the microphones away from everyone in the squad except their squad leaders, while other platoon leaders encouraged all squad members to talk freely. Therefore, the Army platoons used whatever TTPs were dictated to them by their platoon leader. These varied, depending on the "best guess" of the platoon leader as to what he thought would be most effective. The marine platoon traditionally has no radio communications below the platoon leader level. Therefore, they were unaccustomed to the radio communications at lower echelons and they had to "guess" how to control radio communication in JE1. The marine platoon from JE1 that also participated in JE2 learned from their experiences in JE1 and applied a strict TTP to the use of the intra-squad radio during JE2. The JE2 results demonstrated that their TTP application was very successful.

1.3 Purpose

The purpose of this study was three-fold. First, it was to develop and validate a methodology that augmented the strengths (i.e., realism, reliability, and validity) and minimized the weaknesses (i.e., time required, uncontrolled variables) of the free-play methodology developed by Redden and Blackwell (2000). Second, the study was to evaluate the contribution of the MOUT ACTD technology to the SA of an infantry squad operating in a MOUT environment. Third, it was to provide insights into the TTPs that should be used when the technology is operated in the MOUT environment in similar situations.

2. Method

The experiment was conducted in two phases. In Phase I, five TTPs for the intra-squad radio in urban conditions were evaluated with the goal of selecting the most effective TTP. Five Army Ranger squads conducted three mini-vignettes using a different script (five scripts were written for each vignette) and five different TTPs (for a total of 75 trials). The vignettes were scripted (i.e., OpFor and civilian on the battlefield [COB] activity, platoon leader communication, etc.) and were of short duration to minimize the number of uncontrolled variables

(i.e., OpFor and COB reaction, platoon leader tactics, etc.). In Phase II, the contribution of the intra-squad radio to the SA of the individual squad members was evaluated. The TTP selected from Phase I (TTP 1) was incorporated into Phase II procedures for communications. Each squad conducted each of six different vignettes twice (once with and once without the intra-squad radios) and used a different script to control as many variables as possible each time. Phase I took 2 weeks to complete, and Phase II took 3 weeks to complete.

2.1 Subjects

Rangers were chosen as subjects for this experiment because previous experiments indicated that a learning curve was associated with intra-squad radio use (Redden & Blackwell, 2000). Because Rangers already use intra-squad radios, a long training and practice period was not needed to train them to achieve an asymptote regarding intra-squad radio usage.

The Phase I subjects were four Ranger squads from B Company and one squad from Headquarters Company, 3rd Battalion, 75th Ranger Regiment. The five squads were nearly full strength (a total of 42 soldiers), and the subjects' average age was 22 years. The Rangers had an average of 12.7 years of education, with a mean general-technical (GT) score of 115. They averaged 26 months of military service and 11 months in their current positions. Their self-evaluation of individual knowledge, skills, and abilities was average to above average. None of the Rangers had combat or related experience. Complete results of the demographics are presented in Appendix A, Section 3, Demographics.

The Phase II subjects were nine Ranger squads from A and C Companies, 3rd Battalion, 75th Ranger Regiment. The squads were at full strength (a total of 84 soldiers) and the soldiers' average age was 22 years. The Rangers had an average of 12.7 years of education with a mean GT score of 118. They averaged 24 months of military service and 11 months in their current positions. Their self-evaluation of individual knowledge, skills, and abilities was slightly above average. Complete results of the demographics are given in Appendix B, Section 3.

2.2 Apparatus

To begin developing a metric that retains the strengths of the free-play metric used by Redden and Blackwell (2000) and minimizes the weaknesses, the literature about assessment centers (ACs) was investigated to see if an AC could be developed to measure a construct such as SA. An AC consists of a standardized evaluation of personnel dimensions based on many contributions during varying conditions. This would allow multiple assessments of the construct in a more short-term and controlled environment than a free-play exercise would, and yet retain realism.

The 1989 Standards and Ethical Considerations for Assessment Center Operations (Development Dimensions International, 1989) provided an excellent set of guidelines for the development of an AC for SA. The purpose of the SA AC was to evaluate the strength of the SA construct in the participants during different conditions (i.e., with and without technology, using the technology with different TTPs, etc.) as opposed to the purpose of a true AC, which is selection, early identification, and evaluation of personnel potential. However, the methodology for AC development and validation was applicable in the development of the SA AC.

The first step in the development of the AC was a job analysis to determine what should be evaluated. The job that was defined was infantryman at squad level. Richie and Moses (1988) stated that a job analysis is important in the design of a successful AC. The critical piece of the job analysis for AC design was the task analysis. This analysis drove the development of the tasks that would be included in the AC. Van Cott and Paramore (1988) defined a task as a goal-directed behavior. Since the purpose was to develop an AC for evaluating the construct of SA, it was decided that the tasks to be included in the task inventory would be small units of behavior without any associated standards, conditions, or equipment. These tasks were concerned with outcomes of performance or, as Sistrunk and Smith (as cited in Gatewood & Field, 1994) observed, with *what gets done*.

Because the assessment was planned for an urban environment, an extensive literature review of the Department of the Defense MOUT literature was performed. This literature included training manuals, doctrinal manuals, soldier handbooks, training device development manuals, lessons learned papers, and reports. An initial task inventory was then developed and provided to a number of military and civilians working on the topic of MOUT, who had been identified by the author and other Army personnel as being subject matter experts (SMEs) in the MOUT job.

The selection of SMEs was very important to the composition of the task inventory. Mullins and Kimbrough (1988) found that different groups of SMEs produced different job analysis outcomes. They indicated that educational level and seniority affected the outcome of the job analysis. Landy and Vasey (1991) found that incumbent experience had a substantial influence on task ratings but that educational level and race had minimal effects. While Mullins and Kimbrough (1988) differ with Landy and Vasey (1991) about the effect of educational level, it appeared to be important to ensure that a SME population contained as much diversity as possible.

Choosing SMEs for this task was not as simple as it might be for other jobs. Sidney Gael (1988) stated that a SME group is usually composed of 6 to 10 job incumbents, immediate supervisors of incumbents, or specially trained

individuals such as behavioral scientists. There are no current incumbents or supervisors in the MOUT job, since the job only takes place during a conflict or war. Therefore, the SME group had to be chosen from those individuals who are knowledgeable of current MOUT TTPs and from personnel who have fought in a MOUT environment in the past. The SMEs chosen by the authors for the review of the task inventory came from several categories. Two SMEs were retired infantrymen who had actually participated in MOUT warfare during Viet Nam. One SME was a young infantry officer whose job was the development of equipment for the MOUT environment. One SME was a training developer who was in charge of developing training devices for the MOUT environment. Another SME was a MOUT simulation expert. One SME was a retired Army noncommissioned officer who was responsible for the development of the MOUT training and doctrinal manuals. Two SMEs were responsible for assessing the threat to the Rangers in MOUT environments. Thus, the SME panel consisted of personnel from a wide range of ages, seniority levels, educational levels, and perspectives.

The SME conference began with a discussion of the purpose, that is, the task inventory. Next, the SMEs were briefed about the type of task statements that were needed for the inventory. They were then issued a copy of the initial task inventory and were requested to review each task statement on the list and determine whether the statements represented appropriate MOUT job tasks. The statements were then reviewed orally and the SMEs made suggestions for changes in wording or deletion of the item if it was inappropriate.

It is interesting to note that there were very few items upon which the SMEs did not ultimately agree. The major issues raised were whether certain tasks could be performed by privates as well as sergeants (e.g., "perform a terrain analysis") and whether infantry could be expected to perform a task without the aid of the engineers (e.g., "blow a hole in a wall"). Once the tasks on the list were discussed, the SMEs were requested to generate additional tasks that were not included on the list. They were able to generate several tasks. After this, the SME conference ended.

The initial task inventory was used to develop the task analysis questionnaire. The rating scales for this questionnaire were included to identify the degree to which a task was considered to possess a rated characteristic (Gatewood & Field, 1994). The rating characteristics were based on the work of several authors. Sanchez and Fraser (1992) asked 101 incumbents from 25 service jobs to rate their respective tasks for relative time spent, difficulty of learning, criticality, and overall importance. They concluded that ratings of task criticality and task importance provided very redundant information. They noted that task analysis questionnaires should include ratings of "time spent," "difficulty of learning," and either "importance" or "criticality" because each of the three dimensions provides rather independent and valuable information about tasks. Schmitt and

Cohen (1989) used "time spent" and "difficulty" for their rating scales but did not include "criticality/importance." Based on the research from these authors, it was decided to include ratings of "criticality/importance," "difficulty," and "time spent."

The original task analysis questionnaire was administered to a small group of SMEs as a "pilot." Their comments were incorporated and the revised questionnaire was reviewed by another group of SMEs before final administration. The complete MOUT task inventory questionnaire was administered to SMEs identified by the author via the criteria previously discussed. This SME population included 30 personnel of diverse educational levels, ranks, and experience levels. The results of the questionnaire were used to rank the tasks for inclusion in the MOUT AC. The ranking was achieved by the following formula: $\text{Task Value} = 2 (\text{Criticality}) + \text{Time Spent} + \text{Difficulty}$. As many tasks as practical were included in the AC so that a cut-off score for inclusion was not determined *a priori*. A SME panel was convened after the questionnaire results were generated in order to determine how each task should be constructed in the AC. Once the tasks for inclusion were identified, an additional SME panel was convened to generate vignettes that contained the highest priority tasks, determine the number of freeze frames that were needed, and determine where to place the freeze frames in the scenario.

2.3 Vignettes

The vehicles used to evaluate the Rangers' SA during this experiment were vignettes taken from a Ranger battalion scenario. The results from the MOUT task inventory questionnaire were used to ensure that the most critical, difficult, and time-consuming tasks from the scenario were the focus of the vignettes. All units of the Ranger battalion were simulated in a notional manner, except for the platoon involved with the evaluation. The platoon leader and squad in support activities were scripted, and information from these elements was passed via the AN/PRC-126 frequency modulated (FM) radio to the squad leader. Depending on the iteration being conducted, the squad leader used either the individual communication (ICOM) intra-squad radio or non-radio means of communicating with his squad members.

Six free-play vignettes (A through F) were written, which were appropriate missions for a squad-size unit. Each vignette required scripted activity by the OpFor and the platoon leader "white cell" (simulated command group) activity to control these variables. Evaluator-controllers (ECs) accompanied the attacking squad, the support squad, the platoon white cell, and the OpFor to ensure that the players operated within the controls of the vignette and to gather ground truth data. There was no plan to use the support squad in the defense. After six offensive iterations, it was determined that the support squad provided no additional realism to the scenario. Therefore, the support squad was not used in subsequent iterations. Vignettes A through C (day missions) were used for Phase

I and vignettes A through F (both day and night missions) were used for Phase II. In order to accommodate the high number of iterations required, multiple OpFor scripts were written for the vignettes (see Table 1) so that the squads did not learn the scripts. Since the events that would take place in the AC (i.e., the enemy actions, the placement of civilians in the town, the radio communication with the platoon leader, etc.) could be scripted, the "ground truth" was defined before the start of the exercise by written scripts of the vignettes. Table 2 provides a description of each of the vignettes used.

Table 1. Scripts

	Vignette	Number of vignette scripts			OpFor
		Primary squad	Support squad	Platoon white cell	
Phase I	A	5	5	5	5
	B	5	NA	5	5
	C	5	5	5	5
Phase II	A	2	2*	2	2
	B	2	2*	2	2
	C	2	2*	2	2
	D	2	2*	2	2
	E	2	2*	2	2
	F	2	2*	2	2

*Not used

Table 2. Description of Vignettes and Scripts

Vignette	Tactics	Script 1	Script 2	Script 3	Script 4	Script 5
"A" Day	Squad attacked and cleared a freestanding building, which consisted of four rooms. Squad attacked across an open danger area.	Six OpFor in three different buildings; one OpFor has an intelligence map. Two COB in a fourth building moving toward OpFor.	Six OpFor in three different buildings. One COB bound, blindfolded, and co-located with OpFor.	Two OpFor in one building with an OpFor duty roster hanging on the door. Two COB co-located with OpFor; one COB blindfolded and assassinated.	Five OpFor located in two different buildings; one OpFor has order of battle papers. Two COB; one COB (with OpFor) bound, blindfolded, and assassinated; one COB located in a different building.	Notional OpFor. Three COB in two different buildings; one KIA, one WIA. One building is booby trapped.

Table 2 (continued)

"B" Day	Squad conducted a defensive preparation for counter attack. Squad occupied the second floor a building and observed OpFor activity on the eastern half of McKenna MOUT site.	Seven OpFor; three in an alleyway, four in a building. Three COB; two in a building, one in the vicinity of the cemetery.	Seven OpFor; four in an alleyway, three in a building moving under smoke cover. Three COB; two in a building waving a white flag, one in the vicinity of the cemetery.	Seven OpFor; four in two different buildings, three in the vicinity of the graveyard. Three COB in a building.	Seven OpFor; four in a building and three in the wood line. Three COB co-located with OpFor.	Five OpFor in three different buildings; two moving under smoke cover, one moves to experimental force (ExFor) building and replaces a satchel charge. Three COB in the vicinity of the cemetery moving to co-locate with OpFor.
"C" Day	Squad attacked and cleared a building that consisted of three rooms and a bell tower. Squad attacked across an open danger area.	Four OpFor in a building; one surrenders, three move to another building. Two COB co-located with OpFor; one bound and blindfolded, one moves with OpFor to the other building.	Three OpFor in a building (all WIA); one has intelligence map. Two OpFor in the wood line. Three COB in the wood line with OpFor.	Four OpFor in two different buildings; one OpFor dead, one OpFor uses a COB as shield to another building. Two COB co-located with OpFor.	Three OpFor in a building; one KIA, two WIA. One OpFor in the wood line. Two COB co-located with OpFor; one WIA. One COB in a different building.	Four OpFor in a building; two WIA and one dead. Dead OpFor has inventory of OpFor CW weapons. Four COB co-located with OpFor. One building is booby trapped.
"D" Night	Squad attacked and cleared a ground level section of a four-section building that consisted of three rooms. Squad attacked across an open danger area.	Three OpFor in two different buildings. Three COB co-located with OpFor. Booby trapped rucksack in hallway of a building.	Two OpFor in a building; one surrenders (has intelligence map), one escapes to the wood line with two COB as shields (two COB co-located with OpFor). Booby traps outside a building.	-----	-----	-----
"E" Night	Squad attacked and cleared a second story section of a four-section building consisting of four rooms. The squad moved through an already cleared section in the building and	Four OpFor in two different buildings: one KIA, one surrenders. Two OpFor in the wood line. Two COB co-located with OpFor; one bound, blindfolded and assassinated.	Two OpFor in a building; one KIA, one WIA with intelligence map and radio. Two OpFor in the vicinity of the picnic area. Two COB co-located with OpFor; one dead and booby trapped,	-----	-----	-----

Table 2 (continued)

	attacked up the stairwell of the building.		one KIA.			
"F" Night	Squad attacked and cleared a ground level section of a four-section building that consisted of four rooms and a long hallway. The squad moved through the al- ready cleared first and second story section of the building and attacked down the stairwell.	Five OpFor in two different buildings; two KIA, one takes a COB hostage. Two COB co- located with OpFor; one hostage, one bound and blindfolded.	Four OpFor in two different buildings; one KIA, one surrenders. Two COB co- located with OpFor; one WIA. Two booby traps in a building.	-----	-----	-----

CW = chemical warfare
KIA = killed in action
WIA = wounded in action

2.4 McKenna MOUT Site

The experiment was conducted at the McKenna MOUT site at Fort Benning. The overall layout of McKenna MOUT resembles a village with various types of buildings, avenues, and other features that one might expect to find in a small European community. The site itself consists of 15 structures divided into 29 buildings (see Figure 1). The buildings include apartment complexes, townhouses, large offices, a confinement facility, a church, a schoolhouse, a radio station, small one-story dwellings, and a restaurant with an outdoor patio. The road network generally divides the village into four areas, with a perimeter road surrounding it. Other features within the village and the surrounding area include a tactical airstrip, a helipad, phone booths, a children's playground, a cemetery with underground weapons cache, street lights, four water wells, two helicopter "hulks," and a limited subterranean system of sewer tunnels with access into basement rooms of two buildings.

2.5 SA Question Sets

Endsley (1995) proposed that the ability to objectively measure SA is critical for progress and understanding in the field. She critiqued several measurement techniques that have been performed to objectively measure SA. These include physiological techniques such as electro-encephalographic measurements; performance measures used to infer SA (e.g., time to complete a scenario, loss exchange ratio, etc.); global measures of overall operator performance that give the final result of a long string of cognitive processes; subjective techniques such as self-rating and observer rating; and questionnaires about SA knowledge that

compare perception to reality. She suggested that the questionnaire method provides an objective and direct assessment of SA.

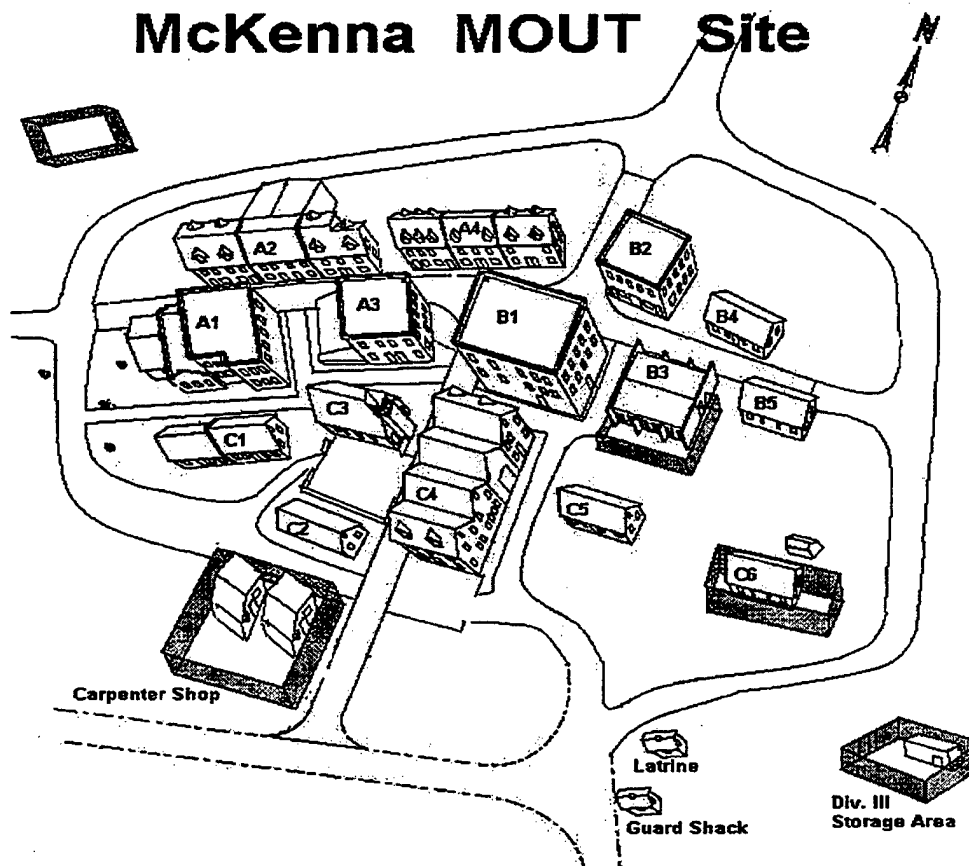


Figure 1. McKenna MOUT Site Layout.

Development of the question sets began by the authors obtaining as much knowledge as possible about all facets of the vignettes planned. This included knowledge of the terrain where the event took place; knowledge of the operations order that was developed for the vignettes, including objectives, constraints, and the time of day the operation would take place; and knowledge concerning the enemy opposing force such as the type of weapons they might carry, the number of enemy troops, and enemy location(s).

A SME conference was then held to establish the critical information requirements of the vignettes. Each set of SA queries (between 10 and 12 questions) was tailored to the specific type of vignette that was used. A critical information requirement for one vignette was not necessarily critical in another vignette. Domain sampling was used to ensure that the full spectrum of ground warrior focus (battlefield operating systems) and each of the levels of SA (i.e.,

perception, comprehension, and projection) identified by Endsley (1995) were covered in the final question set. Several embedded events were included to elicit key situation assessment responses. Development of the specific SA questions to be administered to the participants as an objective measure of SA was the fourth step. While many of these are natural extensions of the critical SA elements that were developed in the third step, the clear wording of the questions is critical to the assessment outcome. Table 3 depicts the domain sampling used for the question set development with Vignette B, Script 3. A full question set, script, and domain sampling matrix are presented in Section 1 of Appendices A and B.

Table 3. Vignette B, Script 3

	Per- cep- tion	Com- prehen- sion	Projec- tion	Maneu- ver	C2	Intelli- gence	Mobility & Surviv- ability	Combat Service Support	Fire Support	Air Defense
Q1	D				√					
Q2			B				√			
Q3	A			BOS		√				
Q4		A					√			
Q5	C					√				
Q6		B					√			
Q7	C					√				
Q8		B				√				
Q9	C								√	
Q10	B			√						
Q11								√		
Q12	D					√				

C2 = command and control
BOS = battlefield operating system

3. Procedures

3.1 Phase I: TTP Experiment

TTPs for the intra-squad radio were evaluated with the goal of selecting the most effective intra-squad radio TTP for use in the Phase II vignettes. Five Ranger squads participated in vignettes A through C and used five different predefined TTPs. Each time they participated in a vignette, they used a different script according to the trial matrix in Appendix A, Section 2. There was a total of 75 trials. The vignettes were conducted during daylight hours only. Table 4 illustrates the five different TTPs evaluated.

Upon arrival, the Rangers participating in Phase I received training about the five TTPs to be used and were given an experimental overview, an orientation of the McKenna MOUT site, and a safety briefing. The training was a combination of lecture and practical exercise conducted by directorate personnel. A 2-hour practical exercise incorporated the TTPs to be used during Phase I.

Table 4. TTPs Evaluated

TTP	Position	Radio	Communications flow
1	Co Commander Platoon Leader Squad Leader Fire Team Leader Squad Members	SINCGARS SINCGARS/PRC-126 PRC-126/ICOM ICOM ICOM	Communications from top down only, no communication from bottom up unless it was of critical importance. (This was the baseline TTP as it was the most common TTP used by the Rangers.)
2	Co Commander Platoon Leader Squad Leader Fire Team Leader Fire Team Leader Squad Members	SINCGARS Squad Leader SINCGARS/PRC-126 PRC-126/ICOM ICOM ICOM	Communications from top down, with only fire team leaders and higher able to communicate upward.
3	Co Commander Platoon Leader Squad Leader Fire Team Leader Fire Team Leader Squad Members	SINCGARS Squad Leader SINCGARS/PRC-126 PRC-126/ICOM ICOM ICOM	Communications from top down, squad members' communication controlled by leaders. (Communicate when asked.)
4	Co Commander Platoon Leader Squad Leader Fire Team Leader Fire Team Leader Squad Members	SINCGARS Squad Leader SINCGARS/PRC-126 PRC-126/ICOM ICOM ICOM	Horizontal communications freely flowing from top down and bottom up
5	Co Commander Platoon Leader Squad Leader Fire Team Leader Fire Team Leader Squad Members	SINCGARS Squad Leader SINCGARS/PRC-126 PRC-126/ICOM ICOM ICOM	Horizontal and vertical communications freely flowing from top down and bottom up, plus communications between squad members and Fire Team Leader at the squad level.

SINCGARS = single channel ground and airborne radio system

One EC was assigned to each leader (squad leader and team leaders) in the experimental force (ExFor); three ECs were assigned to the OpFor, one was assigned to the supporting squad, and another was assigned to the platoon headquarters white cell. The ECs controlled the flow of the vignettes and completed a questionnaire at the end of each vignette, which served as a data point for "ground truth," along with the documentation from the McKenna instrumentation, for the grading of the squad members' questionnaires. The OpFor completed a questionnaire for each trial to gather data about the ExFor's

conduct of each vignette. The questionnaire assessment of knowledge technique (Redden & Blackwell, 2000) was used to query soldiers about the state of their environment at the final point of each vignette (see Appendix A, Section 2 for a sample questionnaire). In addition to this objective SA questionnaire, each member of the Ranger squad was given a subjective questionnaire to obtain his thoughts about the importance of the questions and the TTP used. Additionally, two ECs monitored the intra-squad radio net and the platoon FM net to determine the amount and value of the radio traffic passed during the vignettes. The scripts for the platoon white cell (Appendix A, Section 2) were used to ensure that timely information was passed to the attacking squad.

3.2 Phase II – Intra-squad Radio Experiment

Phase II investigated the effect of the intra-squad radio on the SA of the individual squad members. The TTP selected from Phase I (TTP 1) was incorporated into Phase II procedures for communications. The individual members of the Ranger squad participated in the vignettes under baseline conditions (no intra-squad radio) and then with the intra-squad radio. These vignettes were scripted and of short duration to minimize the number of uncontrolled variables and to maximize the number of iterations that could be run. Each squad conducted each of six different vignettes twice (once with and once without the intra-squad radios). Vignettes A through C were run during daylight hours, and vignettes D through F were run during the hours of darkness.

The Rangers participating in Phase II received training and a 1-hour practical exercise on the TTP to be used. They also received an orientation of the McKenna MOUT site, a safety briefing, and an overview of the experiment. Directorate personnel presented these on the first day of each week when three new squads arrived. During Phase II, only two of the five scripts for vignettes A through C were used, and both scripts were used for vignettes D through F.

One EC was assigned to each leader (squad leader and team leaders) in the ExFor; three ECs were assigned to the OpFor; one was assigned to the supporting squad, and another was assigned to the platoon headquarters white cell. The ECs controlled the flow of the vignettes and completed a questionnaire at the end of each vignette, which served as a data point for “ground truth,” along with the documentation from the McKenna instrumentation, for the grading of the squad members’ questionnaires. The OpFor completed a questionnaire for each trial to gather data about the ExFor’s conduct of each vignette. In addition to the objective SA questionnaire, each member of the Ranger squad was given a subjective questionnaire to obtain his thoughts about the importance of the questions and the TTP used. The scripts for the platoon white cell squad (see Appendix B, Section 2) were used to ensure that timely information was passed to the attacking squads.

At the end of Phase II, the Rangers were given an end-of-experiment questionnaire to elicit their thoughts about the contribution that the intra-squad radio made to their individual SA and their suggested improvements for their issued ICOM (intra-squad) radio.

4. Results

4.1 Methodology

A content validation study of the SA question sets was performed with the outline developed by Schneider and Schmitt (1986). Five judges were used to develop the content validity ratio for each item. The content validity ratios of each item were then evaluated for statistical significance via tables presented by Lawshe (1975). Any item that was not determined to have significant correspondence with SA ($p < .05$) was dropped from the experiment. The content validity of the resulting measure was determined to be very high, as the content validity index was 0.99. The methodology had high face validity and allowed successful discrimination among a variety of conditions (e.g., day and night, five different TTPs, radio and no radio, etc.). The short time required to conduct an iteration (approximately 30 minutes) made it possible to run multiple iterations, thereby increasing the sample size that could be obtained. The Rangers indicated that the vignettes were very realistic and that the training value of the vignettes was high. The OpFor and white cell scripts made it possible to reduce the number of uncontrolled variables present in a vignette.

4.2 Phase I

4.2.1 Critical Information Requirements

A panel of SMEs who studied the terrain and the vignettes developed the questions in the assessment of knowledge questionnaires. The questions were developed to assess the critical information requirements of soldiers in the vignette and were based on a consensus of the group about critical knowledge during each of the vignettes. Upon completion of the vignette, the soldiers were then asked to rate the criticality of each of the questions. The original questions were SME hypotheses, but the soldiers participating in the vignettes were able to more accurately determine the criticality of each of the questions to the accomplishment of their objectives. Appendix A, Section 4 lists all the questions rated critical from the Phase I assessment of knowledge questionnaires and the associated criticality ratings by vignette. Table 5 summarizes questions that were rated critical (5 or higher on a 7-point scale, with 7 being extremely necessary for performance and 1 being extremely unnecessary for performance) and their mean ratings across vignettes.

Table 5. Critical Information Requirements

Critical information	Mean rating
Mission-oriented protective posture (MOPP) status	6.00
Squad's 5.56-mm (ball) ammunition status	5.91
Limitations of securing building	5.90
Reports of OpFor using booby traps	5.86
Chemical threat status	5.85
Number of OpFor seen or reported	5.65
Location of OpFor that are immediate threat to squad or squad objective	5.63
Cause of explosion in stairwell	5.63
When and type of counter attack expected	5.54
Disposition and status of OpFor	5.49
Disposition of platoon sergeant	5.47
OpFor reinforcement status	5.44
Threat from OpFor according to intelligence summary	5.43
Reports of OpFor using nuclear, biological, and chemical (NBC) and location of use	5.41
Most recent ensuing mission	5.32
Most probable OpFor mission	5.29
Items of intelligence value found	5.27
Disposition of friendly units	5.23
Reports of platoon-sized element in or around McKenna	5.21
Disposition of company command post (CP), company casualty collection point (CCP), platoon CCP, prisoner of war (POW) points	5.20
OpFor area proximity threat	5.17
Reported wind direction	5.18
Company's intention of controlling the doctor	5.13
Status of the AC-130	5.13
Type resistance 1st platoon encountered	5.06
Disposition of re-supply vehicle	5.03
Reports of activity in vicinity of airstrip	5.00
Latest reported disposition of helicopter improvement program (HIP) helicopter (air threat)	5.00

4.2.2 Assessment of Knowledge Questionnaires

Appendix A, Section 4 displays the correct responses to each of the critical questions on the assessment of knowledge questionnaires. The results from questions that were not determined to be critical were removed before the analysis of the results, along with incomplete data. The questions that were included in the analysis are displayed in the shaded areas. The percentage of correct responses to the critical questions during each of the TTP conditions is given in Table 6.

Table 6. Mean Percentage of Correct Responses to Phase I Critical Questions

TTP	Mean	Standard deviation	N
1	48.02	19.14	36
2	39.90	17.78	36
3	35.06	13.95	36
4	39.77	19.72	36
5	38.13	16.73	36

The repeated measures analysis of variance that was run on the TTP data to determine the impact of the radio usage TTPs on the soldiers' SA showed a significant effect [$F(4, 140) = 3.59, p = .008$]. Ensuing paired samples t-tests were then conducted to isolate the differences between each of the TTPs and the baseline TTP (TTP 1). A Holmes' sequential Bonferroni was used to control for family-wise error rate. With an alpha level of 0.05, TTP 1 was statistically significantly better than all the other TTPs. Table 7 shows the results from the ensuing experiments.

Table 7. TTP Paired Comparisons

	t	df	Significance (2-tailed)	Holmes' sequential Bonferroni required <i>p</i>
Pair 1 TTP 1-TTP 3	4.54	39	.000	.013
Pair 2 TTP 1-TTP 5	2.98	39	.005	.017
Pair 3 TTP 1-TTP 2	2.88	38	.006	.025
Pair 4 TTP 1-TTP 4	2.63	37	.012	.050

4.2.3 Subjective Questionnaires

At the completion of each vignette in Phase I, the Rangers were asked what things they considered to be the most important to know. Table 8 summarizes the results from this question across vignettes.

During Phase I, no TTP effects were noted about what the Rangers believed to be critical informational requirements. Overwhelmingly, they thought the most important things were location and status of the OpFor and ExFor, followed

closely by ammunition, casualties, and equipment (ACE) reporting and ensuing missions. The status of chemical agents, even though lower on total number of responses, was also very important. (The use of chemical agents was only played in 5 of the 15 scripts.) A complete list of the Ranger's responses by vignette and squad is given in Appendix A, Section 5.

Table 8. Responses to Three Most Important Things You Need to Know, Phase I

Action	Number of responses
Location and status of OpFor	290
Location and status of ExFor	267
ACE report	199
Ensuing mission	110
Status of COBs	65
CCP location	57
Medical evacuation (Medevac)	45
Primary intelligence requirements	35
Status of nerve agent	22
Location of booby traps	6
Status of HIP helicopter	3
Location of vehicles	1

When asked to subjectively evaluate their SA using a 1 to 7 scale (with 1 being extremely unaware and 7 being extremely aware) during Phase I, the Rangers predominantly evaluated themselves as aware to very aware (see Table 9).

Table 9. Mean Responses to Ranger Self-Evaluation of SA, Phase I

Squad	TTP 1	TTP 2	TTP 3	TTP 4	TTP 5
1	5.07	5.03	5.19	5.41	5.34
2	5.79	5.25	5.73	5.75	5.79
3	4.76	5.00	4.95	5.11	5.72
4	5.30	5.39	5.14	5.22	6.56
5	5.12	5.19	5.44	5.08	4.91
Mean	5.21	5.17	5.29	5.32	5.66

The subjective ratings contrast with the soldiers' actual SA, as measured on the questionnaire assessment of knowledge (see Table 6), which demonstrated that the soldiers were aware of less than half of the critical information that they needed to accomplish their objectives. Reports from previous experiments (e.g., MOUT ACTD JE 1 and 2 reports) have indicated that respondents are not often "aware that they are unaware." The Rangers rated themselves slightly more aware when using TTP 5 than when using the other TTPs. This is an indication of the Rangers' belief that the more freedom they were allowed on the radio net, the more situationally aware they were. In actuality, their SA was higher with two other TTPs than with TTP 5. They rated the TTP with which they performed the best (TTP 1) as the next to lowest TTP. It is clear that purely subjective ratings of SA must be interpreted with caution. Mean responses to the self-evaluation of SA by vignette and script are given in Appendix A, Section 5.

The Rangers' primary sources of information during Phase I were the intra-squad radio and voice commands. These two varied by TTP but were used much more than the other sources of information (i.e., visual signals, hand and arm signals, and AN/PRC-126 radio). A complete list of Ranger responses to source of information is given in Appendix 5, Section 4.

The OpFor commented that the Rangers used a lot of self-discipline while they conducted the 75 vignette iterations in Phase I. The OpFor was able to hear the Rangers discuss their activities only nine times during the 75 iterations (twice when TTP 1 was used, 4 times when TTP 2 was used, twice when TTP 3 was used, and once when TTP 4 was used). When the OpFor was asked to rate the Rangers' execution of each mission, they rated it as "good." A complete list of the OpFor comments is given in Appendix A, Section 6.

4.3 Phase II

4.3.1 Critical Information Requirements

Upon completion of each vignette, the soldiers were asked to rate the criticality of each of the questions. The original questions were SME hypotheses, but the soldiers participating in the vignettes were able to more accurately determine the criticality of each of the questions to the accomplishment of their objectives. Appendix B, Section 4 lists all the questions rated critical from the Phase II assessment of knowledge questionnaires and the associated criticality ratings by vignette. Table 10 summarizes the questions that were rated critical (5 or higher on a 7-point scale, with 7 being extremely necessary for performance and 1 being extremely unnecessary for performance) and their mean ratings across vignettes.

Table 11 displays the percentage of questions in each BOS category, along with the percentage of questions that the soldiers rated as critical information to the completion of their mission.

Table 10. Critical Information Requirements, Phase II

Critical information	Mean rating
Squad's 5.56-mm (ball) ammunition status	5.69
Threat from OpFor according to intelligence summary	5.68
Source of hostile fire	5.58
Number of OpFor seen or reported	5.38
Location of OpFor that are immediate threat to squad or squad objective	5.37
When and type of counter attack expected	5.30
OpFor reinforcement status	5.20
Reports of OpFor using booby traps	5.18
Disposition and status of OpFor	5.11
Disposition of company CP, CCP, platoon CCP, POW points	5.07
Obstacles found on objective	5.06
Chemical threat status	5.04
Building(s) reported to be heavily fortified	5.04
Platoon commander	5.00

Table 11. Percentage of Critical Questions in Each BOS Category

Category	Number of questions in category	Number of critical questions in category	Percent critical in each category
Maneuver	18	7	39
C2	14	1	7
Intelligence	56	28	50
Mobility and survivability	34	14	41
Combat service support	4	1	25
Fire support	1	0	0
Air defense	0	0	0
Total	127	51	Percent: 40

The SMEs and the Rangers felt that most of the critical information was intelligence information. However, the SMEs attached more importance to the C2 questions than the Rangers did. When the Rangers' ratings were sorted by leaders (squad and fire team) and squad members, it became apparent that the C2 questions were more critical to the leaders than they were to the squad members. The squad members were only concerned with the location of the

OpFor on the squad objective. Additionally, the leaders were concerned with such information as who was currently in command of the platoon, the disposition of the company CCP, the location of the company CCP, and the location of the company POWs.

4.3.2 Assessment of Knowledge Questionnaire

Appendix B, Section 4 displays the correct responses to each of the critical questions on the assessment of knowledge questionnaires. The results from questions that were not determined to be critical were removed before the analysis of the results, along with incomplete data. The questions that were included in the analysis are displayed in the shaded areas. The mean percentage of correct responses to the critical questions during each condition (baseline and technology) is given in Table 12.

Table 12. Mean Percentage of Correct Responses to Phase II Critical SA Questions With and Without Radios

	$\bar{X}$	Day t	p	$\bar{X}$	Night t	p	$\bar{X}$	Total t	p
With radio	37.04	1.52	.133	36.24	2.56	.012	36.25	3.16	.002
Without radio	33.68			28.35			30.74		

The soldiers' SA was not significantly better with the radio than without the radio during the day. It was significantly better at night with the radio and overall, it was significantly better with the radio. This finding is fairly important because the conditions of this experiment were probably the most difficult for showing the contribution of the radio. First of all, the MOUT vignettes required less dispersion than several other tactical situations (i.e., reconnaissance, "link-up," etc.) so the soldiers were within eye contact of each other a vast majority of the time. The soldiers used in the experiment (Rangers) were much more experienced in MOUT operations than were typical infantry soldiers and were more highly trained in the use of nonverbal communications such as hand and arm signals, which reduced the need for the radio in many instances. Since the conditions of this experiment were probably worst case for showing the contribution of the radio to the SA of a squad, the significant finding is noteworthy.

Table 13 displays the comparison of the soldiers' percentage of correct responses to the SA questions during the day and night vignettes, with and without radios. This comparison gives insight into the degradation in SA experienced by soldiers during periods of limited visibility.

Table 13. Comparison of SA With and Without Radios

	With radio			Without radio		
	$\bar{X}$	t	p	$\bar{X}$	t	p
Day	37.19	.41	.681	34.59	2.19	.031
Night	36.24			28.44		

It can be seen that without radios, there is a significant degradation in SA at night (the percentage of correct responses falls from 34.59 during the day to 28.44 at night). The use of the intra-squad radio negates the degradation experienced at night (there is no significant difference between the percentage of correct responses to the SA questions during daytime and nighttime vignettes).

4.3.3 Subjective Questionnaires

At the completion of each vignette in Phase II, the Rangers were asked what things they considered to be the most important to know. Table 14 summarizes the results from this question across vignettes.

Table 14. Responses to Three Most Important Things You Need to Know, Phase II

Action	Number of responses		
	Week 1	Week 2	Week 3
Location and status of OpFor	214	151	226
Location and status of ExFor	226	182	200
ACE report information	147	61	162
Ensuing mission	67	59	22
Status of COBs	9	20	8
CCP location	5	21	17
Medevac	18	3	24
Primary intelligence requirements (PIR)	4	5	17
Status of nerve agent	3	2	1
Location of booby traps	9	13	9
Status of HIP helicopter	1	2	3
Source of fire	6	--	--
Building security	53	3	3

During Phase II, no technological effects were noted regarding what the Rangers believed to be important to know. Overwhelmingly, the Rangers thought the

most important things they needed to know were location and status of the OpFor and ExFor, ACE reports, and ensuing missions. The first squad was also keenly interested in whether the building was secure. A complete list of the Rangers' responses is given in Appendix B, Section 5.

When asked to evaluate their SA during Phase II, the Rangers predominantly evaluated themselves as aware to very aware (see Table 15), slightly higher than the Rangers during Phase I (see Table 9). The second squad (Week 2 of evaluation) rated themselves as less aware than did the other two squads. This may be an indication of training level and confidence. A complete list of the Rangers' comments on personal SA is given in Appendix B, Section 5.

Table 15. Mean Response to Ranger Self-Evaluation of SA, Phase II

	Week 1		Week 2		Week 3		Total mean	
	Radio	No radio	Radio	No radio	Radio	No radio	Radio	No radio
Squad 1	5.42	5.34	4.15	5.07	5.14	5.22		
Squad 2	4.53	4.05	5.04	5.28	4.69	4.96		
Squad 3	5.35	4.77	5.88	5.07	5.28	4.91		
Mean	5.20	4.72	5.03	5.34	5.04	5.03	5.19	4.99

The subjective ratings contrast with the soldiers' actual SA as measured on the questionnaire assessment of knowledge (see Table 12), which demonstrated that the soldiers were aware of just a little more than one third of the critical information that they needed to accomplish their objectives. Once again, the respondents were not "aware that they were unaware." The Rangers rated themselves slightly more aware when they used the radio (5.19) than when they did not use the radio (4.99). This is an indication that they felt the radio positively affected their SA. Once again, these subjective ratings of SA must be viewed with caution. Mean responses to the self-evaluation of SA by vignette and script are given in Appendix B, Section 5.

During Phase II, the Rangers' sources of information were predominantly voice commands, followed by the radio. A complete list of Ranger responses to source of information is given in Appendix B, Section 5.

4.3.4 OpFor Questionnaire

The OpFor indicated that the Rangers' self-discipline during communications was very poor while the vignettes were being conducted in Phase II. The OpFor was able to hear the Rangers making comments in 50 of the 72 vignettes. They stated that the Rangers telegraphed their movements and plans entirely too

much, even when they had the radio. When the OpFor was asked to rate the Rangers' overall execution of each mission, they rated it as "good." A complete list of the OpFor comments is given in Appendix B, Section 6.

4.3.5 End-of-Experiment Questionnaire

At the completion of Phase II, the Rangers rated their thoughts about the contribution that the intra-squad radio made to their personal SA, using a 7-point scale (7 being the extremely better than no radio and 1 being extremely worse than no radio). The summation of these ratings is given in Table 16. Their ratings showed that the intra-squad radio was "very much" to "extremely better" than no radio. This provides another indication (in addition to the objective SA results) that the subjective ratings of SA must be interpreted with caution because the Rangers' subjective ratings of SA (see Table 15) only indicated a slight improvement with the radio (5.19 with the radio versus 4.99 without the radio). Three of the Rangers stated that the MOUT tactical mission was the least useful mission in which to use the intra-squad radio because of the proximity of the squad. They believed the radio would be more effective while they performed other, more dispersed missions such as patrolling. Two Rangers mentioned that the radio was very effective in finding or controlling the location of the squad members. Other significant comments were related to control and dissemination of information. A complete list of Ranger comments is given in Appendix B, Section 7.

Table 16. Contribution of the Intra-squad Radio to Personal SA

	Week 1	Week 2	Week 3
Squad 1	5.89	6.44	6.89
Squad 2	6.44	6.00	6.78
Squad 3	5.70	5.56	6.56

Throughout the experiment, the Rangers complained a lot about the ICOM radio. When asked what was needed to improve the ICOM, 37 commented that the headset needed to be improved; 27 wanted it to be waterproof; 19 wanted increased range; 15 wanted the radio to be smaller; 7 complained about batteries and battery life; and 4 complained about all the connecting wires. One platoon had previously purchased small Motorola radios with their own money because of their displeasure with the ICOM. Conversely, five believed it was fine and that nothing could be improved. Several Rangers had purchased a low cost headset from Radio Shack to use on their ICOM radios. Most really disliked the batteries and wanted something with AA batteries, and all complained about the poor level of waterproofing on the ICOM. A complete list of Ranger comments is

presented in Appendix B, Section 7, and in the results of the end-of-experiment questionnaire.

5. Discussion

The use of the AC rather than a free-play exercise resulted in fewer uncontrolled variables but realism was retained. The tactics, motivation, and reaction of the OpFor as well as the location of enemy contact were held constant by the use of scripted OpFor movement. The length of time required to complete a vignette was reduced and held constant. The vignettes contained only the high intensity portions of a scenario, thus reducing the time required for an iteration, and the scripts held the time constant between iterations. The capabilities of the leadership at platoon and higher levels were held constant by the use of a scripted white cell at the platoon and higher levels. Phase I of the experiment addressed the radio TTPs used by the squads and platoons. The baseline TTP was most frequently reported by the Ranger participants as the one that they use. The baseline TTP resulted in significantly higher SA than each of the other four TTPs investigated and was brought forward into Phase II of the experiment and held constant. Although TTP 1 did not allow as much information to be passed over the squad network, the information that was passed (i.e., orders from the squad leader and mission-essential information from the platoon leader that was passed by the squad leader) was critical to the conduct of the mission. This limited the potential for cognitive overload. The other TTPs allowed a lot more information to be passed, but much of it was not critical. This may have reduced the ability of the squad members to retain the details of the critical information. It may also be that squad members "tuned out" some of the information that was passed when the other TTPs were used because they knew that much of it was not critical.

The SMEs and the Rangers indicated that most of the critical questions were from the intelligence BOS category. Although the SMEs included 14 C2 questions, the Rangers indicated that only one of them was critical. When the squad members' ratings were excluded, the leaders (squad and fire team) indicated that four C2 questions were critical. This demonstrates that it is important to tailor information by echelon. Information that is not important at one echelon may be critical at another echelon. The combat service support question that was rated as critical by the Rangers concerned the ammunition status of the squad.

The data in Phase II indicated that the intra-squad radio significantly contributed to the SA of the Ranger squad. The conditions under which the radio was evaluated were probably the most difficult for the radio to show improvement in squad SA. The squad members were not dispersed, the AC vignettes were the high intensity portions of the scenarios, and the Rangers were highly trained in

silent communications (and thus not as dependent on verbal communications). It is not surprising that the improvement in SA was much greater at night than in the day. During the day, the Rangers were able to see each other and communicate using hand and arm signals. At night, they had to use an alternate means of communication (the radio).

The SA AC methodology showed good discriminate, face, and content validity. It was able to discriminate among five different TTPs and between daytime and nighttime conditions. The Rangers indicated that the realism of the vignettes was high and that the vignettes provided good practice for them.

6. Recommendations

The TTP chosen for use in Phase II of this experiment may not be valid for all vignettes and conditions. An ensuing experiment needs to be conducted to evaluate the SA of squads using radios in more dispersed vignettes. The squads used for the ensuing experiments should also be less experienced than the Rangers. This would give an indication of whether the TTPs should depend on the condition in which an exercise takes place.

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APPENDIX A

PHASE I

SECTION	TITLE
1	Critical Information Requirements
2	Test Matrix, Sample Questionnaire, and Script
3	Results from Demographic Questionnaire
4	Results from Assessment of Knowledge Questionnaire
5	Results from Subjective Questionnaire
6	Results from OpFor Questionnaire

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SECTION 1
CRITICAL INFORMATION REQUIREMENTS

SCALE

- 1 - Extremely unnecessary for performance
- 2 - Very unnecessary for performance
- 3 - Unnecessary for performance
- 4 - Neutral
- 5 - Necessary for performance
- 6 - Very necessary for performance
- 7 - Extremely necessary for performance

Vignette A

Vignette Question	Mean	Sample Size	Question
A3Q10	6.06	31	Any reports of OpFor using booby traps in McKenna?
A2Q08	6.00	37	What is your squad's 5.56-mm (ball) ammunition status?
A1Q06	5.82	38	Where were the OpFor located in C4?
A5Q03	5.80	41	If used, where were the booby traps found?
A5Q08	5.78	41	Any OpFor in C4; if so, how many / what size unit?
A4Q08	5.77	39	How many OpFor were seen / reported in C4?
A2Q06	5.75	36	Three OpFor escaped from C3, where did they go?
A4Q03	5.64	39	Any reports of OpFor using booby traps?
A5Q06	5.59	41	What direction is OpFor moving (vicinity of cemetery)?
A2Q03	5.49	37	Any reports of OpFor using NBC?
A4Q01	5.41	39	Most likely source of NBC attack?
A4Q11	5.34	38	Where is the OpFor NBC lab located?
A4Q10	5.33	39	Anything of intelligence value found?
A3Q01	5.32	31	Current location of Platoon CCP / POW?
A1Q01	5.29	38	OpFor reinforcement time?
A2Q05	5.27	37	If reported, what are / were OpFor doing?
A1Q09	5.26	38	What items of intelligence value were found?

C4 = command, control, communications, and computers
C3 = command, control, and communications

NOTE: Under the Vignette Question columns above/below, the letter represents the vignette and the number represents the Script, e.g., B (vignette), 3(script).

Vignette B

Vignette Question	Mean	Sample Size	Question
B2Q08	6.05	38	Do you have a chemical threat?
B2Q02	6.05	38	How many OpFor located in vicinity of B2?
B2Q06	6.00	38	What should your MOPP status be at this time?
B5Q02	5.98	41	How many OpFor are in B2?
B3Q03	5.97	38	How many OpFor were in vicinity of B1?
B3Q11	5.82	38	Status of 5.56-mm ball ammunition?
B1Q06	5.82	38	How many OpFor were seen/reported in vicinity of A2/A4?
B3Q02	5.72	38	When do you expect counterattack from east?
B3Q05	5.66	38	How many OpFor in vicinity of C4?
B2Q11	5.66	35	Where were chemical weapons used/ reported?
B5Q07	5.63	41	Cause of explosion in stairwell of building A3?
B2Q01	5.63	38	Length for OpFor to reinforce their units?
B2Q03	5.63	38	Where did OpFor, reported vicinity of building C6, go?
B3Q12	5.61	38	20-30 OpFor currently reported where?
B4Q03	5.55	38	Where did OpFor seen in wood line east of McKenna go?
B1Q05	5.49	39	Likely location of OpFor reinforcements?
B4Q07	5.47	38	Disposition of platoon sergeant?
B1Q01	5.38	39	How long for OpFor reinforcement capability on objective?
B4Q02	5.34	38	According to INSUM, where is large number OpFor?
B2Q04	5.34	38	What type reinforcements does OpFor have?
B5Q08	5.32	41	What is your most recent follow-on mission?
B3Q08	5.29	38	How far have OpFor advanced??

INSUM = intelligence summary

Vignette C

Vignette Question	Mean	Sample Size	Question
C3Q06	6.10	30	Status of two OpFor soldiers attacking C3?
C2Q01	5.95	38	Probability OpFor has booby trapped C4?
C4Q05	5.92	38	Disposition of OpFor in C3 when you entered?
C3Q05	5.90	30	Limitations on securing building C3 and church?
C5Q06	5.80	41	How many OpFor are/were in C3?
C2Q08	5.79	38	What is biggest threat from OpFor according to INSUM?
C3Q03	5.73	30	Status of the OpFor between C3 and C4?
C1Q01	5.71	38	How long for OpFor to reinforce with squad?
C1Q07	5.66	38	Does OpFor have capability to reinforce with platoon?
C5Q07	5.56	41	Any intelligence value found in C3?
C1Q08	5.53	38	Where did the escaping OpFor go?
C5Q04	5.51	41	How many OpFor were seen moving from A4 to B2?
C4Q02	5.47	38	What size OpFor element available for counterattack?
C4Q01	5.45	38	What type counterattack does your element expect?
C2Q09	5.45	38	Disposition of OpFor in Bldg C3 during squad attack?
C1Q04	5.37	38	How many OpFor were KIA/WIA/captured in C3?
C4Q06	5.30	37	Disposition of OpFor in C3 now?
C2Q04	5.29	38	What is the most probable OpFor mission?

SECTION 2

EXPERIMENTAL MATRIX, SAMPLE QUESTIONNAIRE, AND SCRIPT

Trial	Squad	TTP	Vig	Script	Trial	Squad	Radio	Vig	Script
01	1	1	A	1	41	1	3	C	3
02	2	2	B	3	42	2	4	A	5
03	3	3	C	5	43	3	5	B	2
04	4	4	A	2	44	4	1	C	4
05	5	5	B	4	45	5	2	A	1
06	1	1	B	1	46	1	4	A	4
07	2	2	C	3	47	2	5	B	1
08	3	3	A	5	48	3	1	C	3
14*	4	4	C	2	49	4	2	A	5
10	5	5	C	4	50	5	3	B	2
11	1	1	C	1	51	1	4	B	4
12	2	2	A	3	52	2	5	C	1
13	3	3	B	5	53	3	1	A	3
09*	4	4	B	2	54	4	2	B	5
15	5	5	A	4	55	5	3	C	2
16	1	2	A	2	56	1	4	C	4
17	2	3	B	4	57	2	5	A	1
18	3	4	C	1	58	3	1	B	3
19	4	5	A	3	59	4	2	C	5
20	5	1	B	5	60	5	3	A	2
21	1	2	B	2	61	1	5	A	5
22	2	3	C	4	62	2	1	B	2
23	3	4	A	1	63	3	2	C	4
24	4	5	B	3	64	4	3	A	1
25	5	1	C	5	65	5	4	B	3
26	1	2	C	2	66	1	5	B	5
27	2	3	A	4	67	2	1	C	2
28	3	4	B	1	68	3	2	A	4
29	4	5	C	3	69	4	3	B	1
30	5	1	A	5	70	5	4	C	3
31	1	3	A	3	71	1	5	C	5
32	2	4	B	5	72	2	1	A	2
33	3	5	C	2	73	3	2	B	4
34	4	1	A	4	74	4	3	C	1
35	5	2	B	1	75	5	4	A	3
36	1	3	B	3	76**	1	1	A	1
37	2	4	C	5	77**	2	2	B	3
38	3	5	A	2	78**	3	3	C	5
39	4	1	B	4	79**	4	4	A	2
40	5	2	C	1	80**	5	5	B	4

* Out of sequence because of training on McKenna

**Re-run of E-trials 1-5

SAMPLE QUESTIONNAIRE AND SCRIPT A-1

ID#: _____

NAME: _____ RANK: _____ YRS IN ARMY: _____

UNIT: _____ DATE: _____

Please answer the following questions based on your experience with the system.
Answer all questions as accurately as possible. Circle the appropriate letter.

1. How long will it take the OpFor to reinforce their units currently in McKenna?
 - a. Less than 1 hour
 - b. 1-2 hours
 - c. 2-3 hours
 - d. No reinforcements available
 - e. Don't know
2. What type of reinforcements does the OpFor have?
 - a. Motorized Infantry
 - b. Air Assault Infantry
 - c. Irregulars
 - d. None
 - e. Don't know
3. What was the location of the HIP Helicopter when first reported?
 - a. 15K north of McKenna
 - b. 5K north of McKenna
 - c. 5K east of McKenna
 - d. 15K east of McKenna
 - e. Don't know
4. What is the latest reported disposition of the HIP helicopter?
 - a. Flying south 5K east of McKenna
 - b. Landed east end of McKenna Airstrip debarking troops
 - c. Landed east end of Kings Pond
 - d. Shot down by AC-130
 - e. Don't know
5. How many KIA/WIA did A Company receive from the marksman in the steeple?
 - a. 2 KIA, 2 WIA
 - b. 1 KIA, 1 WIA
 - c. 0 KIA, 2 WIA
 - d. 2 KIA, 0 WIA
 - e. Don't know
6. Where were the OpFor located in C4?
 - a. Window 2-1 & 2-2
 - b. Window 2-6 & 2-7
 - c. Window 2-2 & 2-7
 - d. None reported
 - e. Don't know

7. How many ExFor KIA/WIA, if any, does 3rd Squad have at this time?
 - a. 0 KIA, 2 WIA
 - b. 1 KIA, 1 WIA
 - c. 2 KIA, 0 WIA
 - d. None reported
 - e. Don't Know
8. Where, if any, were the COBs seen/reported?
 - a. In C3
 - b. Running from C3 to C4
 - c. In B1
 - d. None seen/reported
 - e. Don't know
9. What items, if any, of intelligence value were found, on your objective?
 - a. Map with ExFor positions
 - b. Map with OpFor positions
 - c. Roster of OpFor personnel
 - d. Nothing found
 - e. Don't know
10. Where is the platoon leader located?
 - a. Enroute to your location
 - b. With 1st Squad
 - c. With 2nd Squad
 - d. At Company CP
 - e. Don't know
11. What is the status of the SAW's in 2nd platoon?
 - a. 1 SAW Inop
 - b. Both SAW's Inop
 - c. No reported change in SAW status
 - d. SAW's can not engage at this time
 - e. Don't know

QUESTIONNAIRE MATRIX
Script 1, Vignette A

	Per- cep- tion	Com- prehen- sion	Projec- tion	Maneu- ver	C2	Intelli- gence	Mobility & Surviv- ability	Combat Service Support	Fire Support	Air Defense
Q1			A			√				
Q2		B		√						
Q3	C			BOS		√				
Q4	B					√				
Q5	B						√			
Q6	B						√			
Q7	A						√			
Q8	B					√				
Q9		B				√				
Q10		B			√					
Q11	C						√			

SCRIPT 1

Time	SQD LDR (1st SQD)	SPT SQD (2nd SQD)	PLT / WC (3rd SQD, Reserve)	OpFor/COB
<u>H Hour</u> - *Building C2 will have concertina all around except side with door N, E, W	ATK From C1 to C2	East rooms of C1	West end of C1	1 OpFor in steeple 1 OpFor in room 1/C2 1 OpFor in room 3/C2 3 OpFor in C4 (window 2-6, 2-7 with weapon) 2 COBs in C3 OpFor room 1 & 3 fight to death All doors open in C2 Dead OpFor in room 3 will have a map with the OpFor positions on him/her (Action) Steeple marksman exposed shoots targets of opp (Time)
+1 Min	Init attack smoke deployed	Obs and Eng. TO	INSUM two motorized vehicles reported vicinity Pinetree & Hourglass road RPT: HIP Helicopter reported 5K East of McKenna moving South West Company CCP co- located with Platoon CCP/POW	2 COBs run from C3 to C4 into door A (Time)
+1-3 Min	Move from C1 to C2	Obs and Eng. TO	A Company under fire from church steeple 1 KIA, 1 WIA Report: Support Squad has OpFor in steeple under fire	OpFor exposed in NE window room 3, C2, when Rangers enter building (Action)
+3-5 Min	Move from C1 to C2	Obs and Eng. TO (If Support Squad sees OpFor in C4, Report to Squad Leader)	MSG: 3 OpFor seen in C4 (window 2-6 & 2-7) INSUM doctor believed to be in C4. OpFor seen in NE window building C2	Steeple marksman taken out (Action) 3 OpFor in C4, window 2-6 & 2-7, fire on ExFor (Time)
+5-10 Min	Prepare/ enter C-2 (doors to other rooms, closed)	Obs and Eng. TO	Request situation report (SITREP) if support squad does not report then WC MSG: 2 COBs seen running from C3 to C4 RPT: HIP landed East end of McKenna airstrip, debarking troops	2 OpFor in C2 fight to the death (Action)

SCRIPT 1 (continued)

Time	SQD LDR (1st SQD)	SPT SQD (2nd SQD)	PLT / WC (3rd SQD, Reserve)	OpFor/COB
	Secure objective	Obs and Eng. TO	3 rd Squad 2 WIA to booby traps	
+10-15 Min			Platoon leader has moved to C3 to evacuate casualties	
			A Company reports doctor seen in B1	
			Motorized vehicles turning east on Hourglass road	
			Request ACE report	

TO = targets of opportunity

SAMPLE SIZE = 42

1. Handedness: 39 Right 3 Left
2. Height: Mean = 70 inches (Range 66 to 75)
Weight: Mean = 171 pounds (Range 145 to 220)
3. Vision:
 - a. Is your vision in each eye 20/20 or correctable to 20/20? 40 Yes 1 No 1 NR
 - b. Do you wear glasses when performing military duties? 10 Yes 30 No 2 NR
 - c. Do you wear contact lenses when performing military duties? 7 Yes 32 No 3 NR
4. Education: Mean = 12.7 years
5. Current Military Occupational Specialty (MOS) Months (mean) in Current MOS
11B - 33 23 months
11C - 9
6. Months (mean) in current job = 11 months
7. Months (mean) of experience in infantry-related MOS = 23 months
8. Months (mean) of military service = 26 months
9. Months (mean) in these leadership positions:
 - a. Fire Team Leader = 3 months
 - b. Squad Leader = 2 months
10. Months (Mean) of military training/instruction received in light infantry operations:
 - a. Classroom training at Infantry school:
3 months
 - b. Field exercises (i.e., NTC, JOTC, CRTTC, JRTC, MOUT training):
3 months

11. Months (mean) of military training/instruction received in the following areas:

- a. Land navigation (map reading, use of GPS data, following planned route): 5 months
- b. Route planning: 3 months
- c. Communications: 3 months

12. GT Score (Mean) = 115

13. Latest Physical Fitness (PFT) Score (mean) = 286 (out of 300)

14. Latest Firing Qualification Test (FQT) Score (mean) = 36 (out of 40)

Type of weapon:	M4 - 31	M240 - 5
(How many used)	SAW - 2	NR - 1
	M16 - 3	

15. Self rating of Knowledge, Skills, and Abilities (KSA) related to Infantry duties:

1	2	3	4	5
Poor	Below Average	Average	Above Average	Outstanding
MEAN RESPONSE				
Knowledge of Infantry TTPs.				3.53
Knowledge of computers.				2.67
Knowledge of electronics.				2.64
Knowledge of mechanics and maintenance procedures for weapon systems and equipment used.				3.55
Knowledge of map reading and orientation in field setting.				3.81
Knowledge of land navigation.				3.81
Knowledge of reconnaissance, surveillance, and target acquisition procedures.				2.98
Knowledge relating to communications equipment and communications procedures.				2.83
Marksmanship skills.				3.98
Map reading skills.				3.88
Land navigation skills.				3.76
Computer skills (keyboards, mouse, track balls, navigating in and out of menus, etc.).				3.17
Communication skills (ability to use communications equipment and face-to-face communications to enhance mission accomplishment).				3.19
Leadership skills				3.48

16. a. Months (Mean) of military deployment for peacekeeping, peace enforcement, and stability operations of combat: 0

b. If so, where? NA

SECTION 4

RESULTS FROM ASSESSMENT OF KNOWLEDGE QUESTIONNAIRE

NUMBER OF CORRECT/INCORRECT RESPONSES

Vignette A – Script 1

Questions	TTP	Sqd	Q1		Q6		Q9	
			C	I	C	I	C	I
	1	1 st	5	2	6	1	3	4
	5	2 nd	6	2	8	0	0	8
	4	3 rd	4	1	5	0	1	4
	3	4 th	3	4	6	1	1	6
	2	5 th	3	5	5	3	4	4

Vignette A – Script 2

Questions	TTP	Sqd	Q2		Q3		Q5		Q6	
			C	I	C	I	C	I	C	I
	2	1 st	2	4	3	3	1	5	3	3
	1	2 nd	3	4	3	4	4	3	2	5
	5	3 rd	5	1	2	4	3	3	5	1
	4	4 th	1	4	4	1	0	5	3	2
	3	5 th	0	9	6	3	0	9	4	5

Vignette A – Script 3

Questions	TTP	Sqd	Q1		Q8		Q10	
			C	I	C	I	C	I
	3	1 st	4	3	3	4	4	3
	2	2 nd	1	6	1	6	0	7
	1	3 rd	4	3	2	5	0	7
	5	4 th	1	7	3	5	1	7
	4	5 th	3	5	2	6	0	8

Vignette A – Script 4

Questions	TTP	Sqd	Q3		Q4		Q8		Q10		Q11	
			C	I	C	I	C	I	C	I	C	I
	4	1 st	5	2	3	4	1	6	4	3	4	3
	3	2 nd	0	8	8	0	1	7	0	8	3	5
	2	3 rd	2	4	6	0	2	4	0	6	4	2
	1	4 th	6	3	7	2	3	6	5	4	3	6
	5	5 th	1	8	1	8	4	5	2	7	3	6

Vignette A – Script 5

Questions	TTP	Sqd	Q3		Q4		Q6		Q8	
			C	I	C	I	C	I	C	I
	5	1 st	3	5	4	4	3	5	1	7
	4	2 nd	5	3	0	8	2	6	1	7
	3	3 rd	4	2	1	6	2	4	1	5
	2	4 th	9	0	1	8	2	7	1	8
	1	5 th	7	1	0	8	4	4	4	4

Vignette B

Vignette B – Script 1

Questions		Q1		Q5		Q6	
TTP	Sqd	C	I	C	I	C	I
1	1 st	4	4	4	4	7	1
5	2 nd	2	6	1	7	3	5
4	3 rd	3	4	0	7	2	5
3	4 th	3	4	0	7	2	5
2	5 th	7	2	2	7	2	7

Vignette B – Script 2

Questions		Q1		Q2		Q3		Q6		Q8	
TTP	Sqd	C	I	C	I	C	I	C	I	C	I
2	1 st	2	5	3	4	2	5	7	0	3	4
1	2 nd	4	4	5	3	1	7	1	7	6	2
5	3 rd	3	3	2	4	2	4	0	6	0	6
4	4 th	4	4	4	4	2	6	1	7	6	2
3	5 th	5	4	3	6	4	5	4	5	2	7

Vignette B – Script 3

Questions		Q2		Q5		Q8	
TTP	Sqd	C	I	C	I	C	I
3	1 st	1	6	1	6	1	6
2	2 nd	4	3	2	5	0	7
1	3 rd	0	6	4	2	2	4
5	4 th	1	8	2	7	1	8
4	5 th	1	7	0	8	3	5

Vignette B – Script 4

Questions		Q2		Q3		Q7	
TTP	Sqd	C	I	C	I	C	I
4	1 st	2	5	2	5	5	2
3	2 nd	1	7	2	6	1	7
2	3 rd	4	2	0	6	5	1
1	4 th	4	5	1	8	9	0
5	5 th	2	5	2	5	4	3

Vignette B – Script 5

Questions		Q1		Q2		Q7		Q8	
TTP	Sqd	C	I	C	I	C	I	C	I
5	1 st	6	2	2	6	5	3	8	0
4	2 nd	3	5	5	3	1	7	2	6
3	3 rd	2	5	1	6	0	7	2	5
2	4 th	5	4	5	4	5	4	4	5
1	5 th	4	5	4	5	8	1	3	6

Vignette C

Vignette C – Script 1

Questions			Q1		Q2		Q4		Q7		Q8	
TTP	Sqd		C	I	C	I	C	I	C	I	C	I
1	1 st		5	2	6	1	3	4	1	6	0	7
5	2 nd		1	7	1	7	3	5	2	6	0	8
4	3 rd		2	5	5	2	4	3	2	5	1	6
3	4 th		0	7	1	6	5	2	1	6	1	6
2	5 th		9	0	2	7	2	7	3	6	6	3

Vignette C – Script 2

Questions			Q1		Q3		Q4		Q8		Q9	
TTP	Sqd		C	I	C	I	C	I	C	I	C	I
2	1 st		5	2	0	7	0	7	5	2	6	1
1	2 nd		5	3	3	5	0	8	6	2	8	0
5	3 rd		3	3	1	5	1	5	4	2	5	1
4	4 th		1	7	1	8	0	8	6	2	7	1
3	5 th		7	2	0	9	1	8	9	0	7	2

Vignette C – Script 3

Questions			Q2		Q3		Q5		Q6	
TTP	Sqd		C	I	C	I	C	I	C	I
3	1 st		7	0	4	3	2	5	2	5
2	2 nd		8	0	0	8	0	8	1	7
1	3 rd		7	0	2	5	7	0	3	4
5	4 th		9	0	9	0	3	6	0	9
4	5 th		7	1	1	7	8	0	0	8

Vignette C – Script 4

Questions			Q1		Q2		Q5	
TTP	Sqd		C	I	C	I	C	I
4	1 st		7	0	5	2	6	1
3	2 nd		5	2	4	3	6	1
2	3 rd		5	1	1	5	5	1
1	4 th		7	2	2	7	8	1
5	5 th		7	2	1	8	8	1

Vignette C – Script 5

Questions			Q4		Q5		Q6		Q7	
TTP	Sqd		C	I	C	I	C	I	C	I
5	1 st		1	6	1	6	4	3	0	7
4	2 nd		1	6	4	3	2	5	0	7
3	3 rd		1	5	3	3	5	1	0	6
2	4 th		1	8	3	6	5	4	1	8
1	5 th		1	7	2	6	1	7	0	8

SOLDIER COMMENTS BY TTP

	No. of Comments
TTP 1	
1 st Squad	
Not familiar with the window numbering system.	1
3 rd Squad	
TTP 1 is very hard for the squad leader because he has to use his eyes to see if teams are doing what he told them.	1
No response on squad radios back to the squad leader gives me an uneasy feeling that they might not hear me.	1
TTP 1 is absolutely the worst TTP; communication is hindered severely.	1
All information other than from higher is from talking.	1
TTP 1 is combat ineffective.	1
TTP 2	
2 nd Squad	
The ICOM would not be in use that much in this TTP.	1
During the confusion of the battle, verbal or face-to-face would be used more.	1
Team leaders had a hard time disseminating information down to the men due to fighting the fight first.	1
I feel the ICOM system should be changed. The one we have gets in the way too much, and is not stable inside the Kevlar®. I think a throat mike and ear piece would work more efficiently.	1
I didn't know much of what was going on with B team or with the remaining battle.	1
Didn't know much of what was going on at anyone higher than my squad leader.	1
TTP 3	
3 rd Squad	
ICOM battery died in middle of exercise.	1
Lots of radio traffic from platoon leader makes it hard to control squad. I think TTP 3 contributes to this.	1
During TTP 3, squad leaders have to move a lot to get feedback.	1
Team leader was dead. Often, team leader was next to me whole time. No need to use ICOM when the soldier you are talking to is right next to you!	1
Doesn't make sense.	
TTP 3 squad leader put his comments over ICOM to squad and it worked very well.	1
TTP 3 is not good for communication when squad is split up.	1
TTP 3 is totally pointless because it will never happen.	1
TTP 4	
2 nd Squad	
Soldiers were not able to speak freely when they were in a bind and needed help.	1
3 rd Squad	
TTP 4 seems to have a lot of redundant radio talk, i.e., soldier tells team leader, squad leader can hear, team leader relays anyway.	1
TTP 5	
1 st Squad	
ICOM went down after initial contact. Received intelligence by over-hearing ICOM and by search of EPWs.	1
2 nd Squad	
This data set will be misleading. TTP 5 lacks the discipline of some of the other TTPs. While I received more information from higher using this TTP, I was unable to have the desired SA for the simple control of my team. From monitoring the ICOM transmissions, you will probably note that we naturally stuck to communications between team members and there was no talk between teams; however, just knowing that we were at TTP 5 gave team	1

members the notion, they could broadcast whenever they saw something. The airways were cluttered. In normal training situations, the squad leader would have taken control of the net, shutting up the squad members, and demanding information only from team leaders.

3rd Squad

This TTP works the best by far.

1

5th Squad

So much happens all at once and all you're trying to do is stay alive.

1

SECTION 5

RESULTS FROM SUBJECTIVE QUESTIONNAIRE

1. *What were the three most important things you needed to know at the end of the exercise?*

	A-1					
	1st Sqd	2nd Sqd	3rd Sqd	4th Sqd	5th Sqd	Total
Ensuing mission	5	2	1	2		10
Location and status of ExFor	7	6	4	1	6	24
Location and status of OpFor	6	5	4	4	6	25
ACE Report	1	4	1	4	1	11
PIR			1		1	2
CCP Location			1		1	2
Status of HIP	1	1			1	3
Status of COBs		1	1		1	3
Medevac				2		2
	A-2					
Ensuing mission	2	2	1	1		6
Location and status of all squad	3	5	2	3	5	18
Location and status of OpFor	5	4	6	3	4	22
ACE Report	1	4	2	3	1	11
PIR			1		2	3
CCP Location	1		1			2
Status of COBs	2	1	2	1	2	8
Medevac		2	1	1		4
Status of nerve agent	1	1			2	4
	A-3					
Ensuing mission	2	2	2	2		8
Location and status of all squad	3	6	3	5	5	22
Location and status of OpFor	1	5	6	3	5	20
ACE Report		2	1	1		4
PIR	1	1	1	1	1	5
CCP Location			2	1		3
Status of HIP						0
Status of COBs		4	3	1	2	10
Medevac		1	1	1		3
Location of booby traps	1	1				2

	A-4					
Ensuing mission	3	2	2		1	8
Location and status of all squad	2	6	6	5	6	25
Location and status of OpFor	3	6	4	4	2	19
ACE Report		7	1	5	1	14
PIR			1	1	3	5
CCP Location	2	1			1	4
Status of COBs	1	1			3	5
Medevac		1	2	2	2	7
Status of nerve agent	3			2	1	6
Location of booby traps				1		1
	A-5					
Ensuing mission		2	4	1		7
Location and status of all squad	3	3	3	2	2	13
Location and status of OpFor	4	4	4	3	2	17
ACE Report	2	3	3	5	3	16
PIR		1	1		2	4
CCP Location		1	1	1	1	4
Status of COBs	1			1		2
Medevac		2				2
Location of booby traps	1	1				2
	B-1					
Ensuing mission	2	1	1			4
Location and status of all squad	2	3	4	3	5	17
Location and status of OpFor	3	4	5	3	4	19
ACE Report	2	5	3	4	1	15
PIR				1	1	2
CCP Location	1		1	1	1	4
Status of COBs					1	1
Medevac		1				1
Location of vehicles		1				1
	B-2					
Ensuing mission	1	1	2			4
Location and status of all squad	2	5	4	4	5	20
Location and status of OpFor	4	4	4	4	5	21
ACE Report	1	5	1	4	1	12
PIR					1	1
CCP Location			1		1	2
Status of COBs		1			2	3
Medevac		1	1			2
Status of nerve agent	3	1		2	3	9

	B-3					
Ensuing mission	1	2	2			5
Location and status of all squad	3	5	2	3	5	18
Location and status of OpFor	5	5	4	3	5	22
ACE Report	2	5	1	4	1	13
CCP Location			1		2	3
Status of COBs		1	1	1	1	4
Medevac					1	1
	B-4					
Ensuing mission	2	2	3	3		10
Location and status of all squad	2	2	3	6	3	16
Location and status of OpFor	2	5	5	4	3	19
ACE Report	3	5	3	5	1	17
CCP Location		1		1		2
Status of COBs	1	1		1		3
Medevac			1			1
	B-5					
Ensuing mission	1	2	2	1		6
Location and status of all squad	3	4	5	3	5	20
Location and status of OpFor	6	5	3	2	3	19
ACE Report	3	5	2	3	2	15
PIR					1	1
CCP Location		1		1	1	3
Status of COBs			1			1
Medevac		1	1			2
Status of nerve agent					1	1
	C-1					
Ensuing mission	1	2	2	2	1	8
Location and status of all squad	1	4	3	2	4	14
Location and status of OpFor	3	5	3	3	6	20
ACE Report		5	3	3	3	14
PIR					2	2
CCP Location				2	2	4
Status of COBs	2				2	4
Medevac		1		1		2

	C-2					
Ensuing mission	2	2	3	1	1	9
Location and status of all squad	4	4	2	5	3	18
Location and status of OpFor	2	5	4	4	4	19
ACE Report	1	5	2	2	4	14
PIR	1			1	2	4
CCP Location	2	1	3		2	8
Status of COBs	1	2	1			4
Medevac	3	2		1	1	7
Location of booby traps	1					1
	C-3					
Ensuing mission	3	2	4	1	1	11
Location and status of all squad	2	3	1	2	4	12
Location and status of OpFor	4	4	5	4	5	22
ACE Report	1	5	3	3	4	16
PIR			1	1	1	3
CCP Location		4	1	1	1	7
Status of COBs	2	2	2	3	2	11
Medevac	2		4	1		7
	C-4					
Ensuing mission	2		1	1	2	6
Location and status of all squad	3	4	2	3	4	16
Location and status of OpFor	2	4	2	3	3	14
ACE Report	2	3	3	2	3	13
CCP Location	1	2	1	3		7
Status of COBs		1		1	1	3
Medevac			1	1		2
Status of nerve agent		1		1		2
	C-5					
Ensuing mission	2	1	3	1	1	8
Location and status of all squad	1	3	2	3	5	14
Location and status of OpFor	5	3	2	2		12
ACE Report	2	3	4	2	3	14
PIR				1	2	3
CCP Location	1				1	2
Status of COBs				1	2	3
Medevac		1	1			2
Location of booby traps	1					1

2. How would you rate your personal situational awareness during this exercise?

	1 Extremely Unaware	2 Very Unaware	3 Unaware	4 Neutral	5 Aware	6 Very Aware	7 Extremely Aware
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Mean Response

Squad

Vignette/Script - TTP 1

	A-1	A-2	A-3	A-4	A-5	B-1	B-2	B-3	B-4	B-5	C-1	C-2	C-3	C-4	C-5
1 st	4.63				5.00						5.57				
2 nd		5.63					5.75					6.00			
3 rd			4.29					5.00					5.00		
4 th				5.44					5.56					4.89	
5 th					4.78					5.44					5.13

TTP 2

1 st		4.50					5.29					5.29			
2 nd			5.25					5.13					5.38		
3 rd				5.00					NR					5.00	
4 th					5.62					5.67					4.89
5 th	4.33					5.56					5.67				

		Mean Response														
Squad		Vignette/Script - TTP 1														
		A-1	A-2	A-3	A-4	A-5	B-1	B-2	B-3	B-4	B-5	C-1	C-2	C-3	C-4	C-5
1 st 2 nd 3 rd 4 th 5 th				4.57					5.43					5.57		
				5.63					5.86	5.17				5.71		4.67
					5.00		5.29				5.14	5.44				
	5.00	5.33						5.56								
								TTP 4		5.57			5.17			
1 st 2 nd 3 rd 4 th 5 th				5.50		5.88	4.86			5.88	5.29		5.00			5.50
	5.17	4.86						5.81						5.50		
			4.50						5.25							
					5.50				TTP 5							4.88
		6.00			6.00				5.67		5.38		5.67		5.89	5.13
1 st 2 nd 3 rd 4 th 5 th																
JR = no response					4.71				4.88							

3. What was your main source of information on this exercise?

A = Intra-Squad Radio
 B = AN/PRC-126
 C = Hand/Arm Signals
 D = Voice Commands
 E = Visual Signals

		Vignette/Script TTP														
		A-1			B-1			C-1			B-2			C-2		
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
SOURCE		15%	26%	52%	45%	72%	51%	27%	48%	39%	74%	43%	25%	50%	57%	72%
	A															
	B	2%	8%	13%	6%	6%	3%	7%	14%	11%	6%	4%	6%	12%	11%	5%
	C	2%	4%	3%	2%	4%	0%	3%	3%	6%	5%	8%	13%	3%	6%	5%
	D	80%	59%	40%	21%	18%	46%	62%	42%	29%	14%	46%	54%	32%	24%	18%
	E	3%	3%	4%	7%	1%	1%	1%	0%	13%	0%	1%	2%	6%	1%	1%
		A-2			B-2			C-2								
SOURCE		29%	77%	22%	70%	54%	30%	63%	13%	57%	58%	21%	57%	17%	59%	73%
	A															
	B	0%	4%	8%	17%	13%	9%	1%	75	15%	13%	9%	2%	7%	16%	13%
	C	5%	0%	6%	9%	4%	4%	0%	7%	11%	2%	7%	0%	9%	9%	4%
	D	58%	18%	63%	26%	22%	56%	35%	72%	40%	21%	57%	31%	68%	36%	9%
	E	1%	1%	1%	10%	6%	0%	0%	1%	10%	7%	1%	1%	0%	9%	1%

		Vignette/Script TTP														
		A-3					B-3					C-3				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
SOURCE																
A	A	16%	38%	57%	49%	55%	12%	42%	63%	44%	58%	23%	30%	76%	53%	68%
	B	14%	6%	2%	6%	14%	15%	9%	1%	6%	16%	14%	5%	1%	6%	17%
	C	9%	6%	0%	4%	8%	3%	4%	1%	1%	3%	8%	5%	1%	4%	8%
	D	61%	48%	40%	47%	43%	70%	42%	36%	49%	36%	52%	56%	21%	37%	29%
	E	0%	3%	8%	0%	8%	0%	3%	5	0%	0%	4%	3%	1%	0%	6%
		A-4					B-4					C-4				
A	A	29%	27%	38%	76%	63%	24%	30%	36%	81%	62%	15%	29%	35%	74%	63%
	B	75%	17%	3%	1%	19%	20%	19%	8%	0%	19%	20%	14%	9%	0%	7%
	C	6%	4%	6%	1%	1%	0%	5%	9%	0%	0%	6%	7%	11%	0%	4%
	D	73%	50%	45%	14%	36%	75%	39%	47%	19%	38%	76%	47%	44%	24%	39%
	E	10%	1%	1%	1%	3%	0%	2%	0%	0%	4%	8%	3%	0%	2%	4%
		A-5					B-5					C-5				
A	A	17%	42%	42%	60%	83%	10%	37%	30%	63%	79%	7%	39%	31%	54%	71%
	B	7%	10%	14%	6%	1%	14%	10%	11%	6%	1%	6%	18%	19%	6%	1%
	C	9%	5%	4%	7%	0%	9%	2%	7%	5%	0%	17%	2%	14%	11%	0%
	D	64%	55%	31%	26%	14%	60%	50%	43%	26%	20%	69%	52%	58%	29%	18%
	E	3%	7%	8%	1%	3%	4%	0%	9%	0%	1%	1%	6%	3%	1%	3%

SECTION 6

RESULTS FROM OPFOR QUESTIONNAIRE

1. Did you hear any commands or discussion that gave you information on what the Rangers intended to do before they did it?

Vignette/Script A															
	TTP 1			TTP 2			TTP 3			TTP 4			TTP 5		
	Y	N	N R	Y	N	N R	Y	N	N R	Y	N	N R	Y	N	N R
1 st Squad	2	5	7	0	7	7	0	4	10	0	6	8	0	3	11
2 nd Squad	0	7	7	0	4	10	0	6	8	0	3	11	0	8	6
3 rd Squad	0	4	10	1	5	8	0	3	11	0	8	6	0	7	7
4 th Squad	0	7	7	0	3	11	0	8	6	0	7	7	0	4	10
5 th Squad	0	3	11	0	8	6	0	6	8	0	4	10	0	7	7
TOTAL	2	26	42	1	27	42	0	27	43	0	28	42	0	29	41

Vignette/Script B															
	TTP 1			TTP 2			TTP 3			TTP 4			TTP 5		
	Y	N	N R	Y	N	N R	Y	N	N R	Y	N	N R	Y	N	N R
1 st Squad	0	10	4	2	8	4	0	10	4	0	10	4	0	10	4
2 nd Squad	0	11	3	0	10	4	0	10	4	0	10	4	0	10	4
3 rd Squad	0	9	5	0	9	5	0	10	4	0	10	4	0	10	4
4 th Squad	0	10	4	0	8	6	0	9	5	0	10	4	0	10	4
5 th Squad	0	9	5	0	9	5	0	10	4	0	10	4	0	10	4
TOTAL	0	49	21	2	44	24	0	49	21	0	50	20	0	50	20

	Vignette/Script C														
	TTP 1			TTP 2			TTP 3			TTP 4			TTP 5		
	Y	N	N	Y	N	N	Y	N	N	Y	N	N	Y	N	N
			R			R			R			R			R
1 st Squad	0	6	8	1	7	6	0	7	7	0	6	8	0	5	9
2 nd Squad	0	8	6	0	7	7	1	5	8	0	10	4	0	10	4
3 rd Squad	0	7	7	0	6	8	0	6	8	0	10	4	0	10	4
4 th Squad	0	6	8	0	6	8	0	6	8	1	6	7	0	7	7
5 th Squad	0	6	8	0	6	0	1	7	6	0	6	8	0	5	9
Squad	0	33	37	1	32	29	2	31	37	1	38	31	0	37	33
<i>TOTAL</i>															

Y = yes; N = no; NR = no response

	1 Extremely Unaware	2 Very Unaware	3 Unaware	4 Neutral	5 Aware	6 Very Aware	7 Extremely Aware								
MEAN RESPONSE															
TTP	Vignette/Script														
	A-1	A-2	A-3	A-4	A-5	B-1	B-2	B-3	B-4	B-5	C-1	C-2	C-3	C-4	C-5
1	4.00	4.71	4.5	4.86	4.67	4.30	4.45	4.37	5.20	4.89	5.50	4.75	4.67	3.67	5.33
2	4.00	4.57	4.75	4.67	3.67	5.00	4.40	4.78	4.44	3.75	4.83	4.38	4.86	4.50	5.67
3	4.50	5.33	4.75	5.33	6.00	4.67	4.50	4.50	4.70	4.50	4.83	5.00	5.71	5.17	4.83
4	5.25	5.00	4.00	5.00	4.00	4.60	5.00	4.90	4.70	4.30	4.33	5.14	5.00	4.50	5.00
5	5.13	5.29	4.33	4.71	4.33	4.60	4.78	4.50	4.90	4.30	5.17	4.88	4.86	3.60	4.6

Vignette A: Sample size varied from 3 to 8

Vignette B: Sample size varied from 8 to 10

Vignette C: Sample size varied from 3 to 10

APPENDIX B

PHASE II

SECTION	TITLE
1	Critical Information Requirements
2	Test Matrix, Sample Questionnaire, and Script
3	Results from Demographic Questionnaire
4	Results from Assessment of Knowledge Questionnaire
5	Results from Subjective Questionnaire
6	Results from OpFor Questionnaire
7	Results from End-of-Experiment Questionnaire

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SECTION 1
CRITICAL INFORMATION REQUIREMENTS

SCALE

- 1 - Extremely unnecessary for performance
- 2 - Very unnecessary for performance
- 3 - Unnecessary for performance
- 4 - Neutral
- 5 - Necessary for performance
- 6 - Very necessary for performance
- 7 - Extremely necessary for performance

VIGNETTE A

Vignette Question	Mean	Sample Size	Question
A1Q06	5.68	81	Where were OpFor located in C4?
A4Q08	5.46	81	How many OpFor were seen/reported in C4?
A4Q03	5.43	81	Any reports of OpFor using booby traps?
A1Q01	5.11	81	OpFor reinforcement time?
A4Q01	5.04	81	Most likely source of NBC attack?
A1Q02	5.02	81	Type of OpFor reinforcement?
A4Q11	4.94	81	Where is the OpFor NBC lab located?

NOTE: Under the Vignette Question columns above/below, the letter represents the Vignette and the number represents the Script, e.g., A (vignette), 1(script).

VIGNETTE B

Vignette Question	Mean	Sample Size	Question
B3Q11	5.69	81	Status of 5.56-mm ball ammunition?
B1Q06	5.59	81	How many OpFor seen/reported in vicinity of A2/A4?
B3Q03	5.51	81	How many OpFor were in vicinity of B1?
B1Q01	5.48	81	OpFor reinforcement capability on objective time?
B1Q05	5.42	81	Likely location of OpFor reinforcements?
B3Q02	5.30	81	When do you expect counterattack from east?
B3Q05	5.26	81	How many OpFor in vicinity of C4?
B3Q12	5.16	75	20-30 OpFor are currently reported where?
B1Q02	5.07	80	Platoon CCP/POW currently located?
B1Q08	4.95	81	What was reported in vicinity of east end of airstrip?
B3Q08	4.90	81	How far have the 20-30 OpFor advanced?

VIGNETTE C

Vignette Question	Mean	Sample Size	Question
C2Q08	5.68	81	Biggest threat from OpFor according to INSUM?
C2Q01	5.65	81	Probability that OpFor has booby-trapped C4?
C4Q02	5.33	81	Size OpFor element available for counterattack?
C4Q01	5.28	81	Type counterattack your element expects?
C4Q04	5.19	81	Any reports of platoon element in/around McKenna?
C4Q05	5.19	81	Disposition of OpFor in C3 when you entered?

VIGNETTE D

Vignette	MEA N	Sample Size	Question
D1Q02	5.57	72	Where received hostile fire before entering building?
D1Q01	5.39	54	Where/what do you expect OpFor to do?
D1Q07	5.22	72	Where were obstacles found in C4?
D2Q02	5.20	71	Likely location of OpFor reinforcements?
D1Q04	5.04	72	What building was reported to be heavily fortified?
D1Q06	4.99	72	What will OpFor most likely do?
D2Q01	4.97	71	How long to take OpFor to get reinforcements?

VIGNETTE E

Vignette Question	Mean	Sample Size	Question
E1Q09	5.28	72	Where are the OpFor on your objective?
E2Q07	5.20	80	Where were the OpFor located on your squad objective?
E1Q02	5.08	72	Do you have OpFor counterattack threats? From where?
E1Q05	4.99	72	Type hostile fire expected from OpFor SE of McKenna?

VIGNETTE F

Vignette Question	Mean	Sample Size	Question
F2Q05	5.70	71	Where are the OpFor on squad objective located?
F2Q04	5.59	71	Have you received hostile fire from outside C4?
F2Q10	5.46	72	Where did your squad encounter booby traps?
F1Q05	5.44	71	Where are the OpFor in squad objective located?
F1Q09	5.01	71	What type reinforcements does the OpFor have?

BY BATTLEFIELD OPERATION SYSTEM CATEGORY

Vignette/ Script	Maneuver		C2		Intelli- gence		M&S		Combat Service Support		Fire Support		Air Defense	
	#	#	#	# C	#	#	#	#	#	# C	#	# C	#	# C
	Qs	C	Qs		Qs	C	Qs	C	Qs		Qs		Qs	
A-1	1	1	1	0	5	2	4	1	0	0	0	0	0	0
A-4	1	0	1	0	7	4	2	1	0	0	0	0	0	0
B-1	1	1	1	0	4	2	5	1	0	0	0	0	0	0
B-3	1	0	1	0	5	4	3	1	1	0	1	0	0	0
C-2	1	0	0	0	7	4	1	0	1	0	0	0	0	0
C-4	0	0	0	0	4	3	5	1	1	0	0	0	0	0
D-1	3	0	1	0	4	2	3	2	0	0	0	0	0	0
D-2	2	1	0	0	6	2	3	1	0	0	0	0	0	0
E-1	2	1	2	0	5	2	2	1	0	0	0	0	0	0
E-2	1	0	5	1	3	1	1	1	0	0	0	0	0	0
F-1	2	2	2	0	4	2	1	0	1	0	0	0	0	0
F-2	3	1	2	0	2	0	4	4	0	0	0	0	0	0
Total	18	5	16	1	56	28	34	14	4	0	1	0	0	0

Q = Question; C = Critical question

SECTION 2

TEST MATRIX, SAMPLE QUESTIONNAIRE, AND SCRIPT

Week 1, 8-12 May 00

<i>Daylight</i>					<i>Night</i>				
Trial	Squad	Radio	Vig	Script	Trial	Squad	Radio	Vig	Script
1	1	Y	A	1	19	1	N	D	1
2	2	Y	B	3	20	2	N	E	2
3	3	Y	C	2	21	3	N	F	1
4	1	Y	B	3	22	1	N	E	2
5	2	Y	C	2	23	2	N	F	1
6	3	Y	A	4	24	3	N	D	2
7	1	Y	C	2	25	1	N	F	1
8	2	Y	A	4	26	2	N	D	2
9	3	Y	B	1	27	3	N	E	1
10	1	N	A	4	28	1	Y	D	2
11	2	N	B	1	29	2	Y	E	1
12	3	N	C	4	30	3	Y	F	2
13	1	N	B	1	31	1	Y	E	1
14	2	N	C	4	32	2	Y	F	2
15	3	N	A	1	33	3	Y	D	1
16	1	N	C	4	34	1	Y	F	2
17	2	N	A	1	35	2	Y	D	1
18	3	N	B	3	36	3	Y	E	2

WEEK 2, 15-19 MAY 00

Daylight					Night				
Trial	Squad	Radio	Vig	Script	Trial	Squad	Radio	Vig	Script
1	1	N	B	1	19*	1	Y	E	1
2	2	N	C	4	20*	2	Y	F	2
3	3	N	A	4	21*	3	Y	D	2
4	1	N	C	4	22*	1	Y	F	2
5	2	N	A	1	<u>Void *</u>	2	Y	D	1
6	3	N	B	1	<u>24*</u>	3	Y	E	1
7	1	N	A	1	25*	1	Y	D	1
8	2	N	B	3	26*	2	Y	E	2
9	3	N	C	4	27*	3	Y	F	2
10	1	Y	B	3	28	1	Y	E	2
11	2	Y	C	2	29	2	Y	F	1
12	3	Y	A	1	30	3	N	D	1
13	1	Y	C	2	31	1	N	F	1
14	2	Y	A	4	32	2	N	D	2
15	3	Y	B	3	33	3	Y	E	2
16	1	Y	A	4					
17	2	Y	B	1					
18	3	Y	C	2					

*Data not used

WEEK 3, 22-26 MAY 00

Daylight					Night				
Trial	Squad	Radio	Vig	Script	Trial	Squad	Radio	Vig	Script
1	1	Y	C	2	19	1	N	F	1
2	2	N	A	1	20	2	Y	D	1
3	3	Y	B	1	21	3	N	E	1
4	1	Y	A	4	22	1	N	D	2
5	2	N	B	3	23	2	Y	E	2
6	3	Y	C	4	24	3	N	F	2
7	1	Y	B	1	25	1	N	E	1
8	2	N	C	2	26	2	Y	F	1
9	3	Y	A	1	27	3	N	D	1
10	1	N	C	4	28	1	Y	F	2
11	2	Y	A	4	29	2	N	D	2
12	3	N	B	3	30	3	Y	E	2
13	1	N	A	1	31	1	Y	D	1
14	2	Y	B	1	32	2	N	E	1
15	3	N	C	2	33	3	Y	F	1
16	1	N	B	3	34	1	Y	E	2
17	2	Y	C	4	35	2	N	F	2
18	3	N	A	4	36	3	Y	D	2

SAMPLE QUESTIONNAIRE AND SCRIPT Vignette E1

ID#: _____

NAME: _____ RANK: _____ YRS IN ARMY: _____

UNIT: _____ DATE: _____

Please answer the following questions based on your experience with the system.
Answer all questions as accurately as possible. Circle the appropriate letter.

1. *When do you anticipate the Platoon size OpFor element will reach McKenna Village?*
 - a. Less than 30 minutes
 - b. 30 minutes to an hour
 - c. More than an hour
 - d. No moving in the direction of McKenna
 - e. Don't know
2. Do you have any OpFor counter attack threats, if so, from where?
 - a. No threat at this time
 - b. S/E wood line
 - c. 1 Km from the East
 - d. 1 Km from the S/E
 - e. Don't know
3. Are there any reports of OpFor Platoon sized units outside of McKenna Village? If so where are they located?
 - a. Yes, approximately 5 Km S/E of McKenna Village
 - b. Yes, approximately 1 Km N/E of McKenna Village
 - c. Yes, approximately 1 Km S/E of McKenna Village
 - d. No, none reported
 - e. Don't know
4. If yes, what is the rate of movement?
 - a. 1 Km/hr
 - b. 2 Km/hr
 - c. 3 Km/hr
 - d. Not moving
 - e. Don't know
5. What type of hostile fire do you expect to receive from the OpFor located southeast of McKenna?
 - a. Small arms
 - b. Mortar
 - c. Light machinegun
 - d. Heavy machinegun
 - e. Don't know
6. What OpFor activity was reported by A CO?
 - a. Squad dug in, vicinity of the cemetery
 - b. Squad moving south in the vicinity of the Cemetery
 - c. Heavy MG team moving south in the vicinity of the Cemetery

6. What OpFor activity was reported by A CO?
 - a. Squad dug in, vicinity of the cemetery
 - b. Squad moving south in the vicinity of the Cemetery
 - c. Heavy MG team moving south in the vicinity of the Cemetery
 - d. Nothing reported
 - e. Don't know
7. What is the disposition of the 2nd Squad?
 - a. Receiving hostile fire from S/E wood line
 - b. Receiving AW fire from S/E wood line
 - c. Receiving AW fire from S/W wood line
 - d. In position, no contact reported
 - e. Don't know
8. Where is the Company CCP currently located?
 - a. East end of C1
 - b. West end of C1
 - c. East end of A1
 - d. West end of A1
 - e. Don't know
9. Where are the OpFor on your objective (if any)?
 - a. Rooms 1 and 2
 - b. Rooms 2 and 3
 - c. Rooms 3 and 4
 - d. None
 - e. Don't know
10. What is the disposition of the A Company?
 - a. Toe-hold in A4
 - b. Secured A4
 - c. Toe-hold in A3
 - d. In reserve
 - e. Don't know
11. Where is your Platoon Sergeant located?
 - a. C1
 - b. C2
 - c. C4
 - d. KIA
 - e. Don't know

QUESTIONNAIRE MATRIX
Script 1, Vignette E

	Per- cep- tion	Com- prehen- sion	Projec- tion	Maneu- ver	C2	Intelli- gence	Mobility & Surviv- ability	Combat Service Support	Fire Support	Air Defense
Q1			B			✓				
Q2		D				✓				
Q3	C					✓				
Q4	A					✓				
Q5			D	BOS				✓		
Q6	C					✓				
Q7	B							✓		
Q8	D									
Q9		C								
Q10	A			✓						
Q11	B					✓				

SCRIPT E-1

Time	Squad Leader	Support Squad	Platoon Leader/WC	OpFor/COB
<u>H Hour</u>	ATK from C4 1 st floor landing to 2 nd floor	East and N/E rooms of building C2 RPT: to PL: Receiving AW fire from S/E wood line	PL located west end of C1 RPT: 2nd Squad receiving AW fire from S/E wood line RPT: 3 rd Squad secured North side C4 first floor	2 OpFor roof B1 (firing on C2) <u>(Time)</u> 1 OpFor room 3 Fight to the death <u>(Action)</u> 1 OpFor room 4 surrenders at first sign of ExFor <u>(Action)</u> 2 OpFor S/E wood line (firing on C4/C2) <u>(Time)</u> 2 COBs 1 in room 1 OK, 1 in room 2 dead bound & blindfolded OpFor fire from roof of BLDG B1 <u>(Time)</u>
H Hour - 1 Min	Continue ATK from C4 1 st floor to 2 nd floor	Observes and engages TO	RPT: A CO established a toe-hold building A4 RPT: 2 OpFor shooters sighted on B1 roof A Co RPT: Heavy MG team moving South vicinity Cemetery RPT: PSG co-located w/2 nd Squad	
1 - 3 Min	ExFor WIA by window sniper Room 1 (if exposed)	Observes and engages TO RPT: to PL: Receiving Heavy MG fire from vicinity S/E wood line	RPT: 2 nd Squad receiving Heavy MG fire from vicinity S/E wood line	
3 - 5 Min	Squad Leader Enter/clear room 1 NOTE: Find 1 executed COB w/hands bound in room 1	Support Squad Observes and engages TO RPT: to PL: Request Class V re-supply	Platoon Leader/WC Request SITREP RPT: Company CCP/POW relocated to West end of building A1	OpFor/COB 2 dead COBs 1 found in room 1 1 in room 2 (bound and blindfolded)

5 – 10 Min	Enter/clear room 2 NOTE: Find 1 executed COB w/hands bound in room 2	Observes and engages TO	RPT: OpFor Platoon last reported 1K S/E of Kings Pond moving N/NW at 1K/HR RPT: North-end C4 1 st floor secure by 3rd Squad	OpFor Continues to defend in rooms 3 and 4 (<u>Action</u>) 2 OpFor SE wood line fire/ maneuver to building C6 (<u>Time</u>)
10 – 15 Min	Enter/clear room 3 Enter/clear room 4	Observes and engages TO RPT: to PL: 2 OpFor engaged (possible KIA depends on EC judgment) outside building C6	Request SITREP RPT: OpFor Platoon vicinity Hourglass Rd moving North/Northwest RPT: to PL: 2 OpFor KIA outside building C6 Request ACE	1 OpFor KIA room 3 (<u>Action</u>) 1 OpFor POW room 4 (<u>Action</u>) (<u>Maybe</u>)

SECTION 3

RESULTS FROM DEMOGRAPHIC QUESTIONNAIRE

SAMPLE SIZE = 84

<u>RANK</u>		<u>DUTY POSITION FOR THIS EXPERIMENT</u>	
E-1 - 1	E-4 - 19	Squad Leader - 8	Grenadier - 18
E-2 - 22	E-5 - 14	Team Leader - 20	SAW Gunner - 19
E-3 - 25	E-6 - 3	Rifleman - 19	

AGE Mean = 22 years (Range 17 to 31)

1. Handedness: 79 Right 5 Left
2. Height: Mean = 70 inches (Range 64 to 77)
Weight: Mean = 173 pounds (Range 140 to 235)
3. Vision:
 - a. Is your vision in each eye 20/20 or correctable to 20/20? 79 Yes 4 No 1 NR
 - b. Do you wear glasses when performing military duties? 13 Yes 70 No 1 NR
 - c. Do you wear contact lenses when performing military duties? 9 Yes 74 No 1 NR
4. Education: Mean = 12.7 years
5. Current MOS Months (Mean) in Current MOS
11B - 84 21 months
6. Months (Mean) in current job: 11 months
7. Months (Mean) of experience in Infantry-related MOS: 22 months
8. Months (Mean) of military service: 24 months
9. Months (Mean) in these leadership positions:
 - a. Fire Team Leader: 4 months
 - b. Squad Leader: 1 month
10. Months (Mean) of military training/instruction received in light infantry operations:
 - a. Classroom training at Infantry School: 3 months
 - b. Field exercises (i.e., NTC, JOTC, CRTC, MOUT training): 5 months

11. Months (Mean) of military training/instruction received in the following areas:

- a. Land navigation (map reading, use of GPS data, following planned route): 6 months
- b. Route planning: 5 months
- c. Communications: 5 months

12. GT Score: Mean = 118

13. Latest Physical Fitness (PFT) Score: Mean = 289 (out of 300)

14. Latest Firing Qualification Test (FQT) Score: Mean = 37 (out of 40)

Type of weapon:	M4 - 64	M240 - 1
	SAW - 3	M203 - 1
	M16 - 10	NR - 5

15. Self rating of Knowledge, Skills, and Abilities (KSA) related to Infantry duties:

1 Poor	2 Below Average	3 Average	4 Above Average	5 Outstanding
MEAN RESPONSE				
Knowledge of Infantry tactics, techniques, and procedures (TTP).				3.60
Knowledge of computers.				2.71
Knowledge of electronics.				2.73
Knowledge of mechanics and maintenance procedures for weapon systems and equipment used.				3.53
Knowledge of map reading and orientation in field setting.				3.78
Knowledge of land navigation.				3.75
Knowledge of reconnaissance, surveillance, and target acquisition procedures.				2.96
Knowledge relating to communications equipment and communications procedures.				2.96
Marksmanship skills.				4.07
Map reading skills.				3.90
Land navigation skills.				3.72
Computer skills (keyboards, mouse, track balls, navigating in and out of menus, etc.).				3.14
Communication skills (ability to use communications equipment and face-to-face communications to enhance mission accomplishment).				3.31
Leadership skills				3.66

16. Months (Mean) of military deployment for peacekeeping, peace enforcement, stability operations of combat:

- a. 2 months.
- b. If so, where? Sinai/Egypt - 1.

SECTION 4

RESULTS FROM ASSESSMENT OF KNOWLEDGE QUESTIONNAIRE

WEEK 1

Vignette A – Script 1

Questions		Q1		Q2		Q6		Q9	
Radio	Sqd	C	I	C	I	C	I	C	I
Y	1 st	4	5	1	8	4	5	3	6
N	2 nd	1	8	4	5	8	1	0	9
N	3 rd	0	9	1	8	4	5	7	2

Vignette A – Script 4

Questions		Q1		Q3		Q8		Q10		Q11	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
N	1 st	5	4	3	6	2	7	3	6	3	6
Y	2 nd	1	8	1	8	1	8	3	6	2	7
Y	3 rd	0	9	6	3	1	8	0	9	1	8

Vignette B – Script 1

Questions		Q1		Q5		Q6		Q8	
Radio	Sqd	C	I	C	I	C	I	C	I
N	1 st	5	4	8	1	4	5	4	5
N	2 nd	3	6	6	3	1	8	3	6
Y	3 rd	2	7	5	4	0	9	4	5

Vignette B – Script 3

Questions		Q2		Q3		Q5		Q8		Q12	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
Y	1 st	1	8	4	5	3	6	3	6	4	5
Y	2 nd	0	9	4	5	1	8	6	3	7	2
N	3 rd	0	9	2	7	2	7	2	7	5	4

Vignette C – Script 2

Questions		Q1		Q4		Q7		Q8	
Radio	Sqd	C	I	C	I	C	I	C	I
Y	1 st	5	4	0	9	4	5	6	3
Y	2 nd	7	2	0	9	6	3	8	1
Y	3 rd	2	7	0	9	5	4	3	6

WEEK 1 (continued)

Vignette C – Script 4

Questions		Q1		Q2		Q4		Q5	
Radio	Sqd	C	I	C	I	C	I	C	I
N	1 st	0	9	2	7	2	7	6	3
N	2 nd	2	7	1	8	2	7	6	3
N	3 rd	9	0	1	8	1	8	4	5

Vignette D – Script 1

Questions		Q1		Q2		Q4		Q6		Q7	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
N	1 st	1	8	5	4	0	9	3	6	2	7
Y	2 nd	4	5	6	3	4	5	8	1	3	6
Y	3 rd	0	9	5	4	1	8	5	4	1	8

Vignette D - Script 2

Questions		Q1		Q2		Q7		Q10	
Radio	Sqd	C	I	C	I	C	I	C	I
Y	1 st	4	5	2	7	2	7	0	9
N	2 nd	2	7	3	6	5	4	1	8
N	3 rd	0	8	0	8	5	3	4	4

Vignette E - Script 1

Questions		Q2		Q3		Q5		Q9	
Radio	Sqd	C	I	C	I	C	I	C	I
Y	1 st	1	8	2	7	1	8	2	7
Y	2 nd	1	8	2	7	1	8	6	3
N	3 rd	0	9	1	8	0	9	2	7

Vignette E - Script 2

Questions		Q4		Q7		Q10	
Radio	Sqd	C	I	C	I	C	I
N	1 st	6	3	5	4	4	5
N	2 nd	7	2	3	6	5	4
Y	3 rd	3	6	3	6	0	9

Vignette F – Script 1

Questions		Q1		Q5		Q8		Q9		Q10	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
N	1 st	3	6	6	3	4	5	1	8	1	8
N	2 nd	1	8	2	7	3	6	2	7	2	7
N	3 rd	0	9	1	8	2	7	1	8	6	3

WEEK 1 (continued)

Vignette F – Script 2

Questions		Q1		Q4		Q5		Q8		Q10	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
Y	1 st	2	7	0	9	2	7	2	7	2	7
Y	2 nd	1	8	1	8	4	5	2	7	7	2
Y	3 rd	1	8	0	9	1	8	0	9	7	2

WEEK 2

Vignette A – Script 1

Questions		Q1		Q2		Q6		Q9	
Radio	Sqd	C	I	C	I	C	I	C	I
N	1 st	2	7	1	8	1	8	0	9
N	2 nd	2	7	0	9	5	4	4	5
Y	3 rd	3	6	0	9	3	6	7	2

Vignette A – Script 4

Questions		Q1		Q3		Q8		Q10		Q11	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
Y	1 st	2	7	0	9	0	9	1	8	2	7
Y	2 nd	3	6	4	5	1	8	0	9	3	6
N	3 rd	3	6	0	9	2	7	0	9	0	9

Vignette B – Script 1

Questions		Q1		Q5		Q6		Q8	
Radio	Sqd	C	I	C	I	C	I	C	I
N	1 st	3	6	6	3	2	7	3	6
Y	2 nd	0	9	2	7	6	3	9	0
N	3 rd	6	3	4	5	3	6	2	7

Vignette B – Script 3

Questions		Q2		Q3		Q5		Q8		Q12	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
Y	1 st	1	8	4	5	4	5	2	7	3	6
N	2 nd	1	8	5	4	2	7	1	8	4	5
N	3 rd	1	8	3	6	1	8	6	3	9	0

WEEK 2 (continued)

Vignette C - Script 2

Questions		Q1		Q4		Q7		Q8	
Radio	Sqd	C	I	C	I	C	I	C	I
Y	1 st	7	2	1	8	6	3	6	3
Y	2 nd	6	3	0	9	1	8	6	3
Y	3 rd	3	6	0	9	7	2	6	3

Vignette C - Script 4

Questions		Q1		Q2		Q4		Q5	
Radio	Sqd	C	I	C	I	C	I	C	I
N	1 st	0	9	0	9	0	9	7	2
N	2 nd	2	7	4	5	1	8	5	4
N	3 rd	3	6	1	8	0	9	2	7

Vignette D - Script 1

Questions		Q1		Q2		Q4		Q6		Q7	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
Y	1 st	2	7	5	4	2	7	1	8	1	8
Y	2 nd										
N	3 rd	0	9	2	7	0	9	1	8	5	4

Vignette D - Script 2

Questions		Q1		Q2		Q7		Q10	
Radio	Sqd	C	I	C	I	C	I	C	I
	1 st								
N	2 nd	1	8	2	7	2	7	2	7
Y	3 rd	3	6	3	6	3	6	2	7

Vignette E - Script 1

Questions		Q2		Q3		Q5		Q9	
Radio	Sqd	C	I	C	I	C	I	C	I
Y	1 st	1	8	1	9	0	9	0	9
	2 nd								
Y	3 rd	0	9	2	7	0	9	1	8

Vignette E - Script 2

Questions		Q4		Q7		Q10	
Radio	Sqd	C	I	C	I	C	I
N	1 st	4	5	4	5	5	4
Y	2 nd	3	6	3	6	6	3
N	3 rd	5	4	1	8	4	5

WEEK 2 (continued)

Vignette F - Script 1

Questions		Q1		Q5		Q8		Q9		Q10	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
N	1 st	3	6	3	6	3	6	3	6	7	2
N	2 nd	0	9	7	2	3	6	1	8	4	5
	3 rd										

Vignette F - Script 2

Questions		Q1		Q4		Q5		Q8		Q10	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
Y	1 st	1	8	2	7	6	3	0	9	0	9
Y	2 nd	0	9	1	8	5	4	1	8	4	5
Y	3 rd	0	9	0	9	4	5	2	7	3	6

WEEK 3

Vignette A - Script 1

Questions		Q1		Q2		Q6		Q9	
Radio	Sqd	C	I	C	I	C	I	C	I
N	1 st	4	5	1	8	8	1	4	5
N	2 nd	5	4	1	8	4	5	4	5
Y	3 rd	6	3	4	5	7	2	0	9

Vignette A - Script 4

Questions		Q1		Q3		Q8		Q10		Q11	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
Y	1 st	2	7	3	6	1	8	0	9	2	7
Y	2 nd	5	4	1	8	3	6	0	9	0	9
N	3 rd	1	8	3	6	2	7	0	9	1	8

Vignette B - Script 1

Questions		Q1		Q5		Q6		Q8	
Radio	Sqd	C	I	C	I	C	I	C	I
Y	1 st	4	5	1	7	2	7	6	3
Y	2 nd	5	4	0	9	2	7	7	2
Y	3 rd	7	2	5	4	3	6	5	4

Vignette B - Script 3

Questions		Q2		Q3		Q5		Q8		Q12	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
N	1 st	0	9	0	9	0	9	4	5	5	4
N	2 nd	8	1	0	9	4	5	8	1	5	4
N	3 rd	1	8	0	9	5	4	2	7	3	6

WEEK 3 (continued)

Vignette C - Script 2

Questions		Q1		Q4		Q7		Q8	
Radio	Sqd	C	I	C	I	C	I	C	I
Y	1 st	3	6	2	7	4	5	8	1
N	2 nd	8	1	0	9	4	5	8	1
N	3 rd	8	1	2	7	8	1	9	0

Vignette C - Script 4

Questions		Q1		Q2		Q4		Q5	
Radio	Sqd	C	I	C	I	C	I	C	I
N	1 st	6	3	3	6	2	7	1	8
Y	2 nd	3	6	2	7	0	9	4	5
Y	3 rd	4	5	3	6	4	5	4	5

Vignette D - Script 1

Questions		Q1		Q2		Q4		Q6		Q7	
Radio	Sqd	C	I	C	I	C	I	C	I	C	I
Y	1 st	3	6	5	4	0	9	3	6	0	9
Y	2 nd	3	6	1	8	1	8	3	6	0	9
N	3 rd	0	9	7	2	4	5	5	4	4	5

Vignette D - Script 2

Questions		Q1		Q2		Q7		Q10	
Radio	Sqd	C	I	C	I	C	I	C	I
N	1 st	1	8	0	9	6	3	0	9
N	2 nd	2	7	1	8	5	4	1	8
Y	3 rd	5	4	2	7	8	1	0	9

Vignette E - Script 1

Questions		Q2		Q3		Q5		Q9	
Radio	Sqd	C	I	C	I	C	I	C	I
N	1 st	1	8	1	8	2	7	1	8
N	2 nd	0	9	2	7	4	5	4	5
N	3 rd	4	5	6	3	1	8	3	6

Vignette E - Script 2

Questions		Q4		Q7		Q10	
Radio	Sqd	C	I	C	I	C	I
Y	1 st	7	2	4	5	7	2
Y	2 nd	4	5	3	6	5	4
Y	3 rd	8	1	3	6	3	6

WEEK 3 (continued)

Vignette F – Script 1

<i>Questions</i>		Q1		Q5		Q8		Q9		Q10	
Radio	<i>Sqd</i>	C	I	C	I	C	I	C	I	C	I
N	1 st	1	8	2	7	3	6	0	9	2	7
Y	2 nd	2	7	1	8	5	4	4	5	5	4
Y	3 rd	5	4	2	7	7	2	5	4	2	7

Vignette F – Script 2

<i>Questions</i>		Q1		Q4		Q5		Q8		Q10	
Radio	<i>Sqd</i>	C	I	C	I	C	I	C	I	C	I
Y	1 st	3	6	2	7	2	7	2	7	7	2
N	2 nd	2	7	3	6	3	6	5	4	0	9
N	3 rd	4	5	0	9	3	6	4	5	7	2

ASSESSMENT OF KNOWLEDGE QUESTIONNAIRE COMMENTS

WITH/WITHOUT RADIO - DAY

	No. of Responses
A-1 Radio Yes	
1 st Squad:	
Information came when we were still taking down the building. I didn't have time to relay all the info when I received it. Building was small enough that enemy SITREP could have been relayed verbally. ICOM seemed to get in the way.	1
3 rd Squad:	
Couldn't hear over the headphones.	1
A-4 Radio Yes	
1 st Squad:	
Couldn't hear anything.	1
We should all be allowed to use ICOMs.	1
A-4 Radio No	
1 st Squad:	
It was better to use hand and arm signals in building. Squad was quiet while clearing room.	1
I cannot tell if my men get the information when they don't respond back.	1
When the firefight is pushed back or away from objective building; then the squad will be more receptive to information and retain it. Questions should be directed more toward locations of the enemy positions during firefight.	1
B-1 Radio Yes	
1 st Squad	
We should all be allowed to use the ICOMs like we've done for the past year.	1
2 nd Squad:	
Look into the Motorola radios in the civilian market (\$70).	1
B-1 Radio No	
1 st Squad	
Information was a lot easier to pass down and pass up in defense.	1
There was less confusion because everybody was stationary and in a small area.	
ICOMs would be helpful in cutting down movement by the squad leader.	1
Voice worked just as well, I thought, due to small area for my squad.	1
We need to be yelling all the time when in the absence of the squad communication.	1
This TTP, Squad Leader only talk, does not work.	1
You must have a happy medium in order to ensure that you have confirmation that the information has been received.	1

B-3 Radio Yes**1st Squad**

ICOM headset was hard to work with facemask and with other radios. 1

Information could be put out verbally just as well in this situation (defense). 1

Information being passed down will be dependent on the situation for it to get passed down. Information will have to be repeated once or twice, depending on enemy situation. 1

Using ICOM alone is not efficient in relaying information, Squad leaders being the only ones who can transmit does not allow for verification transmissions were received or understood. There must be a balance of verbal and radio communication in order to ensure that everyone in the squad fully understands the situation at hand, and since different people perceive things differently. It is necessary sometimes to get feedback in order to plan a picture of the battlefield. 1

C-2 Radio Yes**1st Squad**

Used ICOM more on this vignette. Didn't use headset; it was a little easier to use. Not all the information passed to me was important due to time. It was, however, important if we had follow-on missions to complete. 1

I feel that everyone should be able to speak on the squad radios. This would be more effective and quicker. 1

C-4 Radio No**1st Squad**

Kind of a hard building to clear. Fields of fire were bad. ICOMs would have been too slow. Voice and hand/arm signals worked for the most part to clear the building. 1

ICOMs would have been a lot easier to push down information to the squad after building was clear. I could tell when I put out information not everybody was listening. We should all be allowed to talk on ICOMs. 1

WITH/WITHOUT - NIGHT**D-1 Radio No****1st Squad:**

ICOMs could improve stealth in building. On those floors with multiple rooms, ICOMs would improve flow of information. 1

3rd Squad:

Radio on other end did not work; no transmissions were received after the 3rd one. 1

D-2 Radio Yes	No. of Responses
1st Squad	
ICOM worked really well; put out information quickly; controlled the squad; there was less movement for me in building.	1
E-1 Radio Yes	
1st Squad	
ICOMs were great.	1
I think it would have gone a lot better if the team leaders and I could free talk. They could relay their SITREP and ACE report without me moving through the building. Plus, it would allow team leaders to maintain more control of their teams, and they would not have to keep coming to my position to push up info.	1
Use of ICOMs, once the room/building was secure, assisted team leaders in giving SITREPs to the squad leader. This enabled team leaders to remain in control of their teams without having to move to the squad leader's location. This is essential for mission success.	1
E-2 Radio No	
1st Squad	
ICOM would have made it easy to push down information.	1
F-1 Radio No	
1st Squad	
ICOM could be used to push down information faster. I would not have had to move as much.	1
ICOMs are a must at night.	1
F-2 Radio Yes	
1st Squad	
Team leaders to give SITREPs and ACE reports should use ICOM.	2
Team leaders need to be able to talk to me to help direct movement in buildings and develop security plan. We need to be able to talk to each other. Just like I talk to the platoon leader, team leaders need to talk to me.	
My squad tells me they like having the radios.	1
Team leaders respond much faster.	1
With radios, there is less movement in building; when there is more movement, there is more confusion.	1
With the whole squad having radios, I do not have to repeat info as many times as I do without.	

SECTION 5

RESULTS FROM SUBJECTIVE QUESTIONNAIRE

1. What Were the Three Most Important Things You Needed to Know at the End of the Exercise?

	A-1			
	1st Sqd	2^d Sqd	3^d Sqd	Total
Ensuing mission	3			3
Location and status of ExFor	4	10	12	26
Location and status of OpFor	7	6	7	20
ACE Report	3		3	6
CCP Location		2		2
Status of HIP		1		1
Status of COBs		1		1
Medevac			1	1
Building Secure	3			3
	A-4			
Ensuing mission	6	1		7
Location and status of ExFor	4	5	7	16
Location and status of OpFor	3	5	4	12
ACE Report	7	1	2	10
Medevac		1	5	6
Building Secure	6			6
Status of nerve agent	1	1	1	3
Location of booby traps	1			1
Where are we receiving fire from	1			1
	B-1			
Ensuing mission	4			4
Location and status of ExFor	4	9	6	19
Location and status of OpFor	6	9	6	21
ACE Report	5	2	1	8
CCP Location		3		3
Status of COBs	1	2		3
	B-3			
	1st Sqd	2^d Sqd	3^d Sqd	Total
Location and status of ExFor	11	8	8	27
Location and status of OpFor	9	8	6	23
ACE Report	8	7	2	17
Building Secure	1			1
Where are we receiving fire from	1			1

	C-2			
Ensuing mission	3		6	9
Location and status of ExFor	3	6	3	12
Location and status of OpFor	4	7	8	19
ACE Report	3	5	7	15
PIR	1		2	3
Medevac	1	1		2
Building Secure	3			3
Where are we receiving fire from	1			1
	C-4			
Ensuing mission			1	1
Location and status of ExFor	8	8	10	26
Location and status of OpFor	8	7	10	25
ACE Report	9	7	2	18
Status of COBs		1		1
Medevac		1		1
Building Secure		1		1
	D-1			
Ensuing mission	4			4
Location and status of ExFor	6	6	10	22
Location and status of OpFor	6	6	8	20
ACE Report	8	5	2	15
Status of COBs	2			2
Medevac	1			1
Building Secure	4			4
	D-2			
	1st Sqd	2^d Sqd	3^d Sqd	Total
Ensuing mission	8			8
Location and status of ExFor	4	8	7	19
Location and status of OpFor	4	6	7	17
ACE Report	8	2	2	12
Medevac	1			1
Building Secure	8			8
Location of booby traps	1		1	2
Where are we receiving fire from	1			1
	E-1			
	1st Sqd	2^d Sqd	3^d Sqd	Total
Ensuing mission	9		4	13
Location and status of ExFor		6	9	15
Location and status of OpFor	6	6	5	17
ACE Report	8	2	4	14
PIR	1			1
Medevac	5			5
Building Secure	8			8

	E-2				
Ensuing mission	6				6
Location and status of ExFor	4	5	10		19
Location and status of OpFor	2	5	7		14
ACE Report	8	4	1		13
Status of COBs	2				2
Building Secure	6				6
Where are we receiving fire from	2				2
	F-1				
Ensuing mission	6				6
Location and status of ExFor	5	4	6		15
Location and status of OpFor	4	4	6		14
ACE Report	6	1	1		8
Medevac	1				1
Building Secure	6				6
	F-2				
	1st Sqd	2^d Sqd	3^d Sqd	Total	
Ensuing mission	6				6
Location and status of ExFor	1	4	5		10
Location and status of OpFor	3	4	5		12
ACE Report	6	4	1		11
Building Secure	6	1			7
Location of booby traps	6				6

2. How would you rate your personal situational awareness during this exercise?

	1 Extremely Unaware	2 Very Unaware	3 Unaware	4 Neutral	5 Aware	6 Very Aware	7 Extremely Aware					
MEAN RESPONSE Vignette/Script												
WEEK 1												
	A-1	A-4	B-1	B-3	C-2	C-4	D-1	D-2	E-1	E-2	F-1	F-2
1 st Sqd	5.00	5.33	5.50	5.50	5.14	5.33	5.14	5.57	5.71	5.29	5.43	5.57
2 nd Sqd	4.00	5.14	5.00	4.86	5.29	4.29	4.57	3.57	4.71	3.43	4.00	4.43
3 rd Sqd	5.38	5.38	6.14	5.38	4.67	4.25	5.38	4.71	4.88	5.50	4.00	5.00
WEEK 2												
1 st Sqd	4.56	4.89	4.89	5.11	5.56	5.38				5.33	5.44	
2 nd Sqd	4.88	5.44	5.22	5.56	5.00	5.00		5.67			4.50	
3 rd Sqd	5.50	5.25	6.13	6.13	6.11	5.75	5.56			5.78		
WEEK 3												
1 st Sqd	5.33	4.78	5.78	5.89	4.63	5.56	4.89	5.11	5.44	5.56	4.00	5.22
2 nd Sqd	4.33	4.78	5.56	5.56	5.11	4.89	4.11	4.78	5.33	4.22	4.56	4.67
3 rd Sqd	5.44	5.22	5.33	5.22	5.44	5.44	4.38	5.22	4.44	5.22	5.00	4.78

NOTE: Shaded = with radio; Unshaded = without radio.

3. What was your main source of information on this exercise?

WEEK 1

Squads->	Intrasquad Radio			AN/PRC-126			Hand/Arm Signals			Voice Commands			Visual Signals		
	1 st	2 nd	3 rd	1 st	2 nd	3 rd	1 st	2 nd	3 rd	1 st	2 nd	3 rd	1 st	2 nd	3 rd
A-1	34%	6%	1%	20%	0%	8%	21%	23%	8%	34%	68%	64%	13%	3%	13%
A-4	0%	33%	57%	8%	4%	8%	17%	11%	14%	60%	46%	14%	4%	6%	5%
B-1	0%	0%	61%	8%	6%	8%	14%	13%	4%	76%	74%	30%	3%	1%	1%
B-3	32%	28%	1%	11%	4%	11%	8%	12%	12%	52%	62%	74%	0%	3%	7%
C-2	24%	38%	41%	11%	4%	11%	11%	21%	26%	54%	49%	18%	1%	0%	2%
C-4	0%	0%	1%	6%	6%	7%	13%	22%	16%	69%	52%	62%	2%	1%	18%
D-1	0%	46%	58%	8%	4%	9%	3%	10%	7%	83%	40%	31%	4%	1%	6%
D-2	40%	0%	0%	9%	11%	6%	4%	14%	9%	46%	71%	70%	2%	3%	11%
E-1	49%	48%	0%	8%	4%	8%	3%	8%	19%	37%	41%	73%	1%	0%	0%
E-2	0%	0%	52%	8%	6%	11%	2%	14%	10%	84%	66%	38%	1%	0%	2%
F-1	0%	0%	1%	8%	6%	3%	1%	14%	12%	82%	75%	71%	0%	2%	1%
F-2	46%	36%	53%	10%	10%	8%	6%	7%	7%	34%	47%	36%	1%	0%	1%

NOTE: Shaded = with radio; Unshaded = without radio.

[illegible]

WEEK 3

Squads->	Intrasquad Radio			AN/PRC-126			Hand/Arm Signals			Voice Commands			Visual Signals		
	1 st	2 nd	3 rd	1 st	2 nd	3 rd	1 st	2 nd	3 rd	1 st	2 nd	3 rd	1 st	2 nd	3 rd
A-1	0%	0%	57%	11%	0%	8%	6%	20%	9%	76%	81%	42%	8%	0%	3%
A-4	47%	66%	0%	8%	0%	12%	5%	4%	11%	38%	30%	89%	2%	0%	2%
B-1	41%	67%	50%	10%	0%	11%	3%	1%	8%	43%	32%	46%	2%	0%	0%
B-3	0%	0%	0%	12%	0%	13%	4%	2%	13%	81%	87%	94%	2%	0%	0%
C-2	53%	0%	0%	3%	0%	11%	7%	3%	12%	27%	86%	94%	8%	0%	2%
C-4	0%	63%	43%	11%	0%	12%	9%	16%	8%	72%	28%	58%	8%	0%	3%
D-1	46%	55%	0%	11%	0%	11%	1%	6%	3%	38%	44%	97%	3%	0%	0%
D-2	0%	0%	53%	11%	0%	11%	2%	2%	3%	81%	98%	48%	7%	0%	0%
E-1	5	0%	0%	11%	0%	11%	12%	2%	3%	76%	98%	97%	1%	0%	0%
E-2	52%	58%	44%	11%	0%	11%	1%	2%	4%	35%	39%	51%	1%	0%	0%
F-1	0%	65%	49%	11%	0%	11%	1%	2%	14%	88%	35%	41%	1%	0%	0%
F-2	52%	0%	0%	11%	0%	0%	1%	0%	4%	35%	98%	96%	1%	0%	0%

SUMMARY

	Intrasquad Radio	AN/PRC-126	Hand/Arm Signals	Voice Commands	Visual Signals
With Radio	42%	50%	56%	42%	50%
Without Radio	32%	0%	0%	32%	0%

SECTION 6

RESULTS FROM OPFOR QUESTIONNAIRE

WEEK 1

1. Did you hear any commands or discussion that gave you information on what the Rangers intended to do before they did it?

		VIGNETTE/SCRIPT											
		A-1			A-4			B-1			B-3		
		Y	N	NR	Y	N	NR	Y	N	NR	Y	N	NR
Radio	1 st Sqd	0	8	5	0	8	5	0	10	3	1	9	3
	2 nd Sqd				0	8	5				2	8	3
	3 rd Sqd												
No Radio	1 st Sqd	0	8	5	0	8	5	0	10	3	0	10	3
	2 nd Sqd	0	8	5				0	10	3			
	3 rd Sqd												
		D-1			D-2			E-1			E-2		
		Y	N	NR	Y	N	NR	Y	N	NR	Y	N	NR
Radio	1 st Sqd	0	6	7	0	4	9	0	6	7	0	4	9
	2 nd Sqd	0	6	7				0	6	7			
	3 rd Sqd												
No Radio	1 st Sqd	0	6	7	0	4	9	0	6	7	0	4	9
	2 nd Sqd				0	4	9				1	3	9
	3 rd Sqd												
		F-1			F-2			C-2			C-4		
		Y	N	NR	Y	N	NR	Y	N	NR	Y	N	NR
Radio	1 st Sqd	0	6	7	0	4	9	0	6	7	0	6	7
	2 nd Sqd	0	6	7									
	3 rd Sqd												
No Radio	1 st Sqd	0	6	7	0	4	9	0	6	7	0	6	7
	2 nd Sqd				0	4	9						
	3 rd Sqd												

Sample size was 13. Y = Yes, N = No, NR = no response.

WEEK 2

		VIGNETTE/SCRIPT																	
		A-1			A-4			B-1			B-3			C-2			C-4		
		Y	N	NR	Y	N	NR	Y	N	NR	Y	N	NR	Y	N	NR	Y	N	NR

Sample size was 10. Y = Yes, N = No, NR = no response.

2. How would you rate the Ranger's execution of this mission?

	1 Extremely Poor	2 Very Poor	3 Bad	4 Neutral	5 Good	6 Very Good	7 Extremely Good					
MEAN RESPONSE												
Week One (sample size varied from 4 to 10)												
	Vignette/Script											
	A-1	A-4	B-1	B-3	C-2	C-4	D-1	D-2	E-1	E-2	F-1	F-2
1 st Squad	4.63	5.25	5.30	5.00	4.25	4.83	5.67	4.50	5.83	5.75	5.57	5.50
2 nd Squad	4.75	5.29	4.70	4.20	4.63	5.67	4.67	4.75	5.67	6.25	5.29	5.50
3 rd Squad	4.75	4.37	4.80	4.60	4.50	4.83	5.83	4.50	5.67	4.00	5.00	4.83
Week Two (sample size varied from 4 to 11)												
	A-1	A-4	B-1	B-3	C-2	C-4	D-1	D-2	E-1	E-2	F-1	F-2
1 st Squad	4.57	5.17	5.00	4.10	4.13	5.00	*	*	*	5.25	5.71	*
2 nd Squad	4.88	5.43	4.70	4.56	5.25	5.17	*	*	*	*	5.57	*
3 rd Squad	4.14	4.88	4.60	4.80	4.88	3.17	5.83	*	*	4.50	*	*
Week Three (sample size varied from 3 to 10)												
	A-1	A-4	B-1	B-3	C-2	C-4	D-1	D-2	E-1	E-2	F-1	F-2
1 st Squad	4.25	5.00	5.00	4.60	4.75	5.33	6.20	4.33	5.40	6.00	5.57	5.17
2 nd Squad	4.50	4.86	4.78	4.70	5.13	6.17	5.33	5.00	6.00	6.33	5.86	5.17
3 rd Squad	4.63	5.63	4.50	4.78	4.71	5.67	5.00	5.00	5.20	5.75	5.57	5.20

NOTE: Shaded = with radio; Unshaded = no radio.

* Uncontrolled variables resulted in invalid data.

SECTION 7

RESULTS FROM END-OF-EXPERIMENT QUESTIONNAIRE

1. Please rate the contribution of the intra-squad radio to your situational awareness:

1	2	3	4	5	6	7
Extremely worse than no radio	Very much worse than no radio	Somewhat worse than no radio	About the same as no radio	Somewhat better than no radio	Very much better than no radio	Extremely better than no radio

MEAN RESPONSE

	Week 1	Week 2	Week 3
1 st Squad	5.89	6.44	6.89
2 nd Squad	6.44	6.00	6.78
3 rd Squad	5.70	5.56	6.56
MEAN = 6.26			

Comments

No. of Responses

WEEK 1

More useful when team leaders relay their situation and ACE reports (free talk squad leader and team leaders).	1
There must be traffic going up to the squad leader. This enables team leaders to maintain control of their teams when passing up situation reports.	2
Retention of information received over the ICOMs is relative to the individual's rank.	1
The MOUT environment is one of the least times we use ICOMs.	3
The most beneficial time is during patrolling.	2
Easier to reach out and find location of squad with radio.	
If there had been longer movement in this study, the radios would have proven to be 100 percent necessary.	1
Intra-squad radios allow us to practice silent MOUT, which is our SOP.	1
Though I would not use all the information put out, some information is better than no information.	1
When they work, they are ok.	1
I could hear what was going on more clearly from the squad leader; that way I knew what to do before the team leader had to tell me.	1
I would give it a better vote if it was more comfortable to wear, but with all the wires it is a pain in the butt.	1

Comments	No. of Responses
WEEK 2	
Need inner earpieces for better retention of information.	1
Squad radios allow information to be freely transmitted and to know exactly what is going on with no talking.	1
Having a radio is very important part of squad communications.	2
It is much easier to communicate with, plus it makes it safer because you do not have to move as much. Radio is good but everybody in the squad does not need to talk.	1
Useful for information.	1
With the radio you have the option of both voice and radio.	1
The ICOM is no good.	1
With everyone repeating the information (with no radio) I understood it more.	1
WEEK 3	
The ICOM is very good. In many missions they are the main source of communication.	1
I was RTO for 6 months; they are the best.	1
I am not in a line squad, but I can see it helps.	1
In a weapons squad the ICOM is a must.	1
We have to be in contact with the squads.	1
It is quieter.	1
Easier to control.	1
ICOM radios make it possible for more effective reporting even if the tests do not show it, it really makes everyone more aware.	1
ICOM enables the squad to communicate over distances greater than the voice can carry.	1

2. How would you improve the ICOM radio?

Comments	No. of Responses
WEEK 1	
Increase range.	19
Make it waterproof.	28
Improve the headset (durability, fit, function, size).	37
Make it more durable.	7
Make it more lightweight.	1
Make it more reliable.	3
Make it smaller.	15
Add a push to talk button.	2
Make it more combat accessible.	1
Better transmission.	1
Longer battery life.	7
Use fewer batteries.	4
Needs selectable channels.	1
No rechargeable batteries.	1
Fewer wires.	4
Quiet squelch.	1
More expensive than what our platoon's personally bought. For the cost of one ICOM complete, you could outfit a 9-man squad with the Motorola Talk About 250 with a \$2.00 headset from Radio Shack. The Talk About only costs \$79.00. It has an effective range of 1.5 miles while behind thick concrete walls of the Ranger barracks. It is nearly waterproof and indestructible. It only takes three "AA" batteries, which will last almost a week of use.	1
I would not use the ICOM. The Motorola Talk About is a superior intrasquad mode of communication. It is proven.	1
Break it and buy a Motorola Talk About.	1
WEEK 2	
Need inner earpiece.	4
Remote the PTT switch.	1
Better activation switch.	2
Needs to be louder.	1
Need a wireless headset.	1
Needs more sensitivity.	1
Mount headset directly into the K-pot.	1
Find a different way to talk (different PTT, maybe voice activated)	1

Comments**No. of
Responses****WEEK 3**

Works fine.	5
Needs voice-activated headsets.	2
Needs Handless mike and earpiece.	3
Needs Neck mike with earpiece.	3
Install a key switch on weapon.	1
Design so that it can be tied down better.	1
Earpiece should be modified to the ones similar to the EC earpiece.	1
Find a headset that attaches to the ear with a small flexible mouth transmitter.	1
Found a better headpiece at PX for \$12.	1
Use the radio as a microphone.	1
Team leaders need to be able to talk for this test.	1

3. What suggestions do you have for improving squad communication?

Comments	No. of Responses
WEEK 1	
Team leaders should talk.	3
Head mike needs to be improved.	3
More reliable.	1
Waterproof.	1
Better battery life.	2
More durable.	1
Soldiers must have commo discipline to avoid too much radio traffic.	1
Squad leaders must do the talking.	1
A smaller radio with a small set of earphones that fit snug. Speak up.	3
Everyone should have a radio and be able to cross talk with one another.	1
Squad leader and team leader ensuring information is disseminated.	1
Use Motorola's instead of ICOMs.	15
Use Kenwood instead of ICOM.	1
By confirmation after every transmission to the squad leader.	1
Motorola is extremely water resistant (ICOM is not). Only cost \$70-\$80. Range is much greater - 2 miles in most conditions.	1
Allow squad members to speak especially team leaders.	1
Test them in our environment the way we use them. I did not think you wanted the test group to know what was being done.	1
A headset that actually stays in your ear. Motorola has a pretty good set up; you should check it out.	1
Do not transmit vital information while teams are clearing rooms or engaged in a firefight.	1
There is a must or squad radios but ICOM is not where it is.	1
Do not relay all the BS down the chain of command that is why we have squad leaders. Let the men focus on what is at hand.	1
Distribute only important information relative to squad mission.	2
Eliminate unnecessary transmissions.	1
Different equipment. The others cost less and are more effective.	1
Multi-net radios. Everyone have the ability to hear all transmissions.	1
Besides a well working radio, good team work. Only the squad can improve the squad.	1

WEEK 2

Headset that would work with FM, MX, and ICOM - with maybe a switch to charge off.	1
Loader headset.	1
Ear plug speakers.	1
Push to talk button.	1
Something smaller.	2
Squad leaders and team leaders have radios; less confusion.	2
Platoon leader and platoon sergeant use the radio to communicate with squad leader and team leader.	1
More training; better understanding of mission.	1
Do not send worthless information through the radio.	1
When the ICOM gets moist or wet, it stops working all together.	2
ICOM had very limited range.	2
ICOM is very fragile.	1
Get better radios.	1
Keep practicing movements in MOUT.	1
During the experiment I was only allowed to use the ICOM. If the platoon could put out to everyone over the same net, it would alleviate the squad leader/team leader having to relay everything.	1

WEEK 3

Nothing, leave it alone.	2
Keep using ICOM.	1
Keep it simple.	1
Pay attention to surroundings.	1
Keep giving us more batteries; the procedures are taking up all the batteries for charging.	1
The chargers can only charge 6 batteries at a time.	1
The metal connectors rust on the batteries.	1
The advantage is the multi-channels.	1
They enhance our ability, but do not let the squads forget about the basics (arm-hand signals).	1
Maybe a pager device that can save transmissions in text format.	1
Voice activated.	1
I believe that no noise is the best. Work on knowing your squad and know your own signals.	1
Somehow silence them.	1
Need ear piece that does not block normal sound.	1
Let all pax hear platoon net but speak only on squad net.	1
Use them only when you need them so that what comes across is easier to retain.	1
Make up an SOP so that everyone is on the same page.	1
Squad leaders and team leaders need to be able to talk too.	5
Members of squad could speak louder and slower into radio.	1
If you do another test, use MILES because with Simunitions you have to use a mask, which fogs up and you do not get the full effect of normal room clearing. Use the unit's SOP for numbering building because it is already known. Have the unit's platoon leader give the operations order and give a few days for TLPS. I think then you would get a test which information actually registers in people's minds because they already know the plan.	1

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1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE October 2001		3. REPORT TYPE AND DATES COVERED Final	
4. TITLE AND SUBTITLE Situational Awareness and Communication Experiment for Military Operations in Urban Terrain: Experiment I				5. FUNDING NUMBERS AMS Code 622716 PR: AH70	
6. AUTHOR(S) Redden, E.S. (ARL); Blackwell, C.L. (SBCCOM)					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Research Laboratory Human Research & Engineering Directorate Aberdeen Proving Ground, MD 21005-5425				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Research Laboratory Human Research & Engineering Directorate Aberdeen Proving Ground, MD 21005-5425				10. SPONSORING/MONITORING AGENCY REPORT NUMBER ARL-TR-2583	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) The U.S. Army Research Laboratory and the Soldier and Biological Chemical Command-Natick Soldier Center, Natick, Massachusetts, developed a situational awareness (SA) assessment center (AC) for squad members, fire team leaders, and squad leaders at the McKenna military operations in urban terrain site, Fort Benning, Georgia. The AC was used to conduct a two-phase SA experiment. In Phase I, tactics, techniques, and procedures (TTPs) for the intra-squad radio were evaluated with the goal of selecting the most effective TTP for the intra-squad radio in urban conditions such as those evaluated. Five Army Ranger squads conducted three mini-vignettes five times using different TTPs and a different script each time (a total of 75 trials). The vignettes were scripted (i.e., OpFor activity, platoon leader communication, etc.) and were of short duration to minimize the number of uncontrolled variables. In Phase II, the contribution of the intra-squad radio to the SA of the individual squad members was evaluated. The TTP selected from Phase I was incorporated into Phase II procedures for communications. Each squad conducted each of six different vignettes twice (once with and once without the intra-squad radios) and used a different script each time. The AC methodology content validity index was 0.99, had high face validity, and allowed successful discrimination among a variety of conditions (e.g., day and night, five different TTPs, radio and no radio, etc.). Critical informational requirements were identified by echelon for each of the vignettes. The use of the intra-squad radios significantly increased the SA of the squad.					
14. SUBJECT TERMS assessment center situational awareness military operations in urban terrain situational awareness methodology				15. NUMBER OF PAGES 115	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT		