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INTEGRATING INTELLIGENCE AND BUILDING TEAMS WITHIN THE INFANTRY IMMERSION TRAINER

by

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September 2009

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13. ABSTRACT (maximum 200 words)

The trend of focusing on technology in "technology augmented environments" and practicing a set of skills in isolation needs to shift towards user-centered training with skills being integrated earlier in the training process, as long as conditions for that integration exist. The purpose of this thesis was to examine whether incorporating intelligence briefs and debriefs with a Squad Planning Operations Center (SPOC) supported by suitable technologies improved infantry training in urban warfare training situations. To prepare for this task, a pilot study was conducted following current Infantry Immersion Trainer (IIT) procedures for the control group, while the experimental group utilized an Augmented Combat Operations Center (A-COC). Information gained from this study was then utilized for the main study conducted at the IIT aboard Camp Pendleton, CA. This study was conducted utilizing sixty participants in the control group (following current IIT procedures) and ninety-three participants in the experimental group (IIT procedure augmented with the use of a SPOC). The most statistically significant difference between the groups came from the participants' self-assessment on training confidence and overall success of training. Members of the experimental group, after utilizing the SPOC for planning, felt more confident in completing their training tasks and their view of achieving success in executing their mission was also higher.

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INTEGRATING INTELLIGENCE AND BUILDING TEAMS WITHIN THE INFANTRY IMMERSION TRAINER

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Submitted in partial fulfillment of the
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The trend of focusing on technology in "technology augmented environments" and practicing a set of skills in isolation needs to shift towards user-centered training with skills being integrated earlier in the training process, as long as conditions for that integration exist. The purpose of this thesis was to examine whether incorporating intelligence briefs and debriefs with a Squad Planning Operations Center (SPOC) supported by suitable technologies improved infantry training in urban warfare training situations. To prepare for this task, a pilot study was conducted following current Infantry Immersion Trainer (IIT) procedures for the control group, while the experimental group utilized an Augmented Combat Operations Center (A-COC). Information gained from this study was then utilized for the main study conducted at the IIT aboard Camp Pendleton, CA. This study was conducted utilizing sixty participants in the control group (following current IIT procedures) and ninety-three participants in the experimental group (IIT procedure augmented with the use of a SPOC). The most statistically significant difference between the groups came from the participants' self-assessment on training confidence and overall success of training. Members of the experimental group, after utilizing the SPOC for planning, felt more confident in completing their training tasks and their view of achieving success in executing their mission was also higher.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAR – After Action Review

A-COC – Augmented Combat Operations Center

AR – Augmented Reality

BSC – Battle Simulation Center

BST – Basic Skills Trainer

CAN – Combined Arms Network

CCM – Close Combat Marines

CFF – Call For Fire

CGA – Computer Generated Actors

ChrAVE – Chromakey Augmented Virtual Environment

CLIC – Company-Level Intelligence Cell

CLOC – Company-Level Operations Cell

COC – Combat Operations Center

COTS – Commercial Off The Shelf

DLI – Defense Language Institute

DRMO – Defense Reutilization and Marketing Office

DVTE – Deployable Virtual Training Environment

FOPCSIM – Forward Observer PC Simulation

HEAT – HMMWV Egress Assistance Trainer

HHQ – Higher Headquarters

HLA – High Level Architecture

HMMWV – High Mobility Multipurpose Wheeled Vehicle

HUMINT – Human Intelligence

HVI – High Value Individual

IED – Improvised Explosive Device

IIT – Infantry Immersion Trainer

ISMT-E – Indoor Simulated Marksmanship Trainer-Enhanced

IST-E – Infantry Squad Trainer-Enhanced

JCATS – Joint Conflict and Tactical Simulation

JSAF – Joint Semi Automated Forces

MAGTFTC – Marine Corps Air Ground Task Force Training Command

MCDP – Marine Corps Doctrinal Publication

MCMWTC – Marine Corps Mountain Warfare Training Center

MCOO – Modified Combined Obstacle Overlay

MCWP – Marine Corps Warfighting Publication

MOVES – Modeling Virtual Environments and Simulations

MOS – Military Occupational Specialty

MTWS – MAGTF Tactical Warfare Simulation

NPS – Naval Postgraduate School

ODS – Operator Driver Simulator

ONR – Office of Naval Research

OPFOR – Opposing Force

PIR – Priority Intelligence Requirement

PPE – Personal Protective Equipment

ROE – Rules Of Engagaement

RPG – Rocket-Propelled Grenade

SERE – Survive, Evade, Resist, Escape

SESAMS – Small Arms Marking System

SOP – Standard Operating Procedures

SPOC – Squad Planning Operations Center

TDS – Tactical Decision-making Simulations

TILCT – Tactical Iraqi Language and Culture Trainer

TTECG – Tactical Training Exercise Control Group

UNC – University of North Carolina

USA – United States Army

USMC – United States Marine Corps

USN – United States Navy

VBIED – Vehicle Born Improvised Explosive Device

VBS – Virtual Battle Space

VCCT – Virtual Combat Convoy Trainer

VE – Virtual Environment

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I. INTRODUCTION

A. BACKGROUND / MOTIVATION

In October 2007, under Marine General James Mattis' guidance, the U.S. Marine Corps (USMC) and the Office of Naval Research (ONR) unveiled a $1.3 million prototype Infantry Immersion Trainer (IIT) aboard Camp Pendleton, CA (Babb, 2007). It was constructed to improve Marine Corps combat skills across a wide range of military operations, with emphasis being on supporting squad training in an urban environment. Training scenarios created for this environment involve the tasks in an urban environment, room clearing, urban patrolling, reaction to sniper fire and Observation Point (OP) activities.

Designing an effective training framework and providing an optimal solution for a given training objective and training environment while developing high performing teams is a significant issue for military leadership (Knight). According to Katzenbach and Smith (1998), a team is defined as "a small number of people with complimentary skills [...] committed to a common purpose, performance goals and approach [...]" Western military tactics show the major advantage of teamwork is that teams often achieve a high success rate where individuals often fail.

The military is very focused on building teams at the squad leader and fire team leader levels. Each of these leaders must prepare their teams for missions in remote areas with the potential for possibly quick changes to their situation; as described by retired Marine General Charles Krulak in the 1990s as the *Three Block War*. For example, Marines may be required to conduct full-scale military action, peacekeeping operations and humanitarian relief within the space of three contiguous city blocks (Krulak, 1999).

Through effective patrolling on the battlefield, military forces can gain an advantage over the enemy by establishing a means of communication with the local population and gaining intelligence about enemy activity and local population concerns. The local population can provide a wealth of information, which can ensure support for a

mission accomplishment. However, to build an effective relationship with the local population, squads must be trained in patrolling and interacting with the local populace.

Training is essential for teambuilding among squads and for developing the individual skills required to become successful at patrolling (Marine Corps Warfighting Publication (MCWP) 3-11.3). Patrol members must work together and fight as a team (MCWP 3-11.3), which can be challenging for the squad during their training due to the different levels of expertise. Training at the IIT could address and assist in developing a multitude of skills identified for learning the skills necessary for effective patrolling. These skills do not always involve fighting the enemy. Urban patrols must interact with the local populace, collecting Human Intelligence (HUMINT) about the local atmospherics and enemy related activities; each unit member needs to be fully trained and engaged and directly supporting the strategy of "every Marine collector, every Marine reporter." Marines also must remember the vast majority of the individuals with whom they come in contact will be noncombatants attempting to survive in trying political, economic, and social situations (MCWP 3-11.3).

To support and achieve previously stated objectives, the state of the art training has being developed at the IIT includes Computer Generated Actors (CGAs) or rather agents like those seen in Figure 1, representing human characters/virtual humans (Hoyt et al., 2003). Agents are commonly defined as graphical representations controlled by the human operators or being completely autonomous while reacting in real time. In present configuration of IIT training facility, the images of virtual humans are displayed on flat walls inside eight separate rooms. The primary purpose of these graphical representations is to augment the presence of live role players who are not intended to be used for target engagement, and to provide the user with a sense that there is someone else present with them in the virtual environment (this is often referred to as a sense of co-presence (Hoyt et al., 2003)). The more realistic these virtual humans act, the higher is a level of co-presence (Casanueva & Blake, 2001).

Figure 1. Graphical representations of human characters, known as avatars or virtual humans.

The downside to using these computer-generated actors (CGAs) is that these human-controlled actors are costly in terms of hardware, software, and human resources needed to support them (Stytz et al., 1998). To date, CGA systems have proven to be expensive to implement, expensive and challenging to modify, and lacking in realistic behaviors (Stytz et al., 1998). Because the Marine Corps is moving toward infantry immersion training, approaches to mitigate costs associated with current CGA implementations are needed. To minimize costs, the IIT utilizes a single computer host inserting a number of CGAs of various types into the environment and coordinates the activities of the agents. However, the costs of having the real role players (humans) may be even higher. Their presence adds to the sense of "being there," and they make the training more realistic and believable. Human role players can fully interact with the unit; they can satisfy a number of tasks that the virtual humans are not capable of supporting like conversing with the unit members, searching, detaining, physically interacting with the unit members (pulling the arms of the Marines as to distract them), acting as a casualty, and physically interfering with the course of action..

Another impressive aspect of the immersive training is the blast experience of an Improvised Explosive Device (IED) or Vehicle Born Improvised Explosive Device (VBIED) that can be programmed to detonate nearby, a rocket-propelled grenade (RPG) being fired overhead, or Small Arms Marking System (SESAMS) round being fired at a

person by an adversary. For those who have engaged in combat and for those who have not, this kinetic training at the IIT can cause strong psychological emotions often experienced during an actual firefight.

As great as this training setup is, it can still be improved. Our motivation is to plan a way to build upon the current form of training at the IIT. In our view, current training is too technology centered—the emphasis is on instrumented elements of the training range, and the training scenarios as well as training approaches are built around the technical features provided in this facility. This thesis will present a training process that will emphasize a true integration of intelligence skills. The current trend appears to be a rush to engage in a firefight when, in all reality, patrolling efforts can only begin with intelligence and must end with input into the intelligence cycle for the next patrol to go out.

B. PROBLEM OVERVIEW / RESEARCH QUESTIONS

Across the Marine Corps, the infantry squad leaders of today lack an accessible simulation center for training their squads for their first firefight. These virtual combat experiences would prepare fire teams and squads to accomplish the mission by integrating individual and fire team tasks at the squad level. The simulation center must be cost effective and robust enough to create a virtual environment that replicates the asymmetrical battlefield military faces today.

The majority of casualties on the battlefield are from the combat arms fields—89%. Only 0.1% of Department of Defense simulation funding is spent on infantry simulation. The people working in the aviation domain have realized that virtual training simulations save lives and preserve precious resources (maintenance and logistical costs for the plane, fuel, parts). The practitioners in the ground domain have also realized that it is the time to invest in ground combat simulation—for both immediate and long-term benefits. The Marine Corps needs the world-class simulations to support training for the combat arms Marines (U.S. Marine Corps, 2008), and the needs of the infantry combat elements are even more pronounced in contemporary warfighting.

The result of our observations and domain analysis suggest that the training at the IIT, even though highly advanced during the actual training run, makes no use of information technology during its briefings. In order to remedy this situation and connect unit actions inside the simulated village with the intelligence activities, they will be expected to do in the operational theatre, we established an idea of a briefing area which presents the mission to the squad and fire team leaders in a realistic and understandable format similar to what can be expected when deployed in operational theatre. The intelligence collected during the previous training session (a scenario) should be presented to the patrol leadership for their planning. This intelligence input can then generate their planning efforts for rehearsals and their confirmation brief before conducting the patrol. This same briefing area could then be used for the After Action Review (AAR) and patrol debrief. Information gained from this process would then be utilized to generate the follow-on patrol scenario, completing the loop in the intelligence cycle and driving a patrol order for the next mission.

It is our aspiration for Marines conducting their training patrols within the IIT to radio back with situation reports to a Squad Planning Operations Center (SPOC). We also envision the patrol debriefs being conducted by the company-level intelligence cell (CLIC). The CLIC will then use their computers and accessible data files to analyze the information collected to create an intelligence picture of the battlefield. To support this level of understanding, intelligence products can be generated to visualize the data previously collected. These intelligence products will then be the source to drive the patrol order issued through the squad's leadership within the company-level operations cell (CLOC).

Unfortunately, at present time, most pre- and post training briefings are conducted in a yard outside the IIT. Even though the majority of teams arrive as a pre-trained unit at the IIT, it is hypothesized that improvement in the team briefing processes may result in stronger team cohesion, and serve as a necessary reminder of the tasks that need to be accomplished to support and fully integrate intelligence activities in their operations. Information technology equipment in a SPOC that is introduced in this thesis is used to enhance the briefing experience as well as the team's interaction prior to and after

conducting their training run inside the environment. This way teams will get a better understanding of their individual objective and experience a higher interaction. They will experience different team processes, resulting in a higher performance than without the use of a SPOC. It is also important to note that the addition of the SPOC and the activities that it assumes do not represent a burden on training in IIT—they are a logical extension of that training, both in terms of supporting the training objectives envisioned for IIT as well as corresponding very well with the point in the training regiment that the units are in when they come to IIT (right before their pre-deployment training segment in Twentynine Palms, CA).

1. Hypothesis

Two following hypotheses were set as a result of our domain analysis:

H0 (Null hypothesis): There is no difference in squad performance and team interaction between the squads receiving very short briefings in the yard outside the IIT and those being briefed using the specially designated SPOC.

HA (Alternative hypothesis): Teams receiving the well structured pre- and post-action briefings within the SPOC will experience different team processes resulting in higher performance and display higher team interaction than those who receive very short briefings outside the IIT.

2. Approach: Experimental Studies

This thesis set out to examine whether incorporating the well-structured intelligence briefs and debriefs within a SPOC, supported by suitable technologies, improved the training that was conducted within an infantry immersion training environment. To examine this hypothesis, two studies have been designed and executed:

(1) a pilot study and

(2) a main study.

The goal of the pilot study was to generate starting knowledge and build the expertise in organizing and executing the user studies, and conduct an initial testing of

the hypothesis, all with the goal of helping plan the main study that will involve real (combat) units while they are preparing for their future deployment. The pilot study was conducted utilizing six fire teams that were equally divided into a control group and a treatment group (utilizing an Augmented Combat Operations Center (A-COC)). The participants consisted of twenty-three entry-level military personnel (both male and female) who completed self-report questionnaires and were under direct observation by an evaluator. Information and experience gained from this first study was then utilized to design a second study, (i.e., the main study, which lasted two weeks at the Infantry Immersion Trainer (IIT) aboard Camp Pendleton, CA). The goal of the second study was to obtain the data in a relevant training environment that would help us test our main hypothesis. This second study was conducted utilizing sixty participants in the control group (following current IIT procedures) and ninety-three participants in the treatment group that used a SPOC. The participants completed self-report questionnaires and were under direct observation by multiple evaluators. Chapters VI and VII provide detailed information about both studies, including a discussion of their results.

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II. IMMERSIVE ENVIRONMENTS

A. BASIC CONCEPT

Immersion is defined as instruction based on extensive exposure to surroundings or conditions that are native or pertinent to the object of study (Merriam-Webster Online Dictionary, 2009). In domain of virtual environments, Slater and Usoh (1994) explain the term *immersion* as a description of a technology, which can be achieved to varying degrees. A necessary condition is Ellis' (1991) notion of a virtual environment (VE), maintained in at least one sensory modality (typically the visual). For example, a head-mounted display with wide field of view, and at least head tracking would be essential. The degree of immersion is increased by adding additional and consistent modalities, greater degree of body tracking, richer body representations, decreased lag between body movements and resulting changes in sensory data, and so on.

Research studies done in domain of virtual environments suggest that immersion may lead to a sense of presence. Presence is a psychological emergent property of an immersive system, and refers to the participant's sense of "being there" in the world created by the VE system. Note that immersion is a necessary rather than a sufficient condition for presence—immersion describes a kind of technology, and presence describes an associated state of consciousness (Slater & Usoh, 1994).

There are many possible ways to create an immersive environment, and each way will contribute towards enhancing a sense of “being there” for the user. “Being there” can be stimulated by the sights, sounds, touch, smells, tastes which the user experiences. This experience of “being there” is known as “Personal presence.” Presence is knowing the illusion is not true, but behaving like it is true (Casanueva & Blake, 2001).

Witmer and Singer (1998) provide the following about the meaning of presence:

• **“**Presence is defined as the subjective experience of being in one place or environment, even when one is physically situated in another.”

• **“**...presence refers to experiencing the computer-generated environment rather than the actual physical locale.”

Witmer and Singer’s (1998) view of immersion also relates to understanding the meaning of *presence*:

• **“**Immersion is a psychological state characterized by perceiving oneself to be enveloped by, included in, and interacting with an environment that provides a continuous stream of stimuli and experiences.” In several papers (see references cited in Slater & Wilbur, 1997) Slater (1999) has employed the notion that presence includes three aspects:

• **“**The sense of “being there” in the environment depicted by the VE.”

• **“**The extent to which the VE becomes the dominant one (i.e., that participants will tend to respond to events in the VE rather than in the “real world.”)”

• **“**The extent to which participants, after the VE experience, remember it as having visited a “place” rather than just having seen images generated by a computer.”

For this thesis, our working definitions of immersion and presence are as follows:

1. **Immersion**—a degree to which human sensory system is provided with alternative (simulated) sensory information. (Example: desktop systems are less immersive, while large screen and CAVE environments are more immersive).
2. **Presence**—user's psychological sense of being in an environment that is different than his/her immediate physical environment.

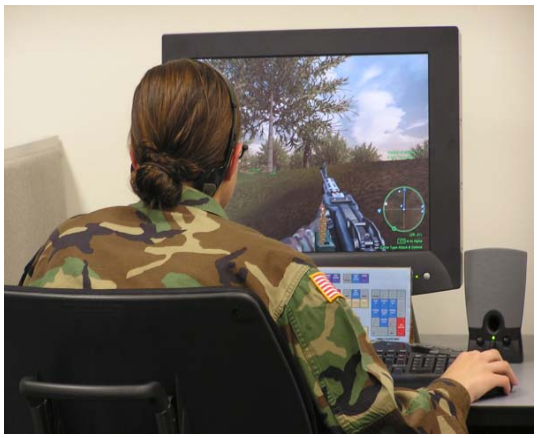
B. CATEGORIES OF IMMERSIVE ENVIRONMENTS

1. Desktop Environment

Not all simulation technologies require visualization on a large display surface nor do they require full-body human interaction. They can run on a desktop computer using only a screen of a regular size, a mouse, and sometimes a microphone and the loudspeakers for audio inputs and outputs (Figure 2). The participant can act as a sole

player, or he/she can interact with other participants, ask questions or give orders by typing or speaking directly, or make comments and report on what he/she can observe by viewing the data and images presented on the computer monitor.

A more advanced variation of this approach allows multiple participants to interact simultaneously in a common "virtual world," linked either through the Internet or a dedicated network. As the users navigate (move) through the synthetic environment, typically they are presented with a series of 2D projections of 3D model of a shared world. Each participant has an "avatar" that represents their persona in the virtual world. They can move the avatar, and when they speak or gesture, the avatars will appear as if they speak or make gestures. This is initiated by the users themselves—they provide direct "instructions" to their avatars by using a special combination of the buttons on the mouse or on the keyboard, each associated with a type of behavior that needs to be presented and visualized to the others. It is also possible to simulate the interaction between two or multiple avatars.



(a) An individual using desktop simulation.

(b) A group using desktop simulation.

Figure 2. Participants using desktop simulations.

Some desktop systems currently in use by the USMC:

a) **Close Combat Marines (CCM)**: The Marine Corps has been leveraging aspects of digital-game based methods and inserting them into the tactical decision-making simulations (TDSs) to supplement existing training (Baxter, Ross, Phillips, Shafer, and Fowlkes, 2004, p. 1). The Marine

Corps currently uses a TDS named CCM at various leadership and tactical training schools. This TDS provides a top-down view of the battlefield (a type of 2 ½ dimensional environment) and it was designed to develop the tactical decision-making skills of entry-level officers (Fitzpatrick & Ümit, 2007).

b) **Forward Observer PC Simulation (FOPCSIM)** is a procedural trainer for artillery and mortar Call for Fire (CFF) that provides scoring and feedback based on the standards of performance prescribed in the Training and Readiness Manuals for observed fire. FOPCSIM is also the forward observer component of the Deployable Virtual Training Environment (DVTE) Combined Arms Network (CAN) that provides a training tool for integration of artillery and close air support with maneuver forces. FOPCSIM uses a 3D visual representation of real world terrain (including MCAGCC, Tikrit, Iraq, et al.) and an intuitive user interface to provide a training environment for doctrinal CFF procedures. FOPCSIM 2.1.14 is software written by Marines for Marines and is available free of charge at the Battle Simulation Center. With user registration, FOPCSIM 2.1.14 may be downloaded from www.fopcsimmarines.com (MAGTFTC Simulation Center (BSC) *FOPCSIM*, 2009).

c) **Virtual Battle Space (VBS) 2** is the latest generation of tactical decision simulation for the USMC. VBS2 was fielded in the third quarter of FY-2007 and features higher visual resolution, fully articulated human movements, interaction with inanimate objects (pick up, load, move, dig, etc), and High Level Architecture (HLA) compliance for the ability to network VBS2 virtual training with constructive simulations, such as Joint Semi Automated Forces (JSAF), Joint Conflict and Tactical Simulation (JCATS), or MAGTF Tactical Warfare Simulation (MTWS), used for staff command post exercises (MAGTFTC Simulation Center (BSC) *VBS2*, 2009).

d) **Tactical Iraqi Language and Culture Trainer (TILCT)** differs from commercially available language training software in that it focuses in the vocabulary and circumstances of interactions between Marines and Iraqi citizens in the context of the operational environment. Lessons cover the language and conversational skills necessary for a variety of situations from basic introductions and explaining the mission and duties of a guest, to conducting a cordon and search. TILCT introduces new material in a Skill Builder format that includes hearing the spoken word by a native speaker, phonetic pronunciation, and the use of a microphone to practice speaking with immediate feedback on performance from speech-recognizer software (MAGTFTC Battle Simulation Center (BSC), *Tactical Language & Culture Trainer (TLCT)*, 2009).

2. Fully Immersive Environment

A fully immersive environment inoculates individuals with a multitude of sensory information that completely surrounds them to experience the sensations they would expect to feel if the situation were for real. Ideally the participants will experience sensation through each of their five senses (i.e., see, hear, smell, touch and taste.) while being completely enveloped by the sensory information presented to them, creating an illusion of a new world for the participants. The more the sensations trigger a familiar response to the individual, the more likely the participant will accept the immersive environment as though it were real. The increase in acceptance by the participant adds to the participant's positive experience of personal presence. Figure 3 (a) shows a person in a helicopter simulator using physical controls of a typical helicopter and surrounded by vivid images. Figure 3 (b) shows a Marine using the Virtual Combat Convoy Trainer (VCCT)—a mock-up vehicle surrounded by the large, continuous displays that fill his field of view with synthetic images.

(a) An individual using a helicopter simulator.

(b) An individual using a VCCT system.

Figure 3. Participants using immersive simulators.

Another training segment that can be characterized as immersive training takes place at the U.S. military's three-week course in the Survive, Evade, Resist, Escape (SERE) school. Through an immersive environment, this course "inoculates" individuals to stressful situations they might encounter if taken prisoner. The instructors go as far as to simulate opposition gunfire while hunting the soon-to-be prisoners. Once taken captive, the participants face sleep and food deprivation, exploitation, singling-out of individuals for punishment, removal of identities and aggressive interrogations. Major General James W. Parker (USA) wrote in 2006 that "CW4 [Chief Warrant Officer 4] Mike Durant [USA] credited SERE training with saving his life when he was captured in Mogadishu in 1993" (Parker, 2006).

In his book, *In the Company of Heroes*, retired 160th Special Operations Aviation Regiment pilot CW4 Mike Durant (Durant & Hartov, 2003, pp.100-109) reflected on the SERE training he received at Camp Mackall in the winter of 1988 and the strength it gave him during his 11-day captivity in Somalia in October 1993:

> I came away [from SERE] with tools that I never believed I would ever really need, but even in those first seconds of capture at the crash site in Mogadishu, those lessons would come rushing back at me. Throughout my captivity, I would summon them nearly every hour … I thanked [Colonel Nick Rowe (USA), who is credited with developing the rigorous SERE training program] silently every day in Mogadishu, and I asked that God bless him, as I tried to plan my next move.

CW4 Durant's words speak volumes on the significant impact the immersive SERE training imparted on him.

Some immersive systems currently in use by the USMC:

1) The **Virtual Combat Convoy Trainer-Marine (VCCT)** is an immersive virtual environment simulation trainer for convoy missions and HMMWV mounted patrolling (Figure 3.b). The VCCT can accommodate 30 Marines in six simulated HMMWVs. The six vehicles are networked together into a 3D virtual environment where the unit can train as a team in complex tactical situations. Training in the VCCT is scenario based and conducted in blocks of four hours. The Utility uniform with individual protective equipment (PPE required to train in VCCT to include Flak, Kevlar, and another PPE required by unit).and 782 gear is the uniform for training (MAGTFTC Simulation Center (BSC) *VCCT*, 2009).
2) The **Operator Driver Simulator (ODS)** is a high fidelity immersive technical skills trainer for teaching Marines how to safely drive several vehicles in the USMC inventory. Those vehicles include the HMMWV, the MTVR 7-ton truck, and the MRAP Cougar. The ODS provides realistic haptic feedback to the student through the steering wheel, pedals and dashboard controls that replicate the experience of driving an actual MTVR. The ODS also models the effects of wind, temperature, precipitation, traction, tire pressure, and road surface on the handling characteristics of the vehicle. Throughput for sustainment training driving scenarios is approximately three or four Marines per hour. The ODS can accommodate two drivers at the same time with two observing Marines plus the instructor in the simulator with one student driving while the others observe from the Instructor Operator Station until it is their turn to drive (MAGTFTC Simulation Center (BSC) *Operator Driver Simulator (ODS)*, 2009).
3) The **HMMWV Egress Assistance Trainer (HEAT)** is a mechanical simulation trainer that familiarizes Marines with the techniques and

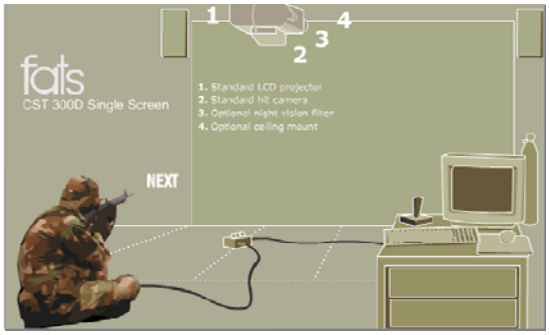
procedures for egressing a HMMWV that has overturned. It is not a rollover trainer in the sense that it does not replicate the inertial forces experienced by the crew of a HMMWV during a crash. It is a training tool for learning how to safely exit a vehicle and evacuate wounded after the vehicle has overturned. Training in the HEAT progresses from simple scenarios in which all occupants are uninjured to more complex circumstances in which one or more of the occupants are wounded and potentially unconscious. As a planning factor for throughput, approximately 16 Marines per hour, per HEAT device. Required PPE includes: flak, kevlar, gloves, eye protection, knee and elbow pads (MAGTFTC Battle Simulation Center (BSC) *HMMWV Egress Assistance Trainer (HEAT)*, 2009).

3. Augmented Environment

An augmented environment deals with the combination of real-world and computer-generated data (virtual reality), where the computer graphics objects are blended into the real (physical) world of the user and the user not needing a special device (eye gear) to experience this mix. Another type of environment called augmented reality (AR) is concerned with the use of simulated video imagery being superimposed to the real world while they are both perceived by the user while he/she is looking through special glasses; the combination of real and virtual world exists only inside the glasses, unlike in augmented environments when that mix is more direct and can be seen with a naked eye. The augmented reality research also includes the use of motion-tracking sensors, as to be able to track user's head position and orientation and adjust the synthetic images presented to the single user correctly. The augmented environments have no need for such a tracking system; however, the projection of the virtual characters images will not be correct for every user (it will be correct only for the user that is very near the physical point used as a viewpoint when calculating a 2D projection of 3D synthetic world).

Some augmented environments currently in use by the USMC:

- The **Indoor Simulated Marksmanship Trainer—Enhanced (ISMT-E)** and the **Infantry Squad Trainer—Enhanced (IST-E)** are two dimensional (2D) simulation (i.e., it shows a real image (photograph) with (sometimes) superimposed images of the targets) based trainers for indoor use, capable of instructing in basic and advanced marksmanship, shoot/no-shoot judgment, combat marksmanship, and weapons employment tactics. The trainer consists of an Instructor Station, audio/visual system, and weapons firing positions. Each firing position is capable of operating simulated weapons that includes simulated AT4, M2 (.50 cal), M9, M16s, M240G, M203, MK19, MP5, Squad Automatic Weapon, M870 12 gauge shotgun, Shoulder launched Multipurpose Assault Weapon, M224 60mm Mortar, M252 81mm Mortar, M4s, Short Range Anti-tank Weapon (Predator), and Joint Services Combat Shotgun. The ISMT-E has four firing positions. The IST-E consists of three ISMT-E trainers connected as a single system providing fifteen firing positions. A large display device provides simulated targets. The simulated weapons fire upon the simulated targets with an indication of the round fired provided as feedback. The Instructor Station controls the training and provides feedback of the results. ISMT-E/IST-E devices also provide Forward Observer Spotting/Control of indirect fire and night vision training capabilities in addition to the baseline combat and marksmanship training features. Additionally, the ISMT-E provides night vision and optical training for various weapon sights (both magnified and non-magnified), NV devices, and aiming lights. The optics training feature wireless weapon simulators and is focused on M16A4, M4A1, M203, M249G, and M240G weapon systems (U.S. Marine Corps Concepts & Programs, 2008). See Figures 4 (a), (b) and (c) for a visual depiction of the ISMT.



(a) Indoor Simulated Marksmanship Trainer. (b) ISMT – Enhanced.

(c) ISMT with a trainee and synthetic environment as a target.

Figure 4. Images of ISMT system.

- The **Infantry Immersion Trainer (IIT)** is an adaptive, interactive trainer focused on the infantrymen who require honed rifleman skills. Immersive training inoculates Marine rifleman into the chaos and confusion of irregular warfare, and in particular urban battle, to the extent that Marines will have experienced the real demands of combat in a mixed reality and simulated environment. The end state is Marines better trained to make moral, ethical and legal decisions on the battlefield (U.S. Marine Corps, I Marine Expeditionary Force, 2009). To stimulate the vision of the participants at the IIT, a technology known as FlatWorld is used (Figure 5). FlatWorld system uses high-performance PC graphics accelerators to

generate synthetic images and digital projectors to display them onto the walls; both set of devices are available at affordable prices and predominantly off-the shelf solutions (Pair & Peipol, 2002). These are the characteristics that make the system a very desirable training tool for Marine infantry units. Combined with the sounds and smells associated with the images presented on the flat walls, the participant will likely experience a sense of presence for the situation presented to him/her. More details can be found in the subsequent chapter (Chapter III).

Figure 5. An example of augmented environment: Infantry Immersion Trainer (IIT).

Yuhas et al. (2008) provide their vision for the future of infantry immersion training:

a) An order is received to execute a mission in an area of operations urban battlefield environment. The mission is planned on a joint mission planning system and courses of action are electronically rehearsed on a pre-mission rehearsal system that recreates the nuances of the lines of communications, avenues of approach, and objective area. Supporting arms, casualty evacuation, and communications tactics, techniques and procedures are reviewed and rehearsed.

b) The infantry squad enters a hyper-realistic recreation of the battlefield environment—physically, visually, aurally, and aromatically. Mission actions are carried out through interaction with virtual and live entities that will interact with and to the actions of the live infantry squad. The squad is required to interact partially in the native language, to be knowledgeable of, and correctly demonstrate cultural norms and nuance.

c) The mission situation will set the rules of engagement, allowing combat of varying intensity. The infantry squad will encounter differing situations, from patrolling to intense urban combat. The squad will call for mortar, artillery, naval surface, and aviation fires. The squad will request reinforcements. The squad will request medical assistance to include surface borne and aviation medical evacuation.

d) The squad will conduct an attack, an attack of a building, and an attack of a fortified position.

e) Upon completion of the mission exercise a video/aural capture system will be used to conduct an after action review of all elements of the squads mission performance. The system captures and correlates each squad member's actions to produce an individual or collective event-by-event review of the entire mission. A recorded piece of media is made available to the squad to review after the scheduled after action review.

An example of an Augmented Reality system currently in use by the U.S. military is the **Chromakey Augmented Virtual Environment (ChrAVE)**. It was originally prototyped by USMC H-53 pilot Mark Lennerton as a cheap and portable way to turn any vehicle into an interactive trainer. Combining a PC running a navigational application with a head-mounted display and a bluescreen, ChrAVE was field tested at HMM(T)-164 and validated for providing an effective overland navigation training system, a test platform for NVG simulation, and a realistic out-the-window view in a deployable, immersive system (Naval Postgraduate School, 2005).

C. PAST STUDIES

A sizable body of research suggests that simulation-based training is generally superior to conventional training methods:

a) Wolfe (1997, pp. 360–376) examined a variety of studies on simulation-games to teach strategic management, from the 1970s to 1997. His conclusion? "**Ample evidence has been presented authenticating the effectiveness of computer-based general management games as vehicles for teaching strategic management. In every study cited, the particular business gaming application produced significant knowledge-level increases**. When the business game method was pitted against the case approach, and when case-based evaluation criteria were not employed, **the [simulation] approach was *superior* to cases in producing knowledge gains**."

b) David Pierfy (1977, pp. 255–268) reviewed 22 research reports that compared simulation-based treatments to conventional ones. Eleven of those studies assessed retention of knowledge by administering a post-test a second time, well after the training had been completed. Of these, 8 studies found that **retention was significantly better with simulation and gaming than with conventional lecture/study approaches**. Further, 8 of the 22 studies compared student interest in the subject matter, and 7 out of those 8 found **significantly higher interest reported by students participating in the simulation,** than those in conventional training.

c) Bredemeier and Greenblat (1981) synthesize the findings of Shade and Paine (1975), writing that they "…found **more effective *transfer* of information through simulation than through conventional methods…."** [author's italics] They conclude "in sum, the available evidence suggests that simulation/games are at least as effective as other methods in facilitating subject matter learning and are more effective aids to retention…the available evidence thus suggests that, under certain

circumstances and for some students, **simulation-gaming can be more effective than traditional methods of instruction in facilitating positive attitude change toward the subject and its purposes**."

d) The Bredemeier and Greenblat (1981) finding is echoed in Rosenfeld (1975), who writes that "although it is difficult to measure, **there are many reports that simulation games significantly increase the motivation and interest level of student players**."

These types of findings, as well as a realization that simulations have a potential in saving precious resources, have led many organizations to make the move toward simulation-based training.

In 1992, the Marine Corps began fielding the Indoor Simulated Marksmanship Trainer (ISMT) to train with a variety of weapons (i.e., M-249 Squad Automatic Weapons, M-9 pistols, shotguns, M-16 rifles and MP-5s) to improve proficiency. The ISMT provides a realistic environment to learn individual marksmanship skills. The trainer offers three types of shooting formats: (1) lane training, where Marines can hone their accuracy with the rifle and pistol from known distances on both still and moving "B-Mod" targets, (2) computer-generated imagery and (3) video training. Detailed feedback, including visual shot grouping, accuracy ratings and pass/fail grading, provides the instructors and Marines the chance to identify their weaknesses and improve their marksmanship (Dobbs, 2008).

Active duty Lieutenant Colonel William W. Yates (USMC) completed his Naval Postgraduate School (NPS) thesis work in September 2004 involving the ISMT. In this work, he examined the effectiveness of the ISMT system as a tool to train shooters in the fundamentals of marksmanship. Key concepts explored in the research were a verification of skills transfer resulting from practice and the predictive value of simulated performance to proficiency at real task performance. The results of this work suggested that there was no statistical difference in the scores of recruits trained in the ISMT versus a control group that was not trained in the ISMT. Scores on simulated firing were not a strong predictor of live fire performance. In a second experiment done for this thesis

work, the subjects were evaluated on their proficiency and improvement during un-coached practice at the task of simulated precision fire on a target at a simulated known distance of 300 yards from the shooters. After comparable amounts of practice in the ISMT, subjects who had not previously received formal marksmanship training failed to demonstrate levels of proficiency comparable to those subjects who had previously received formal marksmanship training in the military. Consequently, the research found no evidence to suggest the ISMT qualifies as a black box training apparatus capable of imparting skill through practice without the added presence of expert instruction or an existing knowledge of marksmanship techniques (Yates, 2004).

Despite these less than stellar findings, the ISMT still serves as a viable augment for marksmanship training. For example, before live fire training on the range (i.e., during grass-week) Marines go to the ISMT and practice the fundamentals of marksmanship training alongside the assistance of a coach to monitor the Marine's stances in the various firing positions. Also, while conducting live-fire training on the range during range-week, Marines supplement their live-fire training with additional time at the ISMT after range time to make adjustments to their firing stances as required, while emphasizing the fundamentals of marksmanship training.

Dr. Anthony Ciavarelli (NPS faculty) continues to lead research projects involving the capabilities into the ISMT. The thesis work done by Army Major's William L. Platte and Johnny J. Powers (2008) at NPS (both advised by Dr. Ciavarelli), sheds a more positive perspective on the use of the ISMT supported by motion capture technology to carry out marksmanship training:

> Virtual marksmanship trainers are currently used to provide the means to teach basic and advanced marksmanship skills, monitor performance progress from novice to expert, and maintain marksmanship skills. Our research was focused on the use of virtual marksmanship trainers to explore various training method enhancements based on recent studies of complex skill acquisition and expertise. The study of marksmanship skill and shooting characteristics benefited from the emergence of highly precise instrumentation for digital recording of the subject's performance. We used motion capture technology to define and to measure rifle shooting postural profiles associated with different levels of marksmanship expertise. Motion capture data revealed significant

> ($p<.008$) differences between beginner and expert profiles. Using this knowledge to develop a training system for the standardization of expert level marksmanship performance would result in higher levels of expertise and the reduction of variance during the instruction of rifle marksmanship.

In addition to the ISMT studies, Ibbitson's (2005, p. 25) research has shown "that young people of today spend a lot of time outside of the classroom engaged with technology, including but not limited to television, movies, video console games, computer games, Internet surfing, instant messaging, e-mail, and downloading music." The U.S. Marine Corps used the computer-based Marine DOOM to teach battlefield tactics outside of the field training environment in the mid-1990s (Rutherford, 2007). This is one of the earliest examples of modifying a desktop game for training purposes. In 2002, the United States Army developed and released a series of video games and other media under the name of *America's Army* as a global public relations initiative to help with recruitment. This has been the first computer video game to make recruitment an explicit goal and the first well-known overt use of computer gaming for political aims.

America's Army has also achieved a successful degree of imparting the training element to its soldiers and players. One player comments on how *America's Army* helped him save people from a burning car (Wilson, 2008):

> I have received no prior medical training and can honestly say that because of the training and presentations within America's Army, I was able to help and possibly save the injured men. As I look back on the events of that day, the training that I received in the America's Army video game keeps coming to mind." I remember vividly in section four of the game's medic training, during the field medic scenarios, I had to evaluate the situation and place priority on the more critically wounded. In the case of this accident, I evaluated the situation and placed priority on the driver of the car who had missing fingers. I then recalled that in section two of the medic training, I learned about controlled bleeding. I noticed that the wounded man had severe bleeding that he could not control. I used a towel as a dressing and asked the man to hold the towel on his wound and to raise his hand above his head to lessen the blood flow which allowed me to evaluate his other injuries which included a cut on his head. (as cited by Wilson, 2008).

In addition to the medic training, there is an extensive list of other military training for *America's Army*, and we name just a few here:

a) **Javelin Missile System** — Players train on a virtual Basic Skills Trainer (BST), which is based on the actual America's Army powered training simulator; a special "Live Fire" challenge is offered upon completion of the BST qualification.

b) **M1114 Up-Armored HMMWV with CROWS** — A short, two-part, hands-on course including driving and gunnery qualifications. Players must complete both in order to operate the CROWS HMMWV in-game.

c) **Rifle Marksmanship (BRM)** — M16A2 qualification has been enhanced to model the Army's new training curriculum and standards -- earning Expert is a significant challenge.

Master's Thesis student David B. Nieborg, of Utrecht University, The Netherlands, completed his thesis work involving *America's Army* in 2005. His work examined

> the status of the free state-of-the-art PC-game *America's Army* within the military-entertainment complex and contemporary youth popular culture by exploring the implications of the interaction between commercial game culture, technology, marketing and military culture. Since the United States military uses the same simulation technologies as commercial game designers do, there is a blurring between commercial (military themed) games and governmental military simulations. The success of *America's Army* has consequences for thinking about games and simulations and the use of these interactive texts strategically placed inside the synthetic environment for advertising, education, analysis and propaganda. The appropriation of a global game culture results in a dynamic relationship between the top-down institutional nature of the U.S. Military and the bottom-up participatory character of game communities and signals a shift of the changing status of the representation and simulation of war. (as cited by Nieborg, 2005).

In their NPS thesis, *Games for Training: Leveraging Commercial Off the Shelf Multi-player Gaming Software for Infantry Squad Collective Training*, involving leveraging commercial off the shelf (COTS) games for use in military environments, Nolan and Jones (2005) conducted several training sessions. Initially they used the

lecture method and, to a lesser degree, hands-on computer control of their avatar (the virtual representation of a human within the game):

> We initially felt that the training we provided and their (the student's) exposure to the game environment would be sufficient. Survey results…indicated that the participants felt that there was too much lecture and not enough hands-on training…Based on this feedback, we altered our training for the remaining two pilot studies. Our familiarization and training program evolved to a much shorter classroom presentation followed by a group, hands-on training session in the virtual environment….The positive results from these pilot studies led us to use this ads our training and familiarization technique during the experiment conducted at Ft Benning, GA. (as cited by Nolan & Jones, 2005, p. 25).

Additionally, Nolan and Jones (2005) sought to find out whether the first person shooter games could effectively train squads in collective, leadership tasks, and decision making. They chose "combat drill" as the task that the experiment subjects would perform because it is a "collective action rapidly executed without applying a deliberate decision-making process" (as defined in FM 7-8, 2001, Chapter 4, p. 1—see Appendix A). They concluded the infantry squads can use COTS gaming software for this level and type of collective squad training.

Previous research done in domain of training simulations suggested that a variety of methods have been used to teach participants to use simulation. However, the most effective one mentioned by these researchers is one where there is a short lecture phase preceding a "hands-on" training phase. This is where participants actually operate the simulation on their own.

As of October 2007, Marines have been conducting infantry immersive training at the Infantry Immersion Trainer (IIT) aboard Camp Pendleton, CA, where the Office of Naval Research (ONR) has been a sponsor for several research teams and programs aimed towards refining the technologies found in the IIT training environment and studying the effectiveness of training in this facility. The work being conducted by the researchers at Pacific Science & Engineering collected extensive data sets and provided valuable information on infantry immersive training conducted in the IIT. The objective

of their research was to assess mixed reality, fully immersive infantry training and develop recommendations for enhanced technology to support training and performance assessment (Kobus & Palmer, 2009).

The studies described in this section largely support the belief that simulation-based training is a viable and very valuable option for some forms of conventional training methods; in some cases training with simulations is the only training option available (example: training of emergency procedures in flight simulators). In cases where the simulation-based training does not provide an advantage over conventional training methods, it is encouraging to know its use can still generate positive effects (helps form mental maps and instigate motivation) while addressing targeted learning the training objectives.

D. LEARNING AND TRAINING IN IMMERSIVE ENVIRONMENTS

There is a realization in the training community about a gap that exists in the training of the Marine infantryman from classroom to the field. Simulation, particularly infantry immersive simulation, is considered as one type of tool that can fill that gap (U.S. Marine Corps, 2008).

1. Training Needs and the Potential

The casualty count from Iraq strongly suggests that infantry training should be strengthened by all means available to the USMC—this is a compelling requirement for the fleet (U.S. Marine Corps, 2008). This type of requirement is partly met by the creation of the Infantry Immersion Trainer (IIT) as a novel training facility that responded to the very needs identified in the training community. The chart presented in Figure 6 suggests that through September 2007, out of 998 Marine Corps deaths, 646 are from the Infantry Military Occupational Specialty (MOS) fields (Marine Times, 2007, October).

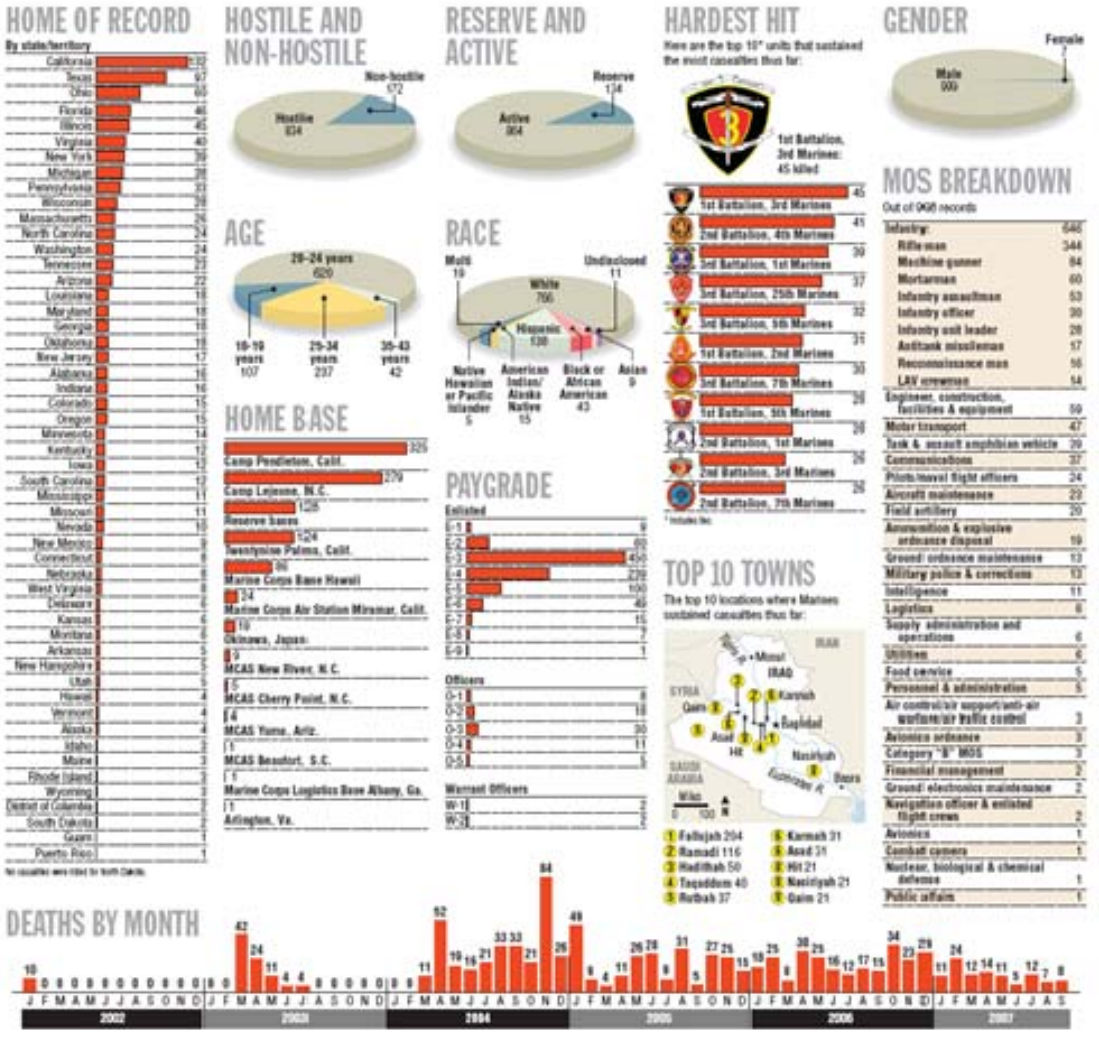


Figure 6. Iraq casualty chart (From Marine Times, 2007, October).

Marine Corps researchers assess that the technology now supports the fidelity required to effectively train the infantry utilizing simulation (U.S. Marine Corps, 2008). By tapping into the existing training aids and simulation technologies to train Marines to operate and handle stressful, chaotic situations well before they reach the combat zone, the Marine Corps is increasing the chances those Marines will successfully get through their first combat experiences, whether an enemy attack, ambush or roadside bomb (Fuentes, 2007).

Simulation training could carry over and have a profound effect on the battlefield. Successful simulation training could be the difference between life and death. The studies

have shown if one survives the first firefight, then the likelihood of that person surviving the rest of his or her tour is getting increased (Fuentes, 2007). A training experience at the IIT could be that first firefight.

Depending on the goal, the potential for simulation-based training could lead to any of the following advantages:

a) **Saving resources (human, material, logistic)—**Savings already occur with flight simulators, where precious resources do get saved (i.e., human lives, fuel, parts, mechanics' time, etc.). On VBS training, Marines can practice a good segment of convoy operations training without a need to go to a physical range and use real trucks (i.e., saving fuel, parts, logistics, etc.).

b) **Improving training skills that could not be trained otherwise**—With the help of flight simulators, pilots are capable of training in a multitude of environments and scenarios. Pilots are able to practice emergency procedures, fly in rainy conditions over the skyline in South Korea, or even engage insurgents over Afghanistan. All those training situations would not be possible to recreate in regular (traditional) training setups.

c) **Training time made shorter—**Flight simulators save time since there is no need to start the aircraft, warm it up or fly to the training area and there are no delays caused by actual clouds or bad weather conditions. Any topic or maneuver can be dealt with by freezing the simulator for discussion or evaluation purposes, and specific lessons can be practiced many times in a short period of time.

d) **Motivating trainees**—According to Kobus and Palmer's (2009) research conducted at the IIT, the Marines appeared to be motivated about the training environment. Positive feedback was observed with regard to (i) realism of sights, sounds, smells, (ii) complexity of environment, (iii) interaction with Arabic-speaking role players, and (iv) situation rapidly changing from calm to chaos. There is widely accepted understanding that a motivated learner (trainee) has a potential to be the best learner (trainee).

Yuhas et al. (2008) provided a list of convincing reasons for the need of continued immersion training for the infantry. Current and future conflicts require improved combat preparation skills for the infantryman.

- Infantry home station training must provide for:

  - Inoculation of rifleman with the sights, sounds, smells, and chaos of battle.

  - Increased situational awareness for survivability and mission success.

  - Infantrymen are required to make immediate moral, ethical and legal decisions.

- Small units should be trained as a "weapon system."
- Must conduct ground combat training for Irregular Warfare & Joint close combat among the innocent.
- Need to provide training capabilities for small units that conduct ground combat in order to test our small units to high standards prior to entering combat.
- Training must be tailorable, repeatable and affordably implemented.

Greg Knapp (2008), Executive Director, Joint Warfighting Center (United States Joint Forces Command) states, "*The first firefight should be no worse than the last simulation.*"

By following the course of action already established by the IIT staff and incorporating the recommendations found in this thesis, it is our belief that the goals listed below by the IIT staff (Yuhas et al. 2008) can be achieved if units are provided with a well-structured exposure to multiple training situations in IIT.

a) Increased efficacy of training

b) Confident and effective combat decision making under complex conditions

c) Reduced friendly and innocent casualties

d) Reduced collateral damage

e) Soldiers and Marines better prepared for the chaos of the complex, distributed battlefield

f) Increased mission success

g) Increased combat effectiveness

h) Reduced casualties, both friendly and civilian

2. Current Approaches and Trends

U.S. ground forces agree that adaptive, interactive, full immersion simulation can be an extremely effective way to expose Marines/soldiers to the rigors of ground combat (U.S. Marine Corps, 2008). Current Marine Corps practices in providing training with simulations can be described through reviewing the activity at the Marine Corps Air Ground Task Force Training Command (MAGTFTC) Battle Simulation Center (BSC) located in 29 Palms, CA (MAGTFTC BSC, Full-color Brochure, 2009):

a) **The BSC facilitates unit training with minimal overhead.** By minimal overhead, we mean since the training is virtual, there is no extra expenditure of fuel, rations, ammunition or supply gear, nor does it require equipment maintenance or repairs for the training unit's assets.

b) **Highly tailorable training.** Since scenarios are very often hard to build (they require considerable technical expertise) the staff works with the unit and tailors existing scenarios or creates a training scenario specifically to meet the training unit's needs. Training can be provided at several different levels, ranging from training for the individual Marine up to the regimental level. The BSC has a variety of simulation systems and models that it uses to enhance training.

c) **Flexibility.** The lack of overhead required for simulation training allows for it to be conducted at almost any time of the day where the unit has a gap in their schedule. Virtually anyone can schedule BSC support very simply and usually on very short notice.

d) **Persistence.** The BSC is unaffected, by weather or other special events except in the most severe of cases. As such, it is always open for training when the training unit needs it.
e) **After Action Feedback.** Near real-time feedback can be provided to analyze the unit's performance.

Tactical Training Exercise Control Group (TTECG) Coyotes have stated that they can tell which units have utilized the Simulation Center prior to going to the field because they are simply BETTER PREPARED (MAGTFTC BSC, Full-color Brochure, 2009). The Marine Corps also trains with simulations in the I MEF BSC aboard Camp Pendleton, CA in relatively the same way. However, the IIT is an additional facility only found at Camp Pendleton.

a) **The IIT staff also facilitates unit training with minimal overhead.** By minimal overhead, we mean the IIT staff will provide the training unit with role players (both real and virtual), pyrotechnics technicians, training ammunition, and protective gear required for the indoor training.
b) **It offers highly tailorable training.** Since scenarios are very often hard to build (they require considerable technical expertise) if the training unit plans ahead, the IIT staff will work with the training unit and tailor existing scenarios or create a training scenario specifically to meet the training unit's needs. However, the IIT instructors do not receive formal training on how to use simulations effectively in training of the units. They must rely on their past experiences and established knowledge base to support the training effort. Because the IIT is a prototype, it does not include instructions on how to use it effectively in training (the instructors have technical manuals, but those do not provide information on simulation training.) Scenarios during the training can develop fast and change quickly. For the training to feel realistic, good intelligence procedures must be established and followed through. Understanding the

intelligence cycle and how it supports the planning process will only improve the unit's situational awareness and overall combat effectiveness during the patrol.

c) **Flexibility.** The lack of overhead required for simulation training allows it to be conducted by almost any size of unit. The idea behind the IIT was to be able to conduct squad (or even fire team) level training. However, the amount of friendly operational support required by a squad from a company-level intelligence cell (CLIC) and a company-level operations cell (CLOC) currently outweighs the possibility for this to occur in a traditional sense since that type of infrastructure and support structure does not exist.

d) **Persistence.** The IIT is unaffected, by weather or other special events except in the most severe of cases. As such, it is always open for training when the training unit needs it.

e) **After Action Feedback.** Near real-time video feedback can be provided to analyze the unit's performance. However, this technology is not always capitalized on and units sometimes use no technology at all to support their learning process from the training conducted. Instead of capitalizing on the technology available to them, they will debrief in a dirt parking lot where many valuable lessons will be soon forgotten.

E. CONCLUSION

Military training that uses simulation technologies can come in many forms. The commonality for each of the different types of this training form, especially in environments that provide high levels of immersion, is that the users believe they are in a different environment than the real world. Through the extensive exposure to surroundings or conditions that are native or pertinent to the conditions and situations that the unit will be faced with in the operational theatre, the results and the effectiveness of that training can reach next (higher) level.

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III. INFANTRY IMMERSION TRAINER (IIT)

A. DESCRIPTION OF TRAINING ENVIRONMENT

The military has been considered a community that by its definition needs to deal with and improve upon the technical tools and systems needed to conduct its basic missions—this is especially true in modern warfare and current missions that are associated with the military force. Innovation by the U.S. military has long been a proud tradition. However, with the fast pace of today's technology, industry has begun to outpace the military's once strength, and the military must find a way to continue innovating newer and better ways to train our military force with the technology available today.

The Marine Corps has been willing to adopt new training opportunities offered through desktop simulations (i.e., Marine DOOM, Close Combat Marines, VBS)—some of them became a part of standard training environment in some schools and simulation centers. With the improvement offered by today's technology the service is willing to make a leap forward and include the immersive environments for the training of its infantry. For Marine Corps training, the creation of the IIT marked the start of a significant change from traditional field training techniques to computer supported immersive training. The IIT uses projectors that depict images on walls inside this training facility. These computer generated characters play a role of imagined civilian villagers or insurgent fighters (Rutherford, 2007). Physical artifacts, like furnishings, doors, and stairwells, add to the realism and can be rearranged to fit particular scenarios and alleviate the problem of going through the same scenario. This has been combined with other virtual effects such as explosions, loud sounds, smoke, and the smells of combat. The training plan for the IIT is to tie the trainer into a constructive game play that meets the unit's training objectives for "particular missions, roles, and environments" (Fuentes, 2007).

This section provides a detailed description of the physical space and its layout, cultural artifacts that are situated inside the environment, role players and auditory and olfactory sensory stimuli used, as well as the training equipment used in each of the training scenarios.

1. Location, Physical Space and the Layout

The IIT training facility is approximately 32,000 square feet large, located in the Tomato Patch in the 62 Area of Camp Pendleton, CA. The training space (shown in Figure 7) is completely enclosed—it is an example of indoor training environment. The entire facility (except for the Admin and AAR/Debrief Room) is qualified as Special Effects Small Arms Marking System (SESAMS) capable; SESAMS are not utilized outside of the building. The environment is partitioned into the buildings, rooms, hallways, and larger public spaces such as souk (bazaar) and streets. Several of the internal buildings of the IIT have internal doors constructed of wood. These doors have been designed with kick panels requiring personnel to use force to kick them open.

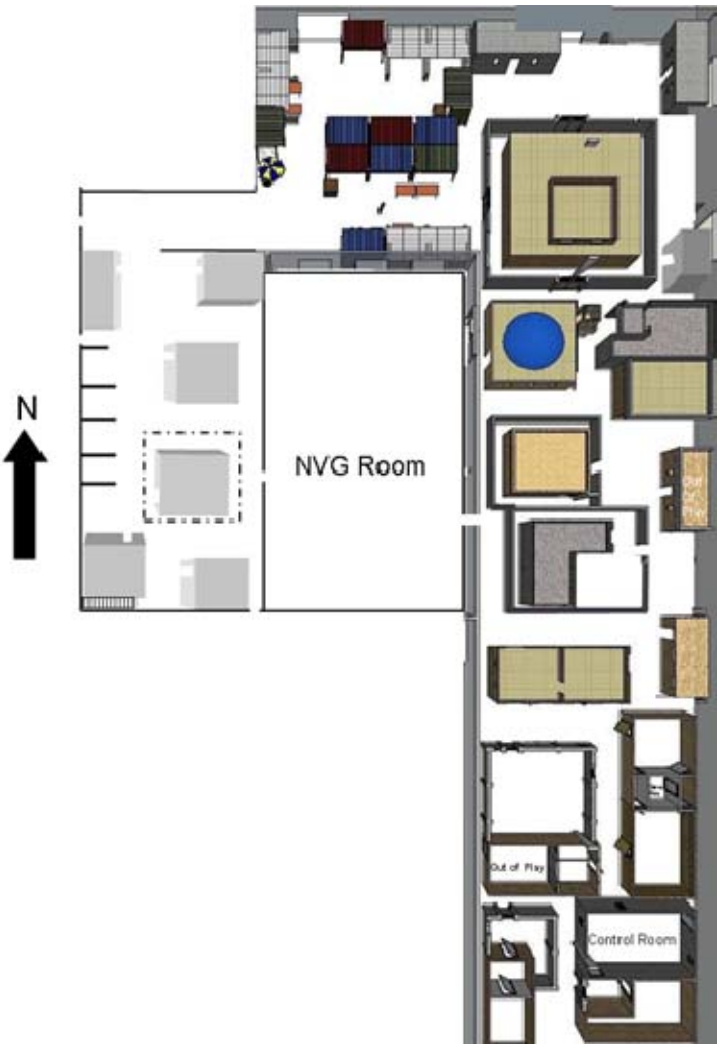

Figure 7. IIT layout (From Al Falljhradi.bmp)

2. Cultural Artifacts

A unique aspect of the IIT is its detailed incorporation of props and cultural artifacts. These items range from household items (i.e., carpets, cushions, dishes and pictures on the wall) to urban/village clutter such as bicycles and baskets as well as battlefield clutter (i.e., empty shells, wires, and ruins). All these items come together to generate a larger infrastructure that represent a typical urban environment (i.e., a village with houses, squares and a marketplace/bazaar).

Figures 8 and 9 show how furniture might be placed in a room at the IIT. This furniture then serves as a means to hide intelligence related documents and weapons which the Marines will search for during a cordon and search mission. To save cost, the majority of furniture at the IIT has been retrieved from the Defense Reutilization and Marketing Office (DRMO) at no cost to the Marine Corps (Alker, 2008).

Figure 8. Typical room environment in IIT.

Figure 9. A kitchen.

Figures 10 through 15 illustrate the distinctiveness of the cultural artifacts found within the IIT, making the training so realistic to the Marines during their training. The infrastructure (i.e., hanging power lines and a market (souk)) found in a foreign country also adds to the immersive experience. There are even bicycles and a vehicle found within the facility to add the depth and realism to the role players' activities.

Figure 10. A room with a rug and pillows.

Figure 11. Power lines run overhead.

Figure 12. Laundry hanging to dry.

Figure 13. A bike and a shop in the Souk.

Figure 14. A fruit stand in the Market (Souk).

Figure 15. A view of the Market (Souk).

3. Role Players

Role players at the IIT come in two basic forms—the form of live people and the avatars (virtual people):

- Live people—these role players serve in a variety of positions to accommodate the training scenario. Elder, more experienced role players might be selected to serve in the position of a local Sheik during a "meet and greet" training situation (Figure 16), while others might serve as the local population (Figure 17). Additionally, Figure 18 depicts how select role players are contracted to act as "opposing force" (OPFOR) and have the required approval to engage in SESAMS training (Alker, 2008).

Figure 16. A meeting with the Sheik.

Figure 17. Role players dressed in foreign clothes and acting as the local population.

Figure 18. A role player serving as "opposing force" (OPFOR).

- Avatars (virtual humans)—these role players create a safe and unique training opportunity for the Marines during room entry in so far as "Shoot" or "Don't shoot" scenarios (Figure 19). Avatars are a great way to avoid putting live people in unnecessary harm's way during training. The use of avatars in training could also help prevent needless deaths like the one that occurred October 30, 2006, aboard Camp Pendleton, CA when what was supposed to have been a non-live fire drill turned deadly (Marine Times, 2007b).

(a) Computer screen displaying avatars.

(b) FlatWorld displaying avatar.

Figure 19. Avatars used during "Shoot" or "Don't Shoot" training upon room entry.

Virtual avatars have an intrinsic value-added element for the training at the IIT. As pointed out by Dolezalek & Weinstein (2007), avatars allow users to hear and see the content in a compelling medium. They are not only interesting and visually stimulating; they also have the potential to drive home the training goals in a safe and effective manner if used successfully. Avatars are also appealing to the computer savvy age group who primarily fill the age group for today's squad leaders. These individuals are accustomed to instant information access (via the Internet), and comfortable with technology.

4. Auditory and Olfactory Sensory Stimuli

High fidelity effects stimulate the Marines sights, smells, and hearing as the chaotic training scenarios are conducted. These "effects" are delivered in the form of Improvised Explosive Devices (IEDs) simulators (use of Soft Graphite/Air), Rocket Propelled Grenades (RPGs) being shot across the facility along well-concealed wires, speakers, and odor machines. The intent is to be able to incorporate Flashbangs, booby traps, blanks, SESAMS, non-lethal weapons (Alker, 2008), noise, and stench into an immersive battlefield.

A specific auditory stimulus broadcast throughout the IIT is the Islamic call to prayer. Depending on the scenario, different messages can be broadcast from the mosque.

This additional noise factor adds to the experience of "being there," whether the prayer is a slow peaceful one or a more violent and hostile one. The Marines will learn the difference so they can pick up on this particular atmospheric for their situation and when the situation gets intense, they will have seen the earlier indications. The rationale is that it is better to have first experience with this sensation during training rather then while overseas; if experienced for the first time during the deployment they can represent a source of chaos, confusion and sensory overload that may be very difficult to manage for the first time causing the Marines to become easy targets.

Another sensation created within the IIT to support the experience of personal presence is the sense of smell (olfactory sensory stimulus). The smell of combat can come in many forms (i.e., burning trash, fuel, or rotting garbage). This sensation impacts some more than others and is another aspect of the IIT that makes the facility so valuable for training.

5. Individual Equipment

SESAMS provide realistic and safe training for Marines by using special rounds filled with color paste that leave a visible mark wherever it hits. SESAMS rounds can currently be fired with slightly modified M-16A2s or M9s (note the blue barrel on the Marine's M16-A2 in Figure 20). The barrel replacement process shown in Figure 21 is required to accommodate the use of the M16-A2 with SESAMS rounds. During training, Marines have been known to get welts when a SESAMS round hits an unprotected area of the body (Figure 22). Despite the bruise and stinging feeling from a welt, the Marines' reaction to being hit by a SESAMS round is very positive due to the added sensation of realism. For safety concern, personal protective equipment (PPE) in the form of masks is worn by all personnel including the role players and instructors to protect the eyes and mouth. This unfortunately, is an aspect to the training that is not favored by the Marines' because with the masks on their heads it becomes hard to interact and communicate with the role players and other Marines while trying to gather information of intelligence value and conduct their operations.

Figure 20. Blue barrels are used on the M16-A2 to fire SESAMS rounds and protective masks are worn to prevent injury.

Figure 21. Barrel replacement with the M16-A2 is required to accommodate SESAMS rounds.

Figure 22. A welt from a SESAMS round.

B. CURRENT IIT CONDUCT OF TRAINING

Marines are able to enter the IIT facility from up to four entry points and can conduct a range of urban warfare tasks from urban patrol, reaction to sniper fire, cordon and knock, Direct Action Raids, and satellite patrols (Alker, 2008).

This section describes the training objectives of the IIT and some of the scenarios utilized to support those training objectives. We also cover and comment the limitation to the current training procedures.

1. Training Objectives and Scenarios

Training goals for units consist of the following:

a) Each Marine will learn to shoot, move and communicate in the urban environment.

b) Each Marine will conduct urban patrolling.

c) Each Marine will conduct room and building clearing.

d) Each Marine will conduct immediate actions in response to threats in the urban environment.

e) Each Marine will learn the basics of Middle Eastern operational culture.

f) Each Marine will apply the basics of Middle Eastern operational culture in scripted tactical scenarios involving role players.

During the combat, hostile incidents often seem to occur spontaneously, but there are usually indications that can alert Marines to imminent danger (MCWP 3-11.3). The most obvious are the sudden alteration of normal routines, patterns, and attitudes of the local populace or other unusual activity (MCWP 3-11.3). The IIT is an ideal location to train against some of the following situations, which are likely to be seen when operating in an urban environment (MCWP 3-11.3):

- Enemy observers tracking the patrol. (For example, observers on rooftops, in windows, etc., who are obviously tracking the patrol.)
- Pedestrian traffic. (For example, the unusual absence of pedestrian traffic and people on porches.)
- Urban/village life. (For example, stores, markets or street vendors closed suddenly or without explanation.)
- Civilian attitude towards the units. (For example, changes in civilian attitude toward patrol members.)

- Foreigners in the area. (For example, unknown individuals or vehicles in the patrol area.)
- Things out of the ordinary. (For example, unfamiliar vehicles parked in the patrol area [possible car bomb]).
- Unusual activity by locals. (For example, children throwing rocks at patrols to possibly draw the patrol's attention away from a more serious danger, such as a deliberate ambush.)
- Hostile activity by locals. (For example, agitators trying to provoke an incident with patrol members.)
- Change in local atmospherics. (For example, anti-American graffiti suddenly appearing in the patrol area.)
- Appearance of propaganda. (For example, pictures of enemy leaders and martyrs posted in the patrol area.)

2. Limitation of Current Training Procedures

The limited space within the IIT facility is a clear drawback. According to MEF Standard Operating Procedures (SOP), the minimum stand off distance for an IED is 300 meters. The IIT does not allow this to properly occur and could potentially create poor training habits. A quick solution to this problem would be to identify the current IEDs used in the scenarios as pipe bombs. The long-term solution is to create a facility large enough to support this amount of stand off distance.

Another limitation from our observations was the hesitation to react to the virtual characters (i.e., avatars) displayed on the walls. Marines paid more attention to the real role players and this caused the Marines to miss things that they were supposed to react to in the shoot/don't shoot scenarios. Indecision to the virtual characters often led to mistakes being made because of the uncertainty to engage the hostile virtual targets.

C. PAST AND CURRENT RESEARCH STUDIES

The Office of Naval Research (ONR) has been a sponsor for several research teams and programs aimed towards refining the technologies found in IIT training environment and studying the effectiveness of training in this facility. The work being conducted by the researchers at Pacific Science & Engineering collected extensive data sets and provided valuable information on infantry immersive training conducted in the IIT. The objective of their research was to assess mixed reality, fully immersive infantry training and develop recommendations for enhanced technology to support training and performance assessment (Kobus & Palmer, 2009). The hypothesis they stated was, "Incorporation of performance metrics and supporting capabilities such as After Action Review (AAR) will improve mixed reality based infantry training." To achieve this objective, they have developed the following technical approach:

- Identify capabilities of IIT for meeting specific infantry training objectives.
- Develop performance metrics for training and retention of skills supported by IIT.
- Provide recommendations for technology such as after action review (AAR) to support mixed reality immersive infantry training and performance assessment.

Some additional reporting on the IIT is summarized here:

1. Palmer, Kobus, & Kobus (2008a & 2008b) interviewed and provided written questionnaires to 15 Marines who visited the IIT shortly after returning from deployment to Iraq and also a group of 105 Marines with 0–2 deployments to the Middle East. From this research, they were able to ascertain some positive feedback regarding training at the IIT involving the realism of the sights, sounds and smells within the facility. The complexity of the training environment, with the situation rapidly changing from calm to chaos, along with the ability to interact with Arabic-speaking role players were viewed very positively. The primary criticisms were related to the confined space of the facility.

2. Dister & Kobus (2009) conducted research to assess tracking technology with respect to improving situation awareness in the control room and of the trainers throughout facility. They are continuing their work with a goal of providing added value to the AAR process and for the perceived potential contributions to performance assessment.

3. During their Skill Retention Study, Palmer, Kobus, & Kobus (2009) observed several research challenges due to the IIT being a training facility where operational commitments take priority. For example, the research effort was planned for two days to compare skill retention. Day 1 involved 40 participants, while due to operational tempo; Day 2 involved only 16 of the original 40 Marines. This caused a problem for maintaining squad integrity. Lessons Learned included the following:

    a) As long as IIT operates as range (vs. trainer), scientific and systematic assessment will be limited.

    b) IIT is underutilized as "train as you fight" opportunity for communications training which is critical for combat effectiveness and valuable for assessing situational awareness (in squads and as conveyed to higher command).

    c) Potential value (for both training and assessment) as an AAR tool.

D. FUTURE PLANS FOR IIT

Similar to the pilots need for flight simulators, the infantry need to expand infantry immersive training and make facilities available on other USMC bases. At present time, a second IIT facility is planned for the new Marine Expeditionary Rifle Integration Facility in Quantico, Virginia. The IIT will incorporate the results of several ONR-sponsored research efforts, as well as technologies sponsored by the U.S. Army Research Development and Engineering Command and the University of Southern California's Institute for Creative Technologies. Additionally, several members of the faculty for the Modeling Virtual Environments and Simulations (MOVES) Institute at the

Naval Postgraduate School (NPS) in Monterey, California are collaborating with the University of North Carolina (UNC) at Chapel Hill through Behavioral Analysis and Synthesis for Intelligent Training project sponsored by the ONR to develop a visualization that can be presented on a Virtual Sand Table developed by UNC team (Figure 23) that could potentially support infantry immersion training for the Marine Corps.

Figure 23. Positioning the physical artifacts on the Virtual Sand Table.

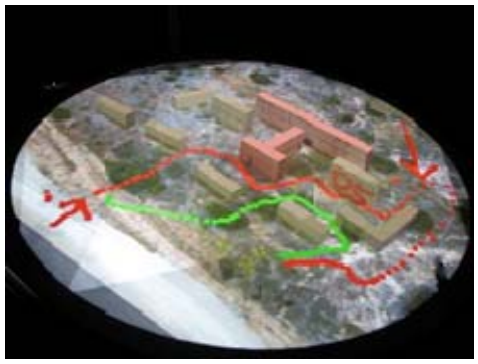

Figure 24. Virtual Sand Table using the Magic Marker capability.

The Virtual Sand Table is a unique combination of traditional media (three-dimensional physical artifacts) and a contemporary form of data presentation (digital simulation). The domain for this platform is urban warfare operations; however, the same platform and the same concepts can be deployed in a variety of other domains. The primary objective of the Virtual Sand Table is to enable a military team discussion during their mission rehearsal, and present the environment and terrain data, as well as dynamic data sets that illustrate unit's movement on the terrain. A Magic Marker capability (Figure 24) has also been added to allow for sketching unit's planned movement and to mark the potential danger zones identified in the environment. ONR's investment in this Virtual Sand Table technology research could benefit the IIT and similar training environments (as cited in Sadagic, 2009).

To support the idea for robotic-based cultural awareness training at the IIT, work done by Dragone et al. (date unknown) goes on to explain that with the development of the field of social robot research in recent years, a strong need has developed for a

coherent development framework for heterogeneous robots that supports explicit social interaction between robots (whether real or virtual) and between robots and humans. In situating this work in the current state of the art in the field, it is important to highlight that there are generally two camps of social robot research aimed at developing deliberative pro-active social capabilities.

The first involves the development of explicit control architectures for (ideally) heterogeneous robots with the capacity to communicate, coordinate, and engage in social complex *inter-robot* behaviors. The social interaction design strategy is primarily based on a bottom-up approach where the social capabilities are often additional communication mechanisms implemented on robotic devices. There are numerous "levels" of sophistication from simple message passing through, for example, light-based transmitters and receivers (Grey, 1967) and more recently (Billard & Dautenhahn, 1997), to more sophisticated Belief-Desire-Intention-based social control paradigms as found in the Social Robot Architecture (Duffy, 2000 & 2004).

The second approach to social robot research involves empowering a robot with the social functionality required to engage human participants in some form of directed social engagement. Such systems often involve building robotic devices with a degree of anthropomorphic representation (head, body, facial expressions, hand gestures, etc.) (see Duffy, 2003 for a discussion). The control systems generally employ key human-centric interaction modalities such as speech and even models of emotion in order to realize as natural a social interaction as possible. Continued research in the field of robotics and avatar support is highly encouraged to sustain the training at the IIT and to mitigate the requirement for costly role players.

The Marine Corps is taking a critical step towards changing the way infantry training is conducted. Marines will be able to walk or run through these simulated spaces in their combat gear with their personal weapon—this has been a priority for General Mattis. Future growth can be expected as the Marine Corps shifts its focus from one theater to another (i.e., Iraq to Afghanistan). One possible location for a future IIT to support mountain warfare training, following an Afghan-scenario would be at Marine Corps Mountain Warfare Training Center (MCMWTC) in Bridgeport, California.

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IV. INTELLIGENCE CYCLE ACTIONS TO SUPPORT, "EVERY MARINE IS A COLLECTOR, AND EVERY MARINE IS A REPORTER"

A. COUNTER INSURGENCY (COIN) AND THE NEED FOR HUMAN INTELLIGENCE (HUMINT) IN AN URBAN ENVIRONMENT

The purpose of the realistic training at the IIT is to enforce the harsh physical realities of a combat environment. In conjunction with this learning objective, the Marines have the opportunity to also realize the importance they all play in the intelligence cycle. By having a good intelligence picture, the Marines can generate tempo and stay one step ahead of enemy activity. The lesson for each Marine, "Every Marine is a Collector, and Every Marine is a Reporter" supports this effort. Despite the shock and commotion occurring around them, they need to be able to remain focused to more effectively observe enemy activities and react in such a manner that gives them the initiative and supports accomplishing the mission. The intelligence cycle represents a tool for improving situational awareness and gaining the initiative. The intelligence cycle consists of six continuous phases integrated together in an ordered and structured way. Figure 25 illustrates the six phases of the intelligence cycle.

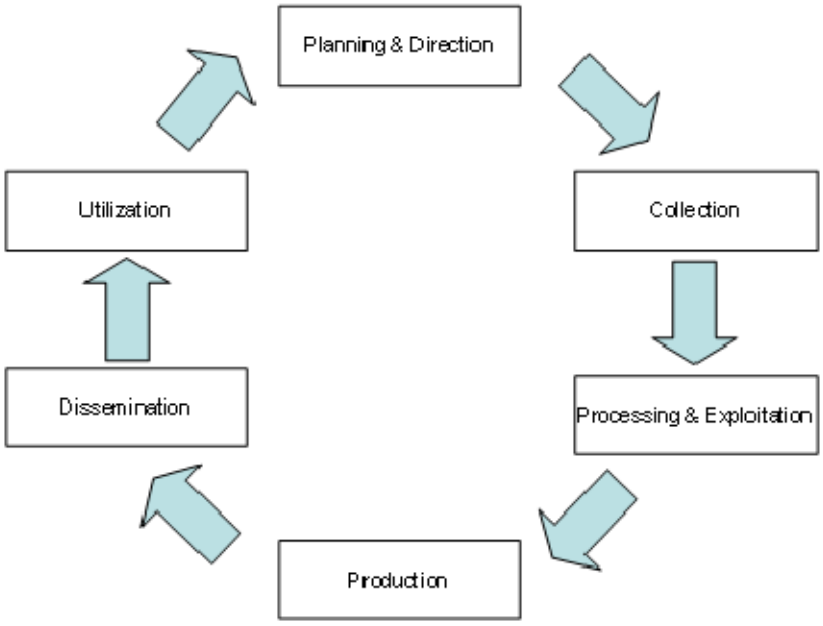

Figure 25. Six phases of the Intelligence Cycle.

1. Planning and Direction

The intelligence cycle begins with *planning and direction*. This phase consists of the identification of intelligence requirements and the planning of intelligence operations and activities to satisfy those requirements. The commander directs priorities for the intelligence effort. Those intelligence requirements for which a commander has an anticipated and stated priority in his task of planning and decision making become priority intelligence requirements (PIRs) (Marine Corps Doctrinal Publication (MCDP) 2).

During this phase Marines will analyze their Higher Headquarters (HHQ) operations order and will likely brief each other from either a sand table or terrain model (Figure 26).

Figure 26. A terrain model used for training.

2. Collection

Collection is the second phase of the intelligence cycle. Marines training in the IIT have the opportunity to be evaluated on their ability to accurately collect information during their training evolution. They will learn what information to disregard and what information to share immediately (MCDP 2). Combat information is defined as the "unevaluated" data, gathered by or provided directly to the commander which, due to its perishable nature or criticality of the situation, cannot be processed into tactical intelligence in time to satisfy the user's tactical intelligence requirements. It is the information that must be acted upon immediately in order to get any benefit out of it.

Actions taken during this step might be searching a person or a room. The tools used by the Marines during this step might include their tactical notebook or a camera during tactical site exploitation. This is the step where each Marine enforces the saying of “Every Marine is a Collector.”

3. Processing and Exploitation

Processing and exploitation is the third phase of the intelligence cycle. This is largely a technical function done by the Battalion S-2 section and would not involve the infantry squads training at the IIT. However, it would be beneficial for these infantry

Marines to understand that processing and exploitation converts the data into an understandable form and enhances its presentation (MCDP 2).

4. Production

The fourth phase of the intelligence cycle is *production*, the activities by which processed data is converted into intelligence products (MCDP 2). This is a step primarily conducted through the efforts of the intelligence section. These products (Figure 27) could resemble a High Value Individual (HVI) list or Modified Combined Obstacle Overlay (MCOO).

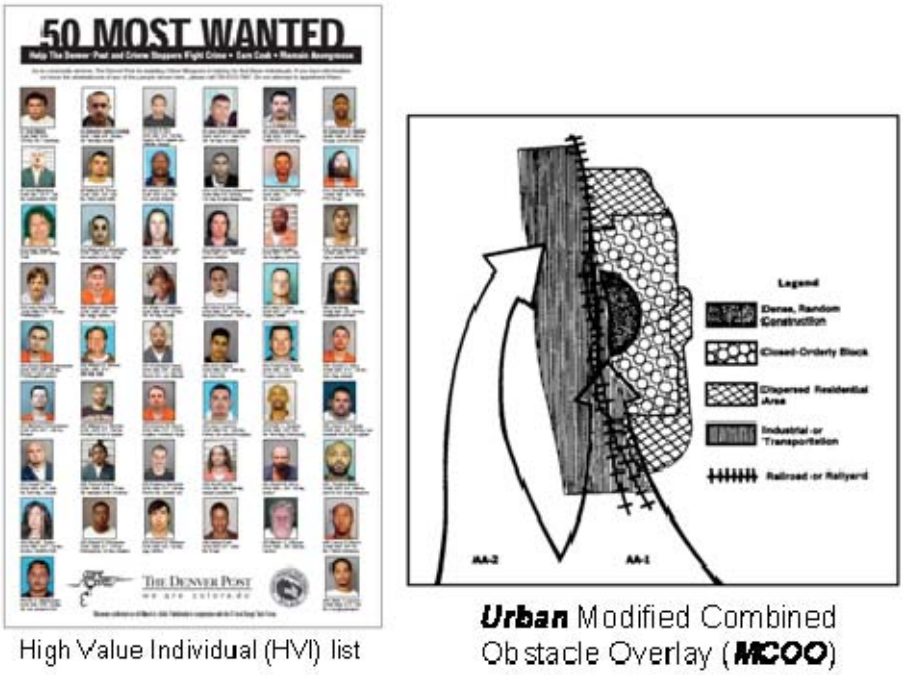

Figure 27. Intelligence products to be used by Marines.

5. Dissemination

The fifth phase of the intelligence cycle is *dissemination*, the timely conveyance of intelligence in an appropriate form and by a suitable means to those who need it (Figure 28). Depending on its importance and time-sensitivity, intelligence may be

disseminated—*"pushed"*—directly to users or it can be sent to an accessible data base from which commanders can *"pull"* that intelligence which they need (MCDP 2).

It is during this phase of the intelligence cycle where Marines implement the saying, "Every Marine is a Reporter."

Figure 28. Intelligence tools for Dissemination.

6. Utilization

The final phase in the intelligence cycle is *utilization* (Figure 29). The commander may provide direction, information may be collected and converted into intelligence, and the intelligence may be disseminated, but unless that intelligence is exploited through decision and action, it has served no purpose. Utilization is not a function of intelligence per se, but rather of command and control—making the decision and then carrying it out. This reinforces two important points: first, intelligence has no value for its own sake but assumes value only when acted upon; and secondly, intelligence is inextricably linked to command and control. *No one phase of the intelligence cycle is more important than the others—they are interdependent* (MCDP 2).

Figure 29. The final step of the intelligence cycle—Utilization.

B. INTEGRATION OF FULL INTELLIGENCE CYCLE IN TRAINING

Although much effort has been dedicated on technology to support the training at the IIT, there is still much work to be done with the fundamentals at the Squad, and Fire Team levels. In a real combat environment, intelligence drives operations; however, this "train as you fight" concept has not reached fruition in the current setup at the IIT; intelligence is minimally factored into the training. This, we believe, could and should be appropriately addressed. Following review of the identified segments of training that could be improved, we will present training recommendations that can fully integrate all phases of the intelligence cycle and will better prepare the Marines for mission accomplishment in a combat environment.

The most distinctive portion of this thesis is the unprecedented practice of completely integrating the intelligence cycle into the infantry simulation training within the virtual environment of the IIT and instilling the concept of "Every Marine is a Collector, and Every Marine is a Reporter." Without question, the IIT could become the classroom of the future for the ground-pounding leathernecks to experience combat as close to reality while at the same time learning how to remain focused when surrounded by the chaos of battle. Today's young Marines thrive for new technology and the intensity of the training at the IIT fully grasps their undivided attention and fits distinctly

with their learning style. The IIT is designed to replicate the chaos and confusion of close-quarter battle as well as the situations that incorporate tactical cultural awareness and address ethical issues that Marines may encounter in an urban conflict.

The primary purpose of this thesis is to validate the need for an emphasis on the integration of the intelligence cycle supported by advanced technological solutions to more successfully train and measure the usefulness of their training at the Infantry Immersive Trainer located at Camp Pendleton, CA. In order to fully support this objective, our thesis will provide a plan for a location and configuration of a Squad Planning Operations Center (SPOC) within the IIT for Intelligence Briefs and After Action Reviews (AAR)/Debriefs.

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V. CASE STUDY OF COC OPERATIONS

A. GHANA: AFRICAN CONTINGENCY OPERATIONS TRAINING AND ASSISTANCE (ACOTA) MISSION

This chapter relates to a case study conducted by the author to examine a foreign military's Combat Operations Center (COC) functionality and how that experience was used to gain a fresh perspective on such operations.

This section provides a description of the training event, its timeline, and relevant after action comments. We comment the lessons learned and provide the recommendations that were transferred to our main study.

1. ACOTA—Ghana CPX (15-26 September 08): General Information

- **Mission:** The purpose of the exercise was to prepare a Ghanaian battalion commander and his battalion staff for deployment on a United Nations Mission in Congo (MONUC).
- **Who, When & Where**:
  - Ghanaian Armed Forces (GAF), composite Battalion (Bn)
  - Burma Camp, Accra
    - The author was one of four U.S. Marine officers assigned to support this training mission.
- **Training:** The training consisted of one week of a Command Post Exercise followed by one week of a computer-assisted exercise (CAX) [utilizing Joint Army Navy Uniform Simulation (JANUS)]. JANUS is an interactive, digital simulation of combined-arms warfare named after the Roman god, "Janus," who guarded Rome's city gates (Massachusetts National Guard, 2009).

- **Schedule:**

During Week 1, the Marine mentors engaged their staff counterparts (Figure 30) during the practical exercise of the orders development process; the examples of how the mentors have tackled problems and planning considerations were also provided.

  - Week 1:
    - Day 1: Introduction/Issue of Bde order (Mission Analysis and back brief)
    - Day 2:COA Development (COA Brief)
    - Day 3: COA Wargame (COA Decision)
    - Day 4: Orders Development
    - Day 5: Bn Orders Briefs (Rehearsal of Computer Assisted Exercise, for Bn staff and exercise Controllers)

Figure 30. A Marine mentor working with his Ghanaian counterpart.

During Week 2, the Marine mentors combined a mixture of filing the billet of a Higher HQ staff Officer and their staff counterparts, ensuring that any personal experiences or planning considerations observed are accounted for.

– Week 2:

• Day 6-10: Computer-assisted exercise, to include the use of role players. The battalion was provided with the scenarios that tested the Battalion order. The scenarios involved all warfighting functions. The scenarios became progressively more challenging and they were developed from a UN Chapter VI to Chapter VII scenario.

• Marine mentors also considered the issues such as information flow within a staff section as well as with other elements of the staff. COC setup also played a role in assisting the Bn to interact.

After Action Comments:

a) **Topic:** Situational Awareness

Discussion: During week 1, the Bn practiced the Military Decision Making Process (MDMP) and received periods of instruction on the process by the instructor cadre. Student briefs were organized, well delivered and supported by visual products. Week 2 saw a shift to some old habits, (i.e., getting away from the map to brief off and a lack of visual products to support the presentations, causing situational awareness to be hampered to a degree).

Recommendation: Continue to refine and update products. Just because one makes a product once does not mean it is completed. One must get the feedback and find new information, then develop new products to give improved Situational Awareness.

b) **Topic:** Operational Rhythm

Discussion: The author of this thesis provided a period of instruction on the topic of "Operational Rhythm" during week 1. The ACOTA prepared slides were very useful and well organized, allowing the instructor to step in and deliver a quality presentation. This presentation pointed out the good work that was completed during week 1 by the Battalion staff, and introduced how the prepared products could now be summarized and

re-created to have even more training value during week 2 when the pace of activity would be increasing. The S-2 received the input very well and was able to generate useful products to support his staff level function.

Recommendation: To improve Operational Rhythm, consolidate and summarize known information to allow an individual to better analyze and assess new information as it comes in. Prioritize all requirements, and then act in a manner to quickly satisfy them. Doing so will give an advantage over the adversary.

c) **Topic**: Follow-through

Discussion: When the battalion assigned tasks to companies, they did not have a process for following through to ensure that tasks were actually completed. Likewise, when companies requested support from the battalion (and support was approved), they did not have a process to ensure that the action was ever completed. These failures to close the loop often created confusion when tasks were not accomplished because the companies and/or battalion assumed that the tasks had already been completed.

Recommendation: Ensure a solid process is in place to follow up on assigned tasks. Establish estimated times for tasks to be completed, and if status of the task has not been given to you after the estimated time has passed, ask for it. This will ensure a push-pull system to follow up on all assigned tasks.

B. USMC COC OPERATIONS

Infantry squads are most likely to communicate directly with either a company or battalion level COC. The COC is the cornerstone for the Marine Air-Ground Task Force Command and Control (MAGTF-C2) concept. Within MAGTF-C2 concept, information is integrated, aggregated and distributed from disparate Marine and Joint C2 and ISR systems to users at all echelons—from the command center to the individual Marine (General Dynamics, 2007).

The following lessons learned from this case study supported our research goals for finding a way to improve IIT training through integrating intelligence activities:

1. Infantry simulation training must find a way to integrate situational awareness activities by creating a changing environment where information is collected, then analyzed for intelligence value and refined into updated intelligence products that are then disseminated for the next training scenario.
2. Infantry simulation training must find a way to test a unit's Operational Rhythm and create a stressful environment were units must prioritize requirements, and then act in a manner to quickly satisfy them.
3. Infantry simulation training should create a chaotic atmosphere that challenges a unit's ability to clearly communicate task completion.

Our main study COC would need to replicate the planning, collection efforts, dissemination, and utilization of intelligence and employment of communication procedures expected to be executed by the infantry squads during combat.

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VI. PILOT STUDY

A. INTRODUCTION

This study sought to explore whether the integration of an Augmented Combat Operations Center (A-COC) to the IIT would improve current training practices. Despite the substantial effort dedicated to the technology used to support this training, much work remains to be done with the fundamentals at the squad and fire team levels. In an actual combat environment, intelligence drives operations; however, this "train as you fight" concept has not yet reached fruition in the current setup at the IIT; intelligence is minimally factored into the training. It is our intention to introduce a framework within which it will be possible to support and have a process that supports the integration of the full intelligence cycle.

B. RESEARCH HYPOTHESIS, EXPERIMENTAL SETUP AND METHOD

1. Research Hypothesis

Training at the IIT, even though highly advanced during the actual training run, makes no use of information technology during its briefings. Most pre- and post training briefings are conducted in a yard outside the IIT. Even though teams arrive as a pre-trained unit at the IIT, it is hypothesized that improvement in the team briefing processes may be possible to achieve. Information technology equipment in an A-COC was used to enhance the briefing experience as well as the team's interaction prior to and after conducting a patrol. The theory was that teams would get a better understanding of their individual objective and experience higher team cohesion. It was also hypothesized that they will experience different team interaction dynamics, resulting in a higher performance than without the use of an A-COC.

We established the following hypothesis:

H0 (Null hypothesis): There is no difference between the teams being briefed in the atrium of Watkins Hall and those using the A-COC.

HA (Alternative hypothesis): Teams receiving augmented pre- and post-action briefings within an A-COC will experience different team interaction dynamics resulting in higher performance than those not using an A-COC.

2. Experimental Setup and Procedure

a. Participant Selection and Team Interactions

A convenience sample of twenty-three U.S. Marines from Defense Language Institute (DLI), Monterey, CA (21 male and 2 female) participated in this pilot study. The mean time in service for the participants was nine months; they all had non-infantry Military Occupation Skill designators; and the mean age was 19 years old. Participants were randomly formed into six fire teams of four participants each (except for one fire team that had three participants.)

Fire teams were randomly assigned to form a control group (replicating current IIT briefing procedures) and an experimental group (utilizing the A-COC.)

Possible participants were either NPS or DLI military volunteers. As participants at the IIT are rather young and inexperienced, NPS population was discarded as a possible participant pool, and the very much younger and inexperienced DLI pool chosen instead, as they are thought to be a better represent those at the IIT. Nonetheless, these participants are not good representations of IIT participants and therefore any results of this study are not transferable to the IIT.

Participants not assigned to teams were used as role-players. Besides them not wearing civilian attire, these role-players added additional variance by not being trained for what they depicted. Additionally there were two groups of role-players for the morning and afternoon iterations, adding an additional amount of variance to their depictions. Role-players tend to immerse and identify with their role, adding new elements to their performance on each iteration. To control for these undesirable developments, their actions should be scripted so they do not vary their performance based on whom they encounter or how much experience and inherent improvisation talent they have. We attempted to establish certain level of control by providing the same

briefing to the role players; however, it was very difficult to retain full control once the patrol (experiment) started. Role-players are not actors but scripted encounters, especially within an experiment.

As predicted, small groups will form quite fast, especially since they composed of military personnel who are trained to form teams fast. It might be that the groups that formed the fastest actually ran into team storming issues by the third experiment. This would explain why some teams (especially 3 and 5) were actually getting worse in both their combined process and performance score. On the other hand, it might also be possible that those teams never really ended their forming phase and had serious internal struggles resulting in degrading internal team processes over time. Finally, the different performances by the participants may also be due to chance, as this experiment only generated six data points to measure. Even though it is not possible to determine the cause now, the evaluation sheet should be adjusted to incorporate any observations that might explain these varying performances.

It might also have been interesting to record the sex of the participants, as there were both homogeneous and heterogeneous teams tested. Even though this data might not be of interest at first glance, some interactions might still be explained by the team's composition.

b. Method

This study was conducted over a period of 12 hours. The control group arrived in the morning and the experimental group arrived in the afternoon. Both groups followed the same schedule of events, beginning with refresher training on patrolling and intelligence activities (Figure 31). The participants then received the scenario brief and update briefs with the aid of different media to see if the difference in media presentation impacted training. All six fire teams completed three urban patrols. The participants completed self-report questionnaires and where under direct observation by an observer who also completed an evaluation form on team performance.

Figure 31. Participants receiving periods of instruction.

Consent forms (included in Appendix B) were distributed the day prior to the senior Marine who would be present. It was arranged to have the control group arrive in the morning and the experimental group to arrive in the afternoon. Neither group knew what the other group was doing, only that there would be two groups of participants. The IRB paperwork is included in Appendix C.

All participants completed the survey included in Appendix D. The same questionnaire was used after each scenario (the sections to be filled in Patrols 2 and 3 were omitted as they were identical). Evaluators completed the form included in Appendix E. The same form was used after each scenario (therefore, the portions to be filled in following Patrols 2 and 3 were omitted from this thesis).

The timeline of events (included in Appendix F) began in the same manner for each group:

a. Collect informed consent forms.

b. Deliver two periods of instruction on patrolling and intelligence activities for the group (classroom lecture).

The participants "Higher Headquarters (HHQ)" provided the following information during the scenario and update briefs (MCWP 3-11.3):

a. Designated the area for patrol.

b. Intelligence briefs and updates.

c. Special equipment required for the mission (camera and communications equipment.) was replicated with cell phones in place of actual military equipment.

d. Urban maps, photos, as required.

e. Prescribed rules of engagement (ROE).

The control group was taken out of the classroom setting and into a lobby area where the Operations/Intelligence brief was read to them (Figure 32). The scenarios are included in Appendix G. The teams then began to plan and rehearse for their assigned patrol mission. Each subsequent update brief and debrief took place in the same lobby area without the other teams listening in.

Figure 32. Participants receiving their briefing in the foyer.

For the experimental group, the participants were presented the identical scenario in the same classroom used for instruction, which now served as the A-COC (Figure 33). This group received a PowerPoint presentation of the Operations/Intelligence brief and had a high-resolution image of the first patrol route available to them for planning and After Action Review (AAR). Teams in this group were also afforded space on the walls to hang up intelligence products that they created based on the information gained during the conduct of their patrols.

Figure 33. Participants conducting planning in the A-COC.

The scenario that has been utilized in IIT training was modified to meet the needs of this pilot study. The tasks for each of the three scenarios remained similarly intact to satisfy problem solving by requiring the participants to plan, re-plan, and engage in multifaceted decision-making within the situations presented during their patrols where information was at times unclear. This study's scenarios were based on two separate briefing processes, where the participants were tasked with gathering information on the local atmospherics of their area of operation and the level of enemy activity in that area while under time constraints, to facilitate peace in their assigned area of operation. The solutions were complex; they included:

a. Gathering physical intelligence on enemy activity.

b. Gathering HUMINT on enemy activities, as well as local leadership attitudes and atmospherics towards our friendly forces through an interview with the local Chief.

To see the type of tasks to be completed in more detail, please observe the script layout for Patrol 2, which is illustrated in Figure 34.

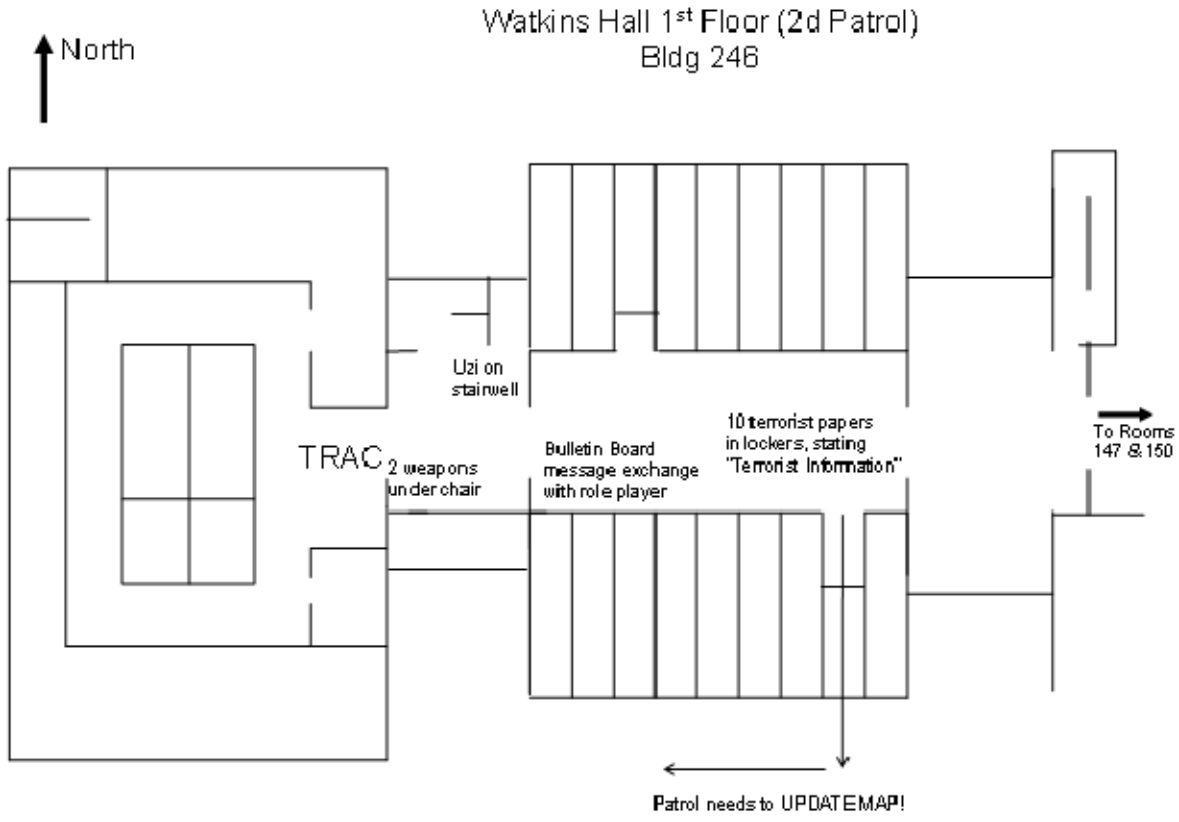

Figure 34. An example of a script layout for the evaluator; listing the tasks to be completed by the fire teams.

The experiment was executed around and inside the first and second floors of Watkins Hall of the Naval Postgraduate School (NPS), Monterey, CA. The control group received all their situation updates and debriefings inside the main foyer of Watkins Hall. The experimental group was briefed inside a classroom (i.e., the A-COC) fitted with selected Information Technology (IT) infrastructure, allowing the teams to further plan and talk through their next patrol, as well as debrief their patrols.

The first experiment was set up to introduce all possible encounter types that would be seen during experiments two and three. It was set up outside Watkins Hall. Participants were training their basic patrolling skills and interaction with non-hostile civilians. The patrolling route at first is wide open, but later forces the teams to group

more densely, as is required inside the buildings. Participants learn to accept the evaluator is present, taking notes and acting as the remote command radio operator on the fire team's replicated reports and situation updates [through the use of cell phones verse actual military equipment].

During the second experiment, participants are to patrol a long narrow corridor depicted by the downstairs corridors of Watkins Hall, at the end entering the second foyer. Participants are forced to interact with local population that is not speaking good English. Participants are expected to search for and recover information of intelligence value (Figure 35), update area maps that are inaccurate, and find and report a weapons cache.

Figure 35. Participants collecting items of intelligence value.

In the final experiment, interaction and reporting are most assessed. After patrolling through confining spaces and interacting with a civilian using a walkie-talkie, the team leader has to make a choice as to go left or right into a mostly identical corridor. When turning right, the team discovers a room full of weapons and enemy intelligence, and then a local chief and his armed guards (Figure 36). If turning left, first the chief and then the weapons, possibly hinted at by the chief, are encountered.

Figure 36. Participants' arriving at the local chief's residence.

Weapons handled by the participants are fully functional softair M4 and Colt 1911 replicas. Weapons and IEDs hidden on the three patrol courses are blue and red colored dummy rubber weapon. These dummies are the correct size and weight as a real weapon but have no functional components.

Post-task (post-patrol) survey measures contained multiple items focused on understanding the mission, teamwork, and task outcome, recorded on six-point and seven-point Likert scales, as well as short answer responses and basic demographic items.

Before and after each patrol the participants and evaluators were afforded time to fill out their survey questionnaires. Patrols lasted anywhere from 20-30 minutes and at the 30-minute mark were required to ENDEX due to time constraints. The participants were dismissed after they completed the third post-patrol survey.

C. RESULTS

This section elaborates the results collected by the evaluators; where applicable we describe and visualize them graphically. The evaluations of the third patrol conducted by the team three were not recorded (the evaluator forgot to fill in the evaluation sheet). The data was then analyzed and is described statistically. Due to the missing data, any tests on the control group as well as inter-group comparisons have less statistical significance. Figure 37 describes the individual team scores of experiment one through three from 1 (low) through 6 (high). Data for cohesion and team-play are inverted. Notice the missing data on team 3, Experiment 3.

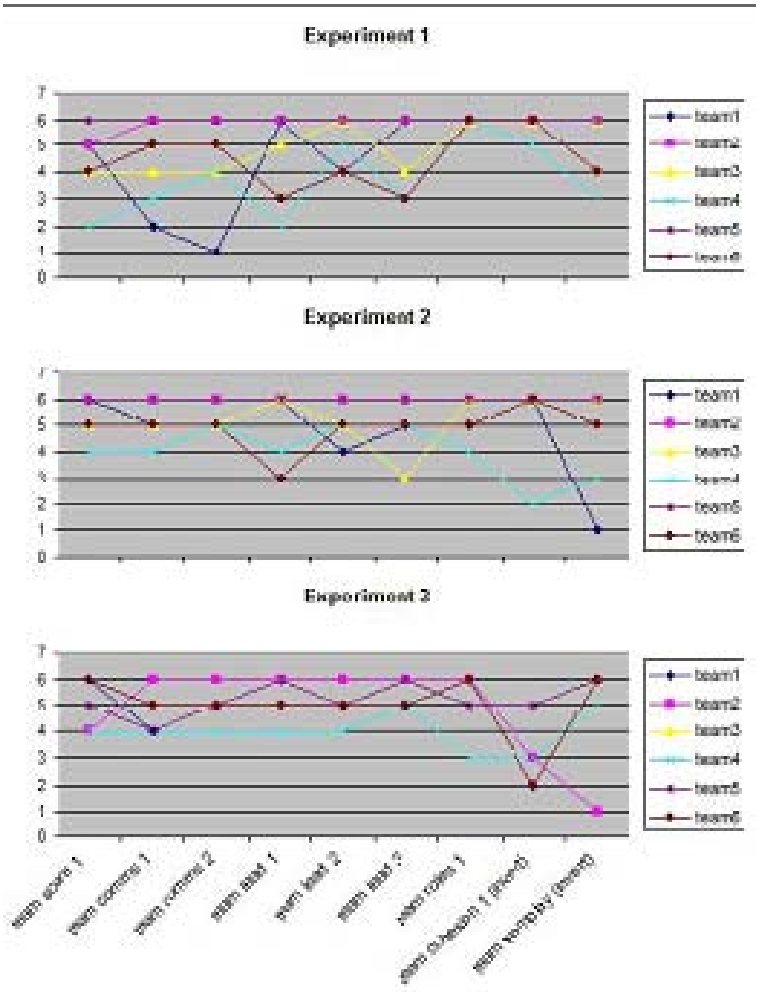

Figure 37. Individual team scores for experiments 1 through 3.

1. Team Performance by Task

Team-performance and team-cohesion levels varied strongly. Overall the grades given by the evaluators are skewed towards higher scores, only one evaluator plotted scores of 2 and below, even though the teams training level was very basic.

Observed team motivation did not change during the three experiments for any team. Team performance and team processes all increased over the three experiments, even if this were not always reflected in the teams overall score. Overall, improvements are higher from the first to the second than in between the second and third experiment.

The individual result tree (Figure 38) is generated by determining the median of the team processes and the normalized team performance data. The median is used as the data is ordinal in nature.[1] The data seems to be skewed towards top scores. Also interesting is that team performance and team processes appear not to be interdependent.

One of the questions asked whether an informal leader emerged other than the dedicated team leader. This is observed in 4 out of the 18 trials.

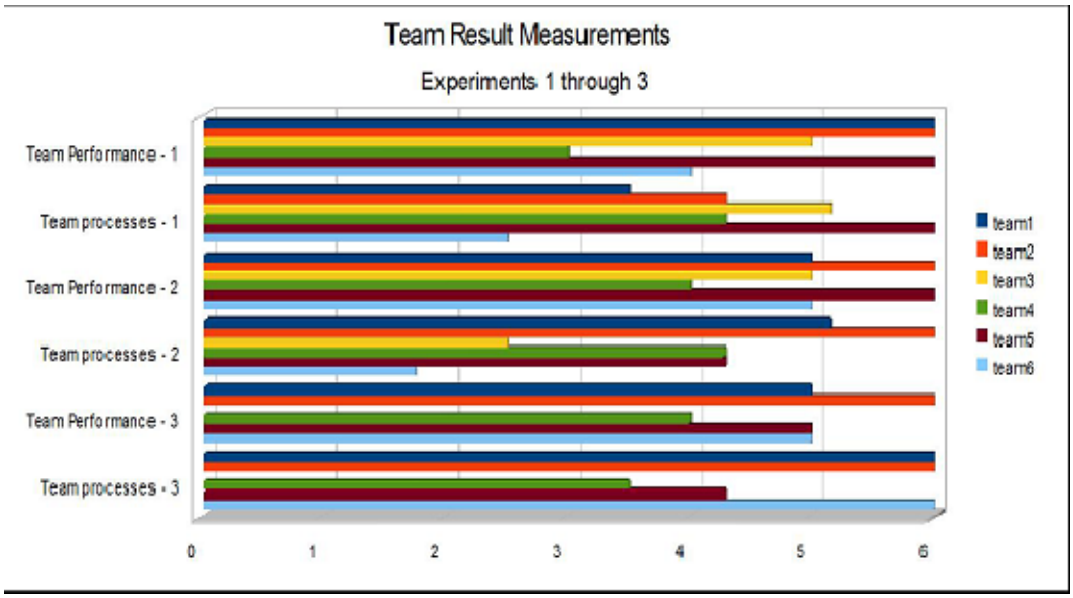

Figure 38. Team performance vs. Team processes in Experiments 1 through 3.

2. Analysis

A mistake noted during data analysis was that all questions should have been in the form of seven-point Likert scale questions vice six-point. The error was corrected for this analysis by converting the seven-point Likert scale to be able to construct a common measure. This was one of many learning points discovered during the conduct of the pilot study. A great deal of time was later devoted to the creation of the survey questionnaires for the main study conducted at the IIT. It was identified that the questionnaires should include predominately seven-point Likert scale questions to better assist during the data analysis process.

[1] Please see the conclusion at the end of this chapter for further explanation.

Additionally, the evaluator forms needed to be improved to support more "Yes/No" questions, as well as adding extra space to support journal entries to remind the evaluator of the five Ws (Who, What, Where, When, Why?) to assist during the AAR. Good examples of Yes/No questions (to later be used in the main study) include the following (MCWP 3-11.3):

- Did the Patrol Leader use proper formations for the movement?
- If contact was made with the enemy, did the Patrol Leader take appropriate action?

It was also decided that based on participant military experiences, the main research survey would conclude by asking questions involving thoughts on the IIT's overall training effectiveness. The questions would be in the following format using a seven-point Likert scale:

- The IIT was an effective way to train me how to patrol in an urban environment.
- The IIT was an effective way to train me how to patrol in an urban environment versus other urban environment training that I have done in the past.
- Having experienced actual urban environment patrolling, the IIT was an effective way to train me how to patrol in an urban environment.

To conduct independent variable t-tests comparing the control and experimental groups the following questions were planned to be asked of the participants (again, using the seven-point Likert scale):

- This IIT training improved my urban patrolling skills.
- This IIT training improved my information gathering skills.

With this knowledge gained, we continued forward on our analysis of the data. Using a histogram and overlaying a normal distribution (Figure 39), it is visibly determined that the team performance and team process scores are not normally

distributed (σ = 4.75; SD = 1.17). Therefore any statistical analysis of the data is performed using nonparametric tests. This reduces the power of those tests significantly, especially as the number of measures is small to begin with.

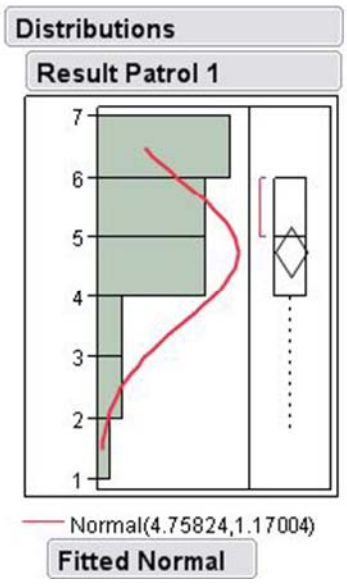

Figure 39. Distribution of ratings shows no correspondence to normal.

A dilemma is encountered as the data for this analysis is collected by Likert and ipsative scales. Even though in psychological and human factors research Likert scales are accepted to contain interval data, this is not the case with ipsative scales. This results in a test on ordinal and not interval data, and reduces the power of any statistical test.

For all tests an α—score of significance at the 0.05 level is chosen.

Within Experiments Comparison

The first evaluation on the data is a test to determine if there is significant difference between the six teams within the three experiments. A Wilcox Signed Rank Test of nonparametric data is used on the data. Figures 40-42 show the boxplots for the data collected.

For Patrol 1, fire teams 4 and 6 were the only teams who performed completely below the mean, making the control group the better performers overall for Patrol 1. The analysis for Patrol 1 is summarized in Figure 40.

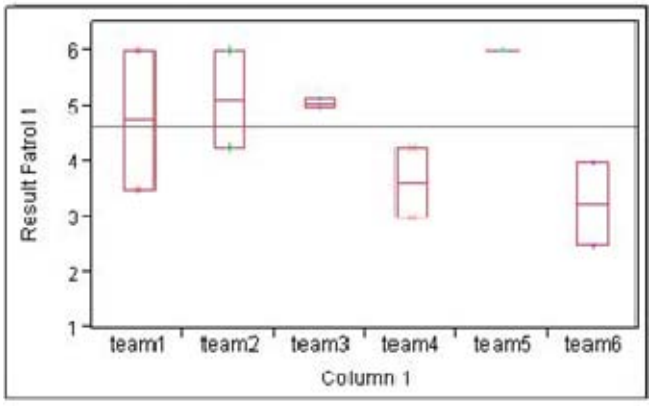

Figure 40. Comparison of each fire team's overall performance during the 1st Patrol.

For Patrol 2, we see fire team 4 again performing completely below the mean. On this occasion, they were the only team to do so, although fire teams 3 and 6 were not much better. However, for a second time we see fire team 6 performing poorly when compared to the remaining fire teams. The control group and the experimental group were similar in nature, but again we see the control group being the better performer. The analysis for Patrol 2 is summarized in Figure 41.

For Patrol 3, we are missing the evaluator data for fire team 3 because the evaluator failed to fill in that information and this error was not identified until the data analysis phase of the pilot study. This is yet again another lesson in supervision of the experimental process. When collecting forms, they need to be thoroughly inspected before letting the individual turning it in depart the area.

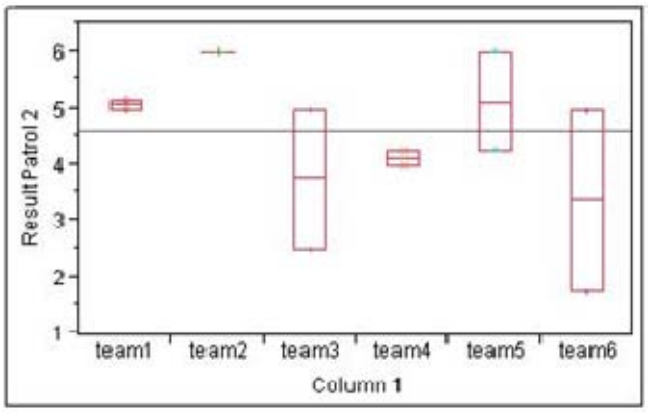

Figure 41. Comparison of each fire team's overall performance during the 2nd Patrol.

As for the data analysis of Patrol 3, we again we see a poor performance by fire team 4. Additionally, fire team 4 and fire team 5 were the only teams to completely fall below the mean. Of note is the marked improvement by fire team 6. Even without the data for fire team 3, we see for a third time the control group performed better. The analysis for Patrol 3 is summarized in Figure 42.

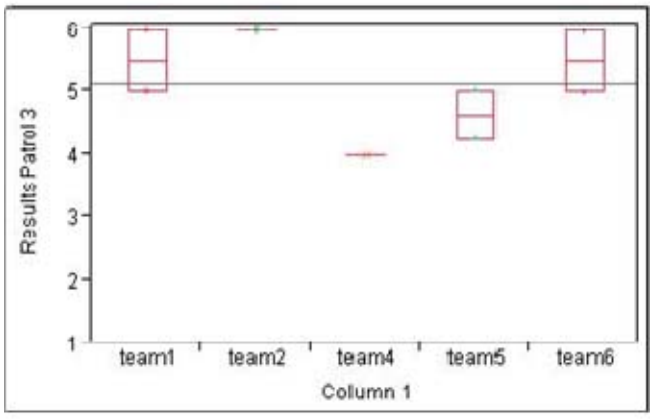

Figure 42. Comparison of each fire team's overall performance during the 3rd Patrol.

Data calculations for within experiments analysis of patrols 1 through 3 spanning all groups is explained further here. The results for all tests show no significant differences between the six teams. The probability to observe the studies results is

between 12% and 25%. The results for experiment 1 are: prob > χ^2 = 0.23, for experiment 2: prob > χ^2 = 0.25, and for experiment 3: prob > χ^2 = 0.12. The same test is used to determine differences between each team in each group within each experiment. This also results in no statistical significant differences (p = 0.187). To allow for these tests, the observed performance scores for each experiment where summed and then compared.

Additionally, the sample sizes are rather small and therefore not very convincing. It is also a threat to validity of these tests. Observe the missing data in Figure 39 for team 3 within the control group. This test was done on summed data, such as not to compare dependent data on a χ^2 test.

Within Groups Comparison

Even though the six teams are not significantly different within each test, this does not mean there is no difference between the control and experimental groups overall. To test for this a contingency analysis of the groups is performed and a 2 statistic for difference computed. The resulting χ^2 statistic shows that the two groups have no statistically significant differences with t = 0.248 (Figure 43).

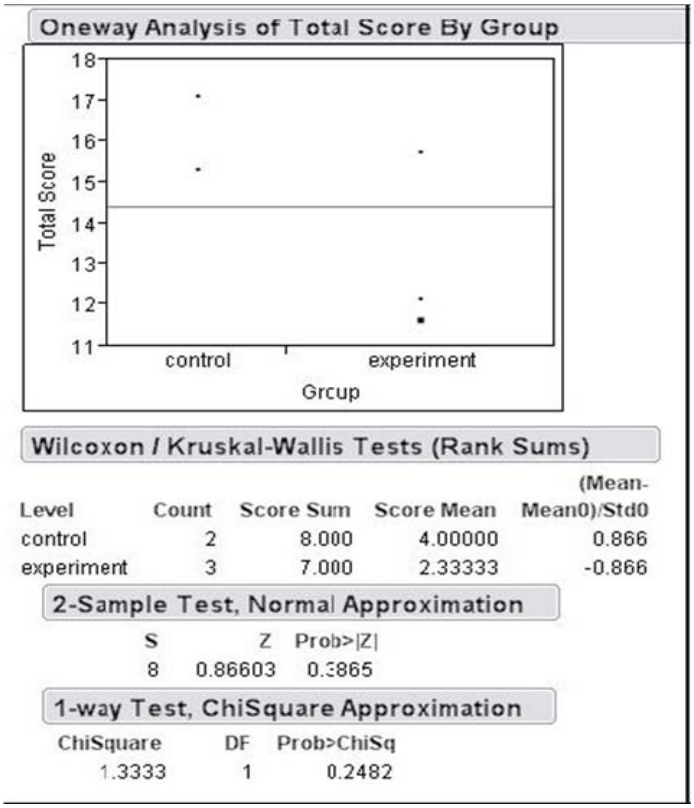

Figure 43. χ^2 test for difference returns no significant result for differences between the two groups.

χ^2 statistics using a nonparametric test on interval data was employed as a comparison using Pearson's ρ is not permissible due to the data being not normal, ordinal and dependent at least within teams. Figure 44 illustrates the overall test for difference between the control group and experiment group. This test, contrary to the ordinal nature of the collected data, assumes interval-type scales and normal data. It was performed to show how the use of ordinal data scales influenced the results, as with this statistic there is a significant difference in between the two groups with $\rho(1) = 0.035$. This test is not allowed as a) the data is not normal b) the data is ordinal c) there is interdependence in the data used for this test. Each team gains experience in each experiment and this is influencing the second and third experiment's score. Therefore, the data is dependent. χ^2 test assume independence of the data. Additionally, each experiment generates two scores for each experiment, a process score and a performance score. These two scores are also interdependent.

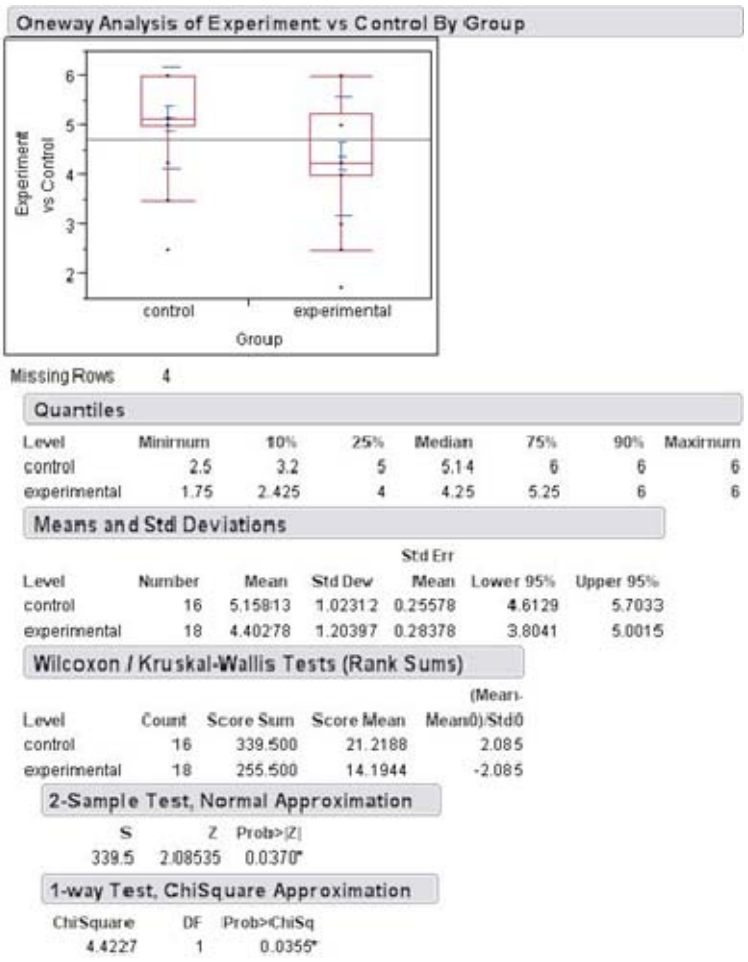

Figure 44. Overall test for difference between the control and experimental groups.

A mean score for each group within each experiment was computed. The results of each team were then summed. The resulting number is assumed to be on a quasi-interval scale, thus being permissible for a χ^2 statistic. Summing the data will also prevent any influence of the Yule-Simpson effect (Simpson, 1951).

The emergence of an informal leader is speculated to have an effect on the teams overall performance. According to Bacal (2008), informal leadership in a small group may either have a positive or negative influence on performance based on the actions of the dedicated team leader. In this study, the emergence of an informal leader is not shown to have statistically significant effects. Neither a low performance nor low team process score nor a high performance and high team process score is associated with the

emergence of an informal leader. Performance and cumulative team process score are not correlated. A team can exhibit a high performance score and have a low cumulative process score. Predictions of a team's performance on the basis of team processes overall explains only 22% of variance.

The experiment results are expected to be encountered about 17 out of 100 times. The null Hypothesis of no significant differences by the use of an A-COC is therefore retained.

Figure 45 compares the mean results of the control versus the experiment group. Data is normalized from 0 through 6. The control group has a mean rating result of 5.18, while the experimental group has a mean rating result of 4.35. The differences in the result are not statistically significant.

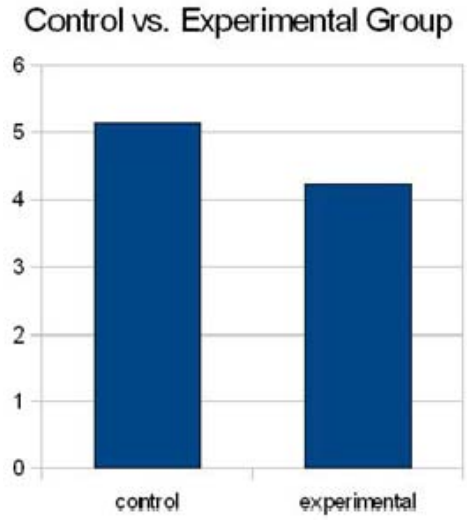

Figure 45. Mean results of the control versus the experimental group.

It must be noted that team three's result vector was omitted from the control group's results, as replacing missing data with the mean of either the whole experiment or the control group mean seemed to be changing the overall result.

D. DISCUSSION

The objectives of this experiment were to see if the introduction of intelligence activities improved performance, while at the same time forcing the individual team members to work together. The three experiments were designed to show how each team is forming and how the team is growing into a cooperating unit.

Choosing Marines that are not part of any specific combat group, are comparatively young and inexperienced in the task at hand is thought to have a higher probability to show any statistically significant effects of an A-COC.

An important objective for the experiment was also to collect information and discover any fallacies and shortcomings of the setup for further research. The most significant aspect of these observations is the improved setup of the evaluators form, and fine-tuning of the questions given to the evaluators.

The primary purpose of this pilot study was to validate the need for an emphasis on the integration of the intelligence cycle supported by advanced technological solutions to more successfully train and measure the usefulness of their training at the IIT. The conduct of this pilot study has provided a great deal of information to improve upon to achieve this objective. To begin with, the recommendation to configure an A-COC within 100 meters from the IIT for the Marine's to receive and conduct their Operations/Intelligence Briefs and After Action Reviews (AARs)/Debriefs (Figure 46) is going to be modified to instead recommend the creation of a Squad Planning Operations Center (SPOC) at roughly the same distance to more satisfactorily meet the needs and requirements for an infantry squad versus a battalion staff.

Figure 46. Participants conducting an After Action Review and Debrief.

Squads do not require a tremendous amount of technical data to prepare for their patrols. Instead, they need easy access to a sand table or terrain model to talk through their plan. This is not to say that technology cannot support the squad, because it can. It just needs to be user-friendly and easily digestible in a short period of time because the squads would rather spend their rehearsal and planning time talking and walking through their standard operating procedures (SOPs) because the level of uncertainty is so high for them that they must prepare for a multiple of contingencies that they might face while on patrol. Pictures and other images that the squad can take with them are useful since they can put this material in their pockets to review as time allows. They are also able to compare pictures that they may have on them to people that they may meet while on patrol, rather than trying to recall from memory. In urban environments, these factors significantly increase and quickly become a challenge if not managed correctly.

An item of interest regarding the A-COC was that we had an inappropriate number of people manning it. The fire teams were too busy preparing for their patrol that they could not access the technology available to them; instead it just became a distraction to their planning. This is one conclusion as to why the experimental group did not outperform the control group. The participants were easily overwhelmed and only one individual had ever even been in an actual Battalion COC, so the technology was not conducive to their planning activities.

Ideally, it would be best to have personnel available to answer any requests for information (RFIs) as they arise so that the squad can continue planning at their level and then have the questions answered at a later time before departing for the patrol. This allows for multiple tasks to be accomplished at once. Many Battalion Intelligence Officer's (S-2's) utilize this technique in Marine Expeditionary Unit (MEU) Special Operations Capable (SOC) units, were the S-2 staff, normally consisting of about five Marines must divide and conquer to satisfy the battalion's multiple RFIs to support overlapping missions.

This information process, utilizing the SPOC, would significantly help to reduce uncertainty for the patrol, while simultaneously generating tempo.

One question that must be addressed is will this new SPOC concept at the IIT lead to an overall training effectiveness and performance improvement? The proper method for evaluating this data will be to collect subjective evaluations coupled with data collected from objective evaluations that will provide the most accurate view of the IIT's effectiveness. The answer to these questions might get us one step closer to improving immersion training for the infantry squads.

1. Limitations and Challenges

Limitations to this study include:

a) Fire teams being put together on the spot rather than from already cohesive units.

b) Using fire teams vice squads; this factor required the fire team to address task requirements that have could have been more widely distributed among a squad (i.e., Enemy Prisoner of War (EPW)/Detainee team, AID/Litter team, Tactical Site Exploitation (TSE) team).

c) Youth and inexperience on behalf of the participants. This became an issue with over-aggressiveness on behalf of the participants who tended to take a hard approach toward the local Chief who could

have provided them with a vast amount of intelligence. However, we did see two fire teams 1 and 6 perform very soundly during this activity.

d) Time was short for the fire teams. They were forced to come together as a team very rapidly. Making mistakes was only natural for them as they began to develop as a team and understand each other's style.

e) The difficult task of trying to replicate a $1.3 million facility and its manning made this a challenging task, but overall, the intentions for this pilot study appear to have been satisfied and we can now begin the planning for our onsite research where many of these problems will be resolved just by being on the actual site of the IIT.

a. Evaluator Variability

Each team was evaluated by a dedicated, overt observer during all experiments. Video cameras were not used during the experiment. The final briefing and after action reviews were captured by video camera for later evaluation. As the observer follows the team during all three experiments, it is possible to observe improvements (Sur, 2004). During all experiments teams were scored on two overall scores, ten teamwork related scores and, for the last two experiments, three improvement related scores. Overall scores are Likert scales, whereas the team scores are ipsative or forced choice scales. There are also free form questions, but those are not evaluated for this thesis.

The independent variable is the use of an A-COC or not. The A-COC is a classroom fitted with multiple laptop computers, an overhead projector and a 26" widescreen monitor. It is important to note that the information given to each team does not differ in content, only in form of delivery (verbal vs. screen, paper vs. projector). Teams are not forced to use the A-COC for planning purposes, but were sent into the A-COC for each debrief. It is hypothesized that teams get a better understanding of their

team members as well as their objectives. Thus, the team forms faster as they can use the time in the A-COC for understanding each other in a collaborative environment. They are also hypothesized to outperform the control group as they act as a team and can therefore interact faster and better than the teams in the control group.

In order to measure team processes, evaluators observe the team's processes and the team performance. A team's performance is objectively rated in relation to objectives briefed prior to each patrol. Team processes are collected subjectively on 12 scales. Three questions collect the role of the team leader, three questions the teams communication, three questions the team-play and one each the teams cohesion, motivation and the occurrence of an informal leader. On the second and third experiment, measures of improvement in communication, teamwork and overall performance are also collected. Measures are recorded on multiple ipsative, a bivariate and a Likert scale.

Due to the date and length of the experiment, it was hard to recruit evaluators. Five evaluators were used for six teams. All evaluators were field officers with recent field experience. The evaluators were not trained on the use and meaning of the questionnaire, and therefore interpreted each question from their own point of view. This resulted in them sometimes contradicting the actual meaning of a question as it was intended to be asked. This insight was gained due to annotations next to the rating scales, which were not requested, but helpful to understand the results. Additionally, no measures of inter-rater reliability were devised. This meant that the observer's scores are actually not comparable, as each evaluator might devise his own baseline. The observer's baseline was instantiated on the first experiment, which was rated, by design, as an easy one. Once the observers rated the participants high in this round, they had difficulty rating them worse on following, harder experiments.

A different problem was experienced by an evaluator not finishing the evaluation. This results in an additional measure of variance and further reduces the validity of the data analysis.

Evaluators should, at best, be involved in working out the questionnaire. At the very least, the evaluators need to have a clear understanding of the meaning of each question, and to be tested for inter-rater reliability. This can be accomplished by showing a video of a patrols performance, and the evaluators independently rating this video. Or, they could be read a patrolling story, after which they individually rate the performance of the patrol. Using this as a template, the scores of all evaluators can be adjusted for equal variance, making the results truly comparable.

b. General Evaluation Setup

Participants also provided data on their experience using a questionnaire. They filled out these questionnaires before and after each experiment iteration. Participant's responses were free form and Likert scale responses. The participant's free form responses are not evaluated for this thesis.

Some of the problems with analysis validity are also inherent in the setup of the experiment and the evaluation sheet. The first problem in the execution of the study was time allotted per team and experiment. During the experiment, time granted for the teams to practice and rehearse as well as time to execute each patrol varied significantly. While some teams had more than half an hour to prepare and another half hour to execute their patrol, some other teams prepared and executed their patrol within half of that time. As the teams were just forming, these differences in training and execution time may have had some significant interactions within team processes measured.

Besides training time, the number of teams and experiments conducted was just too low. With three teams on three experiments each, in between two to eight degrees of freedom are possible. These are low degrees of freedom for any statistical test. Therefore, any statistics will show a high variance, and have low power. A higher number of both participants, as well as experimental conditions are desirable. The groups should each perform in at least seven experimental conditions, and there should be at least eight teams for each independent variable tested. For the IIT experiment, as the

teams should have formed during the training leading up to the IIT, a within subjects design, controlled for order effects, might be desirable.

Finally, the design of the evaluation sheets and questionnaires was done without having any later evaluation in mind. The design was done on grounds of the research question only, and even that process was hastened. Usually, after the research question is stated, a hypothesis is developed. On basis of that hypothesis, statistical tests are evaluated and chosen. The requirements of each test are duly noted. After this is finished, questions allowing for the statistical procedure chosen are developed, as explained earlier. Using this approach, a good statistical test may be employed to get answers from the data collected.

2. Conclusion

This study observed and collected data on formative team processes in the course of a pilot study testing the design of a planned experiment at the IIT aboard Camp Pendleton, CA. It was hypothesized that participants of the group using the A-COC would benefit from this experience. It was thought that they would experience better team processes resulting in a better performance than the control group. The control group was not using an A-COC for pre- and post briefings.

Contrary to the hypothesis, the null hypothesis of no difference in between the two groups was retained. This unexpected result is probably due to several causes. First, there were deficiencies in the planning, setup and execution of the study. Secondly, the participants of the study had not enough experience in conducting the range of tasks they were asked to perform in the study. Third, the data collection was unsatisfactory, both by design and by the untrained observer's variability. Finally, due to all the precious shortcomings, the statistical tests allowed were weak and could not refuse the null Hypothesis. This does not imply that the A-COC does not have any effect. At this time, it demonstrates that the setup did not allow any possible effects to have any statistical significance.

The pilot study did have a significant effect insofar as it explicitly shows areas in need of improvement for a future study. As this is the main task of a pilot study, and any true results are but a bonus, we consider this study a huge success.

Following review of the pilot study data, we were able to plan accordingly for our main research collection effort.

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VII. INTEGRATION OF THE INTELLIGENCE CYCLE AT THE IIT: MAIN STUDY

A. INTRODUCTION

This main objective of this thesis is to explore whether the integration of a full intelligence cycle to the IIT would result in better unit performances and improve current training practices in this training facility. Despite the tremendous effort already dedicated to the technology used to support the training at the IIT, much work remains to be done with the fundamentals at the squad and fire team levels. In an actual combat environment, intelligence drives operations; however, this "train as you fight" concept has not yet reached fruition in the current setup at the IIT; intelligence is minimally factored into the training.

The main study was conducted over a two-week period. The control group participated during the first week utilizing current IIT training procedures and the treatment group participated during the second week utilizing a Squad Planning Operations Center (SPOC) for planning purposes. Both groups followed the same schedule of events, beginning with training on intelligence activities. The participants then received the scenario brief and update briefs from their unit's leadership. All participants completed anywhere from three to five patrols through the IIT. The participants completed self-report questionnaires and where under direct observation by observers who also completed an evaluation form on the squad's performance.

B. FUNCTIONAL ANALYSIS

Based on our observations of the current approaches and trends at the IIT, we have completed a functional analysis for training in this immersive environment.

Assumptions:

The following assumptions regarding the structure of the team and the training situation have been established and accepted for all scenarios conducted in IIT:

i. Patrol leader is a Junior Officer or Non-Commissioned Officer (NCO).

ii. Assistant patrol leader is a Staff NCO or NCO.

iii. Medical support is available.

iv. This is a combat patrol.

Initial State: Receive Patrol Mission

We list our overall training goals here:

1.0 GOAL: Patrol Planning (Patrol Leader/Assistant Patrol Leader).

Individual tasks required to satisfactorily complete the goal of patrol planning:

1.1 OPERATOR: Go to Squad Planning Operations Center (SPOC) to receive Mission Brief (cognitive).

1.2 OPERATOR: Report to company-level intelligence cell (CLIC) to receive intelligence brief/report (cognitive).

1.3 OPERATOR: Ensure adequate security/logistic support for patrol/mission (cognitive/perceptual).

1.4 OPERATOR: Ensure adequate medical support for patrol/mission (cognitive/perceptual).

1.5 OPERATOR: Ensure adequate combat engineer/breeching support for the patrol/mission if necessary (cognitive/perceptual).

1.6 OPERATOR: Ensure operational check of all communications equipment is accomplished (cognitive/perceptual/motor).

1.7 OPERATOR: Establish and maintain kill sheet (cognitive/perceptual).

1.8 OPERATOR: Ensure all equipment and vehicles accounted for (cognitive/perceptual).

1.9 OPERATOR: First echelon maintenance check on all vehicles/fuel levels if necessary (cognitive/perceptual/motor).

1.10 OPERATOR: Ensure extra fuel containers/water containers are full (cognitive/perceptual/motor).

1.11 OPERATOR: Ensure logistics requirements met for patrol—food, water, gear (cognitive/perceptual/motor).

1.12 OPERATOR: Brief drivers/assistant drivers: Patrol Brief (cognitive/perceptual).

1.13 OPERATOR: Final Brief to Watch Officer in SPOC (cognitive/perceptual).

1.13.1-turn in final manifest of gear and personnel (cognitive/perceptual).

1.13.2-ensure adequate copies of kill sheet (cognitive/perceptual).

1.13.3-final communications check (cognitive/perceptual/motor).

Learning Outcomes

Examples of Learning Cognitive Objectives:

a) The student will receive the Mission Brief and understand its intent.
b) The student will be able to receive the Intelligence Brief/Report and discern what is pertinent to his mission.

Example of Perceptual Motor Learning Objective:

a) The student will ensure operational checks of all communications equipment.

2.0 GOAL: Immediate Actions on Patrol

Individual tasks required to satisfactorily complete the goal for immediate actions on patrol under the following circumstances:

2.1 GOAL: Ambush

2.1.1 OPERATOR: Men/Vehicles in the kill zone immediately get out of the kill zone (cognitive/perceptual/motor).

2.1.2 OPERATOR: Men/Vehicles not in the kill zone immediately seek cover and lay down suppressive fire in the direction of the ambush (cognitive/perceptual/motor).

2.1.3 OPERATOR: Assault through the enemy (cognitive/perceptual/motor).

2.1.4 OPERATOR: Consolidate, Communicate, Patrol Leader makes the call whether to abort or complete mission (cognitive/perceptual).

2.2 GOAL: Improvised Explosive Device

2.2.1 OPERATOR: Men/Vehicles in the kill zone immediately get out of the kill zone. It could be an ambush (cognitive/perceptual/motor).

2.2.2 OPERATOR: Men/Vehicles not in the kill zone immediately seek cover and prepare to lay down suppressive fire (cognitive/perceptual/motor).

2.2.3 OPERATOR: MEDEVAC procedures, follow-on, possible communication to call in for close air support, request MEDEVAC, etc. (cognitive/perceptual/motor).

2.2.4 OPERATOR: Consolidate, Communicate, Patrol Leader makes the call whether to abort or complete the mission (cognitive/perceptual).

2.3 GOAL: Obstacle or Chokepoint ahead

2.3.1 OPERATOR: Send some of security attachment ahead to investigate (cognitive/perceptual/motor).

2.3.2 OPERATOR: If necessary, send Breeching Team to breech possible obstacles, explode necessary devices, open up chokepoint if possible (cognitive/perceptual/motor).

2.3.3 OPERATOR: Seek cover if stopped; prepare to lay down suppressive fire (cognitive/perceptual/motor).

Learning Outcomes

Examples of Learning Cognitive Objectives:

a) If ambushed, the student will be able to assault through the enemy.

Example of Perceptual Motor Learning Objective:

a) If ambushed, the student will ensure all Men/Vehicles not in the kill zone immediately seek cover and lay down suppressive fire in the direction of the ambush.
b) If faced with an obstacle, and if necessary, the student will send the Breeching Team to breech possible obstacles, explode necessary devices, and open up chokepoint.

Example of an Attitude/Affective Objective:

a) The student will engage in successful interaction with other patrol members through effectively sharing information and relaying necessary communications up and down the chain of command.
b) The student will show courtesy to foreign citizens (role players).
c) The patrol leader will trust senior leadership to provide additional fire support if required.

3.0 GOAL: Mission Complete, Post-Patrol Brief

Individual tasks required to satisfactorily complete the goal for mission completion and post-patrol brief:

3.1 OPERATOR: Patrol Leader Report Immediately to SPOC your destination to give intelligence brief/report of situation on the ground (cognitive/perceptual).

3.2 OPERATOR: Patrol Leader Report to SPOC with Kill Sheet Information—people and accountability (cognitive/perceptual).

3.3 OPERATOR: While supplies are being delivered, Patrol Leader and Assistant Patrol Leader de-brief with Patrol members, Medical, Communications for lessons learned (cognitive/perceptual).

Learning Outcomes

Examples of Learning Cognitive Objectives:

a) Following the patrol, the student will be able to immediately report to the CLIC and give their intelligence debrief/report.

Example of an Attitude/Affective Objective:

a) The student will engage in successful interaction with other patrol members through effectively conducting a patrol debrief and AAR.

C. RESEARCH HYPOTHESIS, EXPERIMENTAL SETUP AND METHOD

1. Research Hypothesis

Training at the IIT, even though highly advanced during the actual training run, makes no use of information technology during its briefings. Most pre- and post-training briefings are conducted in a yard outside the IIT. Even though teams arrive as a pre-trained unit at the IIT, it is hypothesized that improvement in the team briefing processes may be possible to achieve. Information technology equipment in an SPOC was used to enhance the briefing experience as well as the team's interaction prior to and after conducting a patrol. The theory was that teams would get a better understanding of their individual objective and experience a higher interaction. They will experience different team processes, resulting in a higher performance than without the use of a SPOC.

H0 (Null hypothesis): There is no difference in squad performance and team interaction between the squads receiving very short briefings in the yard outside the IIT and those being briefed using the specially designated SPOC.

HA (Alternative hypothesis): Teams receiving the well structured pre- and post-action briefings within the SPOC will experience different team processes resulting in higher performance and display higher team interaction than those who receive very short briefings outside the IIT.

2. Participant Selection and Team Interactions

A convenience sample of 153 U.S. Marines from Camp Pendleton, CA participated in this study. The mean time in service for the participants in the control group was 6 years and 6 months, while the mean time in service for the participants in the treatment group was 2 years and 8 months. The control group consisted primarily of non-infantry Military Occupation Skill (MOS) designators, while the treatment group consisted primarily of Marines with an infantry MOS. The mean age for the 60 participants in the control group was 25 years and 9 months, while the mean age of the participants in the treatment group was 21 years and 7 ½ months. Participants were already formed into squads by their parent command.

3. Experimental Setup and Procedure

Consent forms (included in Appendix H) were distributed and signed upon arrival to the training site. The IRB paperwork is included in Appendix I. All participants completed the survey included in Appendix J. The same questionnaire was used after each scenario – to avoid unnecessary duplication we include only a copy of questionnaire for Patrol 1. The survey ended with a set of concluding questions that were answered after the final patrol.

Evaluators and the units platoon leadership completed the evaluation form included in Appendix K. The same form was used after each scenario; as for the subjects' questionnaires we include only a copy for Patrol 1.

a. General Evaluation Setup

Participants provided data on their experience using a questionnaire. They filled out these questionnaires prior to and after each experiment iteration. Participant's responses were free form and Likert scale responses. The participant's free form responses are not evaluated statistically for this thesis. During each patrol, the squads were self evaluated on seven basic knowledge scores, two mission understanding related scores, eight self assessment scores, seven CGA interaction scores and, for the last experiment, five improvement related scores.

b. Timeline and Scenarios

The timeline of events has been designed and was completed in the same manner for both control group and treatment groups (Appendix L). Once the informed consent forms were collected, participants were given a period of instruction on intelligence activities. The participants "Higher Headquarters (HHQ)" provided the following information during the scenario and subsequent update briefs (MCWP 3-11.3):

- Designated area for patrol.
- Intelligence briefs and updates.
- Instructions on how to use of special equipment required for the mission (note: actual camera use and communications equipment was replaced with the use of cell phones.)
- Urban maps, photos, as required.
- Rules of engagement (ROE).

It is important to note that while the training scenarios were not identical, they were very much of the same level of complexity to avoid any information from being compromised and tainting the data collected. The control group was taken out of the administrative setting and into the west parking lot area to establish a staging area where the Operations/Intelligence brief was read to them. The teams then began to plan and rehearse for their assigned patrol mission. Each subsequent update brief and debrief took place in the same parking lot area (Figure 47).

Figure 47. Control group participants conducting a debrief following a patrol.

For the treatment group, the participants were presented with similar urban patrol type scenarios but instead of staging in the parking lot, operated out of the SPOC. This group received a brief from the platoon commander over a terrain model built out of MRE boxes (Figure 48) by the first squad of the treatment group to conduct training through the IIT. Of interest, the unit was not giving guidance on how to conduct mission planning, only that the SPOC was open to utilize as they saw fit for their planning purposes. This briefing style was done on the accord of the unit's leadership, and not by our design. In essence, through the use of the terrain model, the unit created a simple motion capture village that they could plan from.

Squads in this group were also afforded the opportunity to interact with a company-level intelligence cell (CLIC) and a company-level operations cell (CLOC). The CLIC used space on the walls to hang up intelligence products that they created based on the information gained during the conduct of their patrols (Figure 49). The CLOC served as a Higher Headquarters to radio back to during the conduct of the patrol to coordinate operational concerns (Figure 50).

Figure 48. Terrain model within SPOC.

Figure 49. Layout for the CLIC.

Figure 50. Intelligence sharing at the CLIC and Operations planning at the CLOC.

D. RESULTS

This section elaborates and comments the results that have been derived from the questionnaires filled by the participants and evaluators; where applicable, we visualized those results in graphical form.

1. Measurable Data

Self-assessed knowledge of the participant's knowledge of infantry tactics, techniques, and procedures: Figure 51 describes the basic knowledge of the participants from the self-assessed set of questions answered before the scenario training began (question numbers 8.1 through 8.7, Appendix J). At first glance one might speculate the control group scored themselves lower because of their non-infantry MOS and longer time period elapsed from basic training, where as the treatment group is younger and more recently graduated from their basic training. In any event, by examining the means, standard deviations and 1-way Test, ChiSquare Approximation score of $0.0017 < 0.05$, it becomes clear that the treatment group is more confident in their abilities and knowledge of infantry tactics, techniques and procedures.

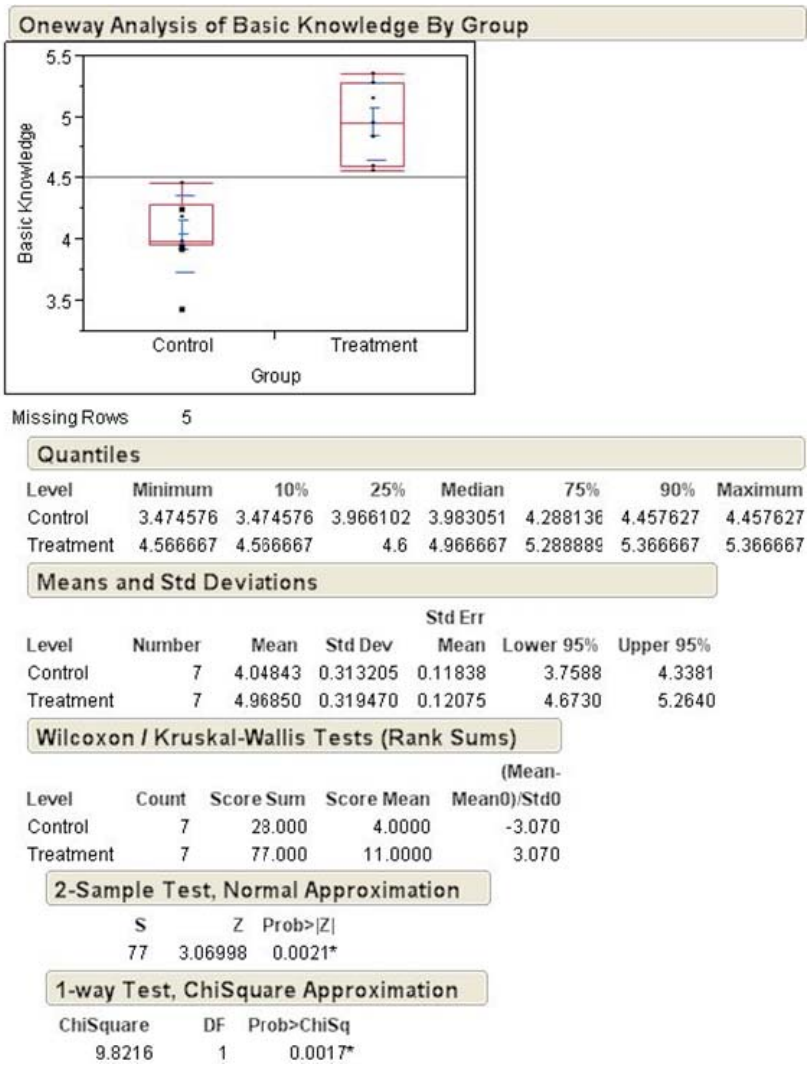


Figure 51. Self-assessed knowledge baseline scores.

Understanding of the mission: Figure 52 describes the participant's level of understanding of their mission following each of the briefs prior to their stepping off for the patrol (question numbers 1-2 'After the Brief', Appendix J). By examining the means and standard deviations, we can see that the treatment group who utilized the SPOC, felt more confident than the control group about understanding their mission, and that their mission brief was well presented. However, the 1-way Test, ChiSquare Approximation value of 0.1213 > 0.05 could refute that claim since it represents a poor fit. This value of

0.1213 therefore lessens the statistical significance of this finding. More sample data should be collected on the issue to further examine the true benefit of utilizing the SPOC to support mission understanding.

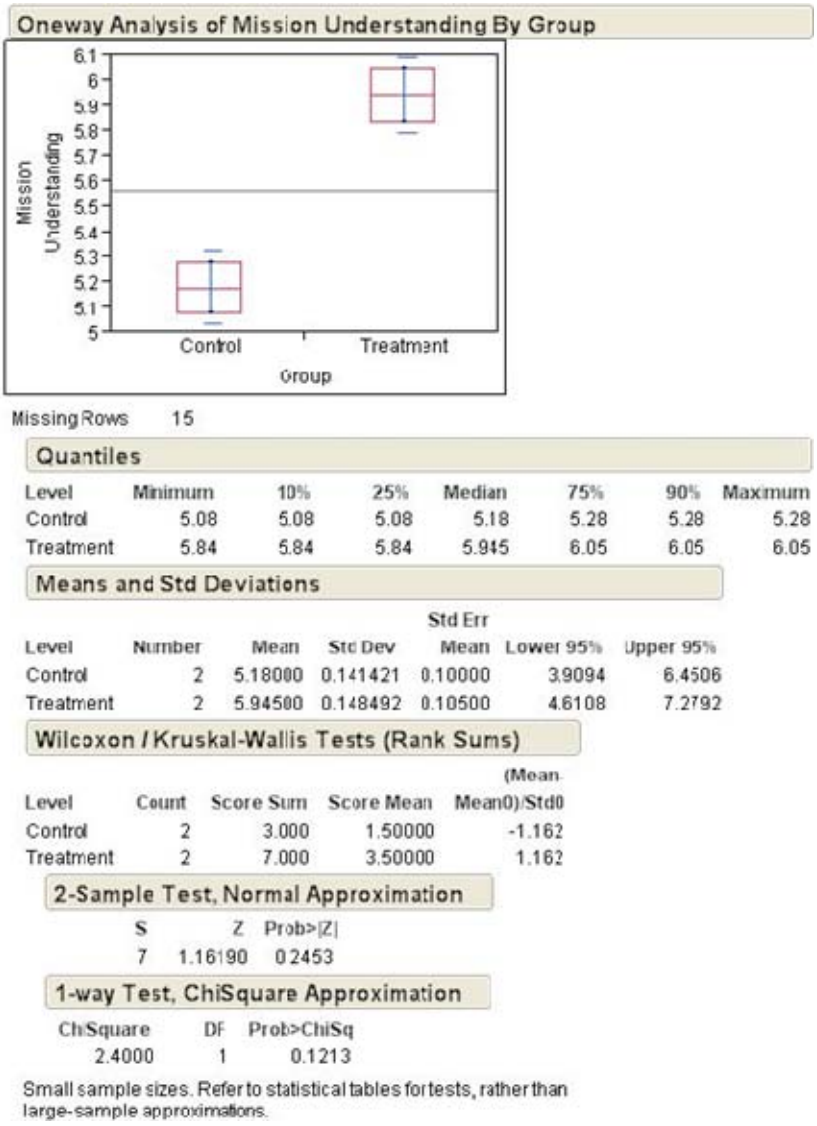


Figure 52. Self-assessed mission understanding and presentation clarity of the mission brief.

Participant's level of confidence: Figure 53 describes the participant's level of confidence in completing their training tasks and their overall view of success in executing their mission (question numbers 10 [seven tasks] and 11 'After the Patrol,' Appendix J). After examining the means and standard deviations, along with the 1-way

Test, ChiSquare Approximation value of 0.0008 < 0.05 we can clearly see a good fit—the treatment group, after utilizing the SPOC for briefings and mission planning, felt more confident in completing their training tasks and that their view of achieving success in executing their mission was also higher.

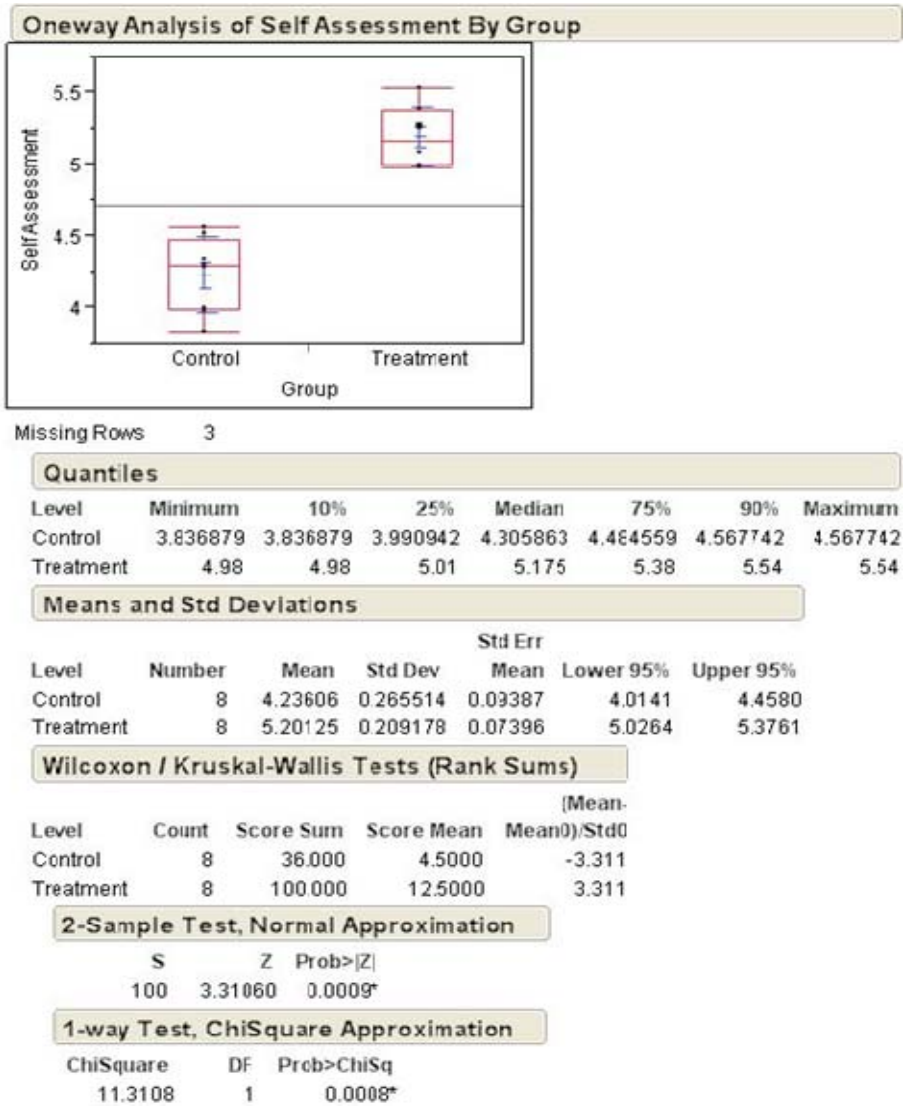
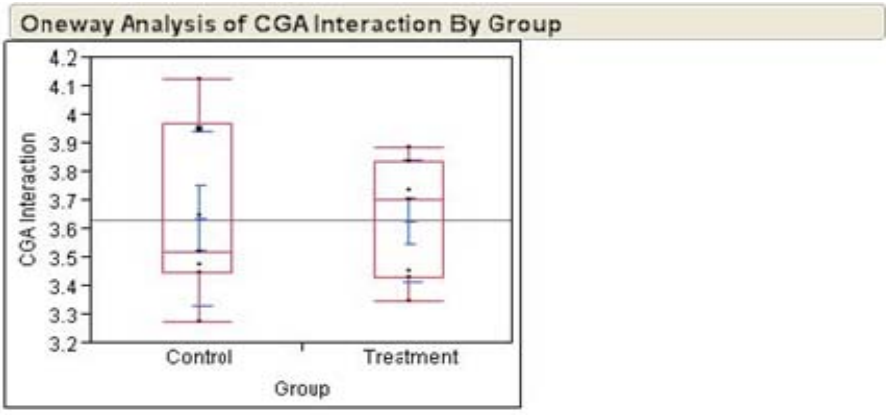


Figure 53. Participant self-assessment on training confidence and overall success of the training.

Computer Generated Actors: Figure 54 describes the participant's overall level of belief that the Computer Generated Actors—CGAs (also described as virtual people) displayed on the wall, are equivalent to real role players (question number 18a through

18g, Appendix J). After examining the means and standard deviations, along with the 1-way Test and ChiSquare Approximation, there is no statistically significant difference between either of the groups. Both groups view the CGAs as somewhat real when compared to actual role players. It is our recommendation that the role of CGAa should be further studied in more detail.



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Quantiles

Level	Minimum	10%	25%	Median	75%	90%	Maximum
Control	3.28	3.28	3.45	3.52	3.97	4.13	4.13
Treatment	3.348315	3.348315	3.434783	3.704082	3.84	3.88764	3.88764

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
Control	7	3.64000	0.304083	0.11493	3.3588	3.9212
Treatment	7	3.62938	0.214280	0.08099	3.4312	3.8276

Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Control	7	53.000	7.57143	-0.000
Treatment	7	52.000	7.42857	0.000

2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
52	0.00000	1.0000

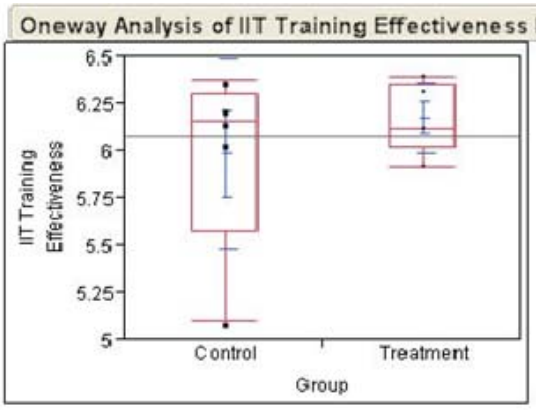
1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
0.0041	1	0.9491

Figure 54. CGAs are only seen as almost somewhat real when compared to actual role players.

Training effectiveness: Figure 55 describes the participant's overall view on the training effectiveness offered at the IIT (question numbers 19-21 [At the conclusion of

training {i.e., in the last 'After the Patrol' section}], Appendix J). After examining the means and standard deviations, along with the 1-way Test, ChiSquare Approximation, it appears that both groups feel strongly that the IIT is an effective way to train how to patrol in an urban environment. Of note, we can see one outlier in the control group and its increased dispersion among ratings. The treatment group has a good fit, and both groups are of the opinion that the training at the IIT helps to improve urban patrolling. We can also state that both groups view the IIT as a way to improve their information-gathering skills.



Oneway Analysis of IIT Training Effectiveness By Group

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Quantiles

Level	Minimum	10%	25%	Median	75%	90%	Maximum
Control	5.11	5.11	5.58	6.17	6.305	6.38	6.38
Treatment	5.923077	5.923077	6.024038	6.128571	6.361111	6.402778	6.402778

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
Control	5	5.98800	0.504995	0.22584	5.3610	6.6150
Treatment	5	6.17977	0.187586	0.08389	5.9469	6.4127

Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Control	5	26.000	5.20000	-0.209
Treatment	5	29.000	5.80000	0.209

2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
29	0.20889	0.8345

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
0.0982	1	0.7540

Small sample sizes. Refer to statistical tables for tests, rather than large-sample approximations.

Figure 55. Participant view of training effectiveness at the IIT.

Squad communication (evaluator's rating): Figure 56 describes the evaluator's ratings of the squad's communication amongst the patrol and to their Higher Headquarters during their patrol (question numbers 1 and 2 'After the Patrol', Appendix K). As one can see by evaluating the means, standard deviations and 1-way Test, ChiSquare Approximation, there is no statistically significant difference between the two groups. Both groups performed poorly in this aspect during their training. It is our recommendation that training emphasis be placed on improving communication during this urban training while at the IIT, since communication is a critical aspect of the intelligence cycle and has a tremendous impact on situational awareness.

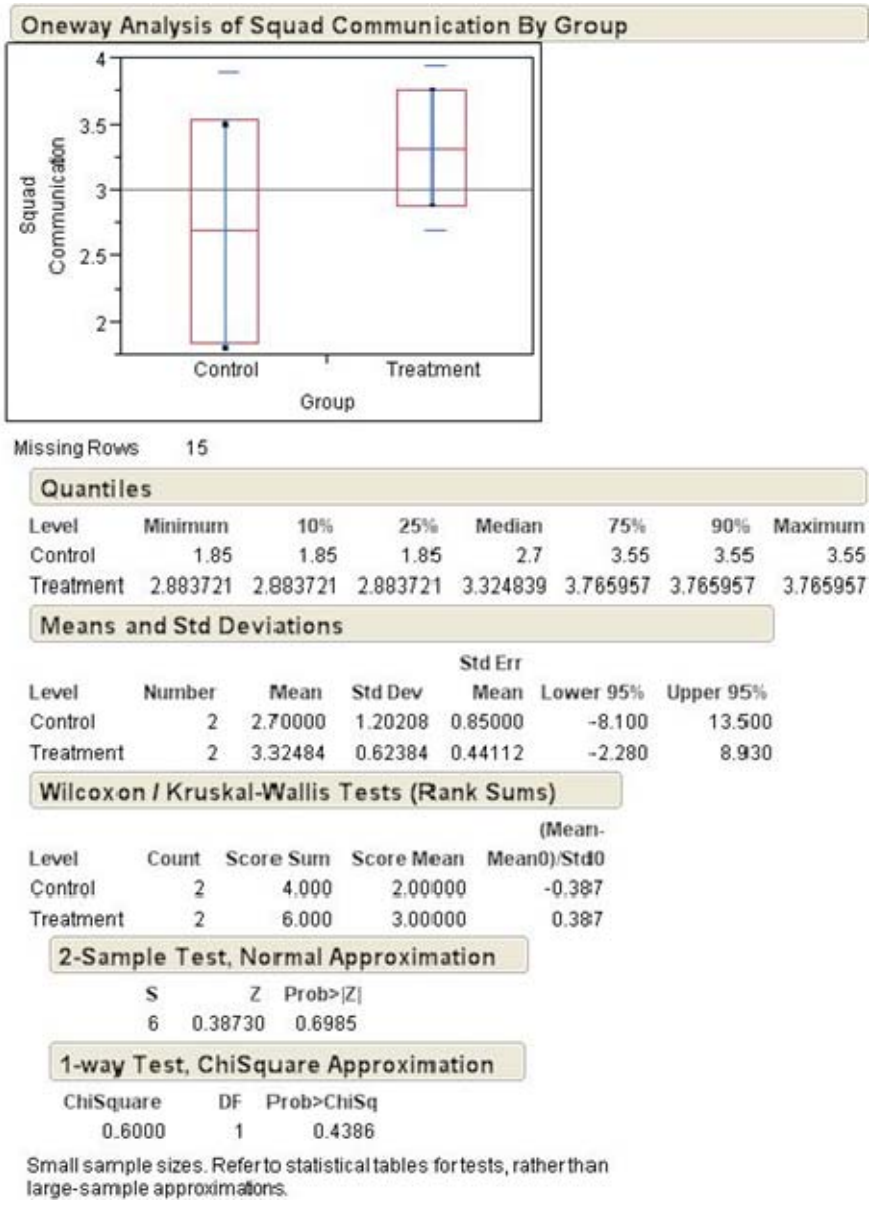


Figure 56. Evaluator ratings on squad communication during the patrol.

Overall team rating (evaluator's rating): Figure 57 describes the evaluator's overall rating regarding positive performance by the squad during their patrol (question numbers 13 through 18 and 20 'After the Patrol', Appendix K). By evaluating the means and standard deviations we do not see a statistically significant difference among the two groups. However, after analyzing the 1-way Test, ChiSquare Approximation we can see that 0.004 < 0.05 and the difference is noteworthy. Therefore, the treatment group,

utilizing the SPOC, did receive a more positive performance rating when compared to the control group through analysis with the 1-way Test, ChiSquare Approximation. This area of our research requires further investigation. The questions that one could ask are: was it the difference in MOS or the utilization of the SPOC that caused this difference? Also, in order to determine if the difference is statistically significant one would need a larger sample size.

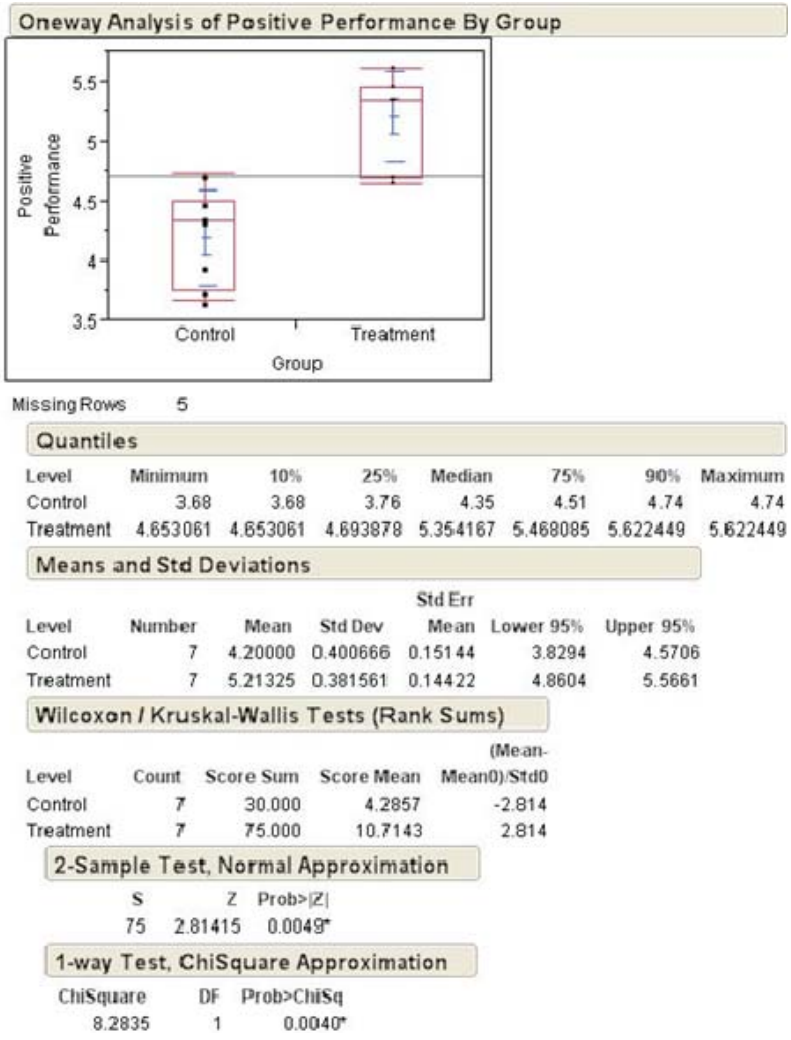
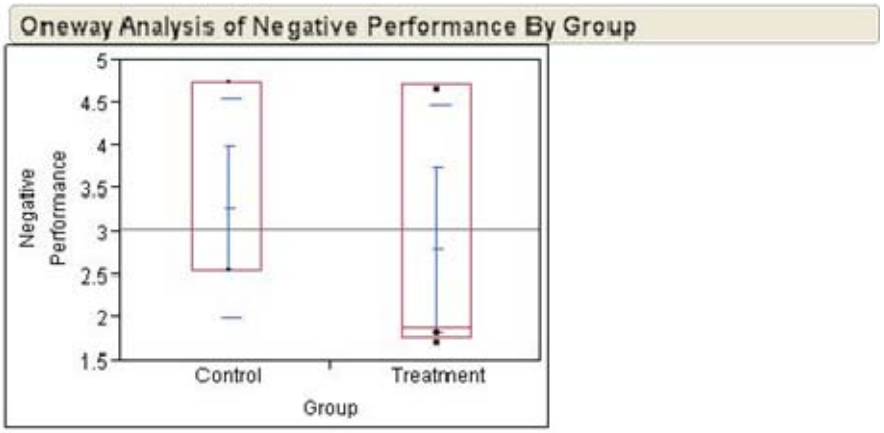


Figure 57. Evaluator ratings on positive performance.

Negative trends in team performance (evaluator's rating): Figure 58 describes the evaluator's overall view on rating negative performance by the participants (question numbers 19, 21 and 22 'After the Patrol', Appendix K). By examining the means,

standard deviations and 1-way Test, ChiSquare Application, we can affirm there is no statistically significant difference among the two groups. Of interest however, is the dispersion and low scoring of the treatment group. This could be explained by the bias of the evaluators observing the treatment group. These evaluators have years of experience in infantry tactics, techniques and procedures; which might raise their levels of expectation for the participants in the treatment group during the training.



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Quantiles

Level	Minimum	10%	25%	Median	75%	90%	Maximum
Control	2.542857	2.542857	2.542857	2.555556	4.75	4.75	4.75
Treatment	1.77551	1.77551	1.77551	1.891304	4.723404	4.723404	4.723404

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
Control	3	3.28280	1.27064	0.73361	0.126	6.4393
Treatment	3	2.79674	1.66954	0.96391	-1.351	6.9441

Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Score Mean	(Mean-Mean0)/Std0
Control	3	13.000	4.33333	0.873
Treatment	3	8.000	2.66667	-0.873

2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
8	-0.87287	0.3827

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
1.1905	1	0.2752

Small sample sizes. Refer to statistical tables for tests, rather than large-sample approximations.

Figure 58. Evaluator ratings on negative performance.

E. DISCUSSION

The objectives for this study were to see if the introduction of deliberate intelligence activities and the introduction of a dedicated planning center supported by suitable technologies improved team performance. An important goal for the study was also to collect information and discover any fallacies and shortcomings of the setup that could be used for further stages of this line of research. The most significant aspect of these observations is the setup of the evaluator and participant forms, and how to interpret the answers to selected questions.

The primary purpose of this study was to validate the need for an emphasis on the integration of the intelligence cycle supported by advanced technological solutions, to conduct more successful training of the units in the IIT. Our pilot study helped us build a necessary knowledge related to the specially designated space that will be used by the unit — we created a Squad Planning Operations Center (SPOC) within the confines of the IIT for the Marine's to receive and conduct their Operations/Intelligence Briefs and After Action Reviews (AARs)/Debriefs.

In general, squads do not require a tremendous amount of technical data to prepare for their patrols. Instead, they need easy access to a sand table or terrain model to talk through their plan. This is not to say that technology cannot support the squad, because it can. The technology just needs to be user-friendly and easy to comprehend in a short period of time. The squads would rather spend their rehearsal and planning time talking and walking through their standard operating procedures (SOPs). This is due to the high level of uncertainty they must prepare for. Pictures and other images that squad members can take with them are useful — they can put this material in their pockets to review as time and situation allows. They are also able to compare the pictures they may have on them to the people that they meet while on patrol, rather than trying to recall from memory. In urban environments, these factors significantly increase and quickly become a challenge if not managed correctly.

An item of interest regarding the SPOC was that the company-level intelligence cell (CLIC) and company-level operations cell (CLOC) fit very nicely into the

arrangement for manning purposes. The information process, utilizing the SPOC, improved situational awareness for planning and sharing of intelligence, thus reducing uncertainty for the patrol, while simultaneously generating tempo for the unit.

One question that must be addressed is how can we man and maintain the SPOC concept at the IIT? The answer to this question will get us one step closer to improving immersion training for the infantry squads.

1. Limitations and Challenges

We discovered the following limitations and challenges:

- *The IIT is a training facility—therefore, the unit decided on what scenario to use, we did not have any influence*
- *IIT VIP visits take priority over the research effort—sometimes pausing the training*
- *Uncertainty plays a factor, given that infantry tasks are complex and dynamic—therefore, the scenarios can never be fully scripted and are often different from one patrol to the next*

To mitigate these limitations, one must maintain the continuous support from the I MEF and IIT personnel, and should maintain close collaboration with the subject matter experts on site for support.

To find units willing to support this research, prior coordination was a necessity. It was essential to maintain good communication with the training units so that we did not interfere with their training objectives while at the same time ensuring we were able to support our study goals.

2. Conclusion

The data collected in this study and our statistical analysis of that data suggests that the treatment group began and ended the study as the more confident group. This should not be a surprise due to this group being younger and more confident in their infantry skills, having more recently graduated from their MOS training, and more

frequently conducting infantry specific training. Of interest, however, is the positive perception for understanding the mission from the mission brief within the confines of the SPOC. Until we compare two groups of the same MOS, under the same scenarios, we will not be able to ascertain scientifically if the SPOC was the cause of this finding.

F. ADDITIONAL DOCUMENTATION

This section elaborates the items created by the CLIC within the space of the SPOC to support the training scenarios utilized during this study (Figures 59 through 62). These products, among several others describing threat weapons and enemy tactics, techniques and procedures (TTPs) were created by the Marine's within the CLIC on their own initiative to add to the training. The instructor staff did not prompt this activity. This information was derived during the course of the patrol and later shared during the conduct of the patrol debriefs. The information was then analyzed for intelligence value, to be produced into this usable format for dissemination, and ultimately for utilization while on patrol for the Marines.

Figure 59 shows a number of the intelligence products created by the CLIC during the course of the training. Each of these items was made available to the squads during their mission planning. Figure 60 shows a Marine analyzing the data collected to make valid assessments to clarify and drive the training scenario. Figure 61 was created based on the information provided during a patrol debriefing and Figure 62 was created based on actual historical data to add realism to the training scenario.

Figure 59. Enemy TTPs disseminated to support the patrolling squads.

Figure 60. A CLIC Marine works to produce an intelligence product.

Figure 61. An intelligence product to support identification of a HVI during patrol.

Figure 62. IED TTPs disseminated to support the intelligence effort.

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VIII. RELATED WORKS

A. X3D MODEL OF IIT

Figure 63, created by the author, shows a 3D model of the IIT and was used to brief the participants during their orientation brief. This work could also be used for mission planning or AAR. An advantage of this data format is that it is web-based and could easily be shared with incoming units to conduct initial planning for their training at the IIT. A disadvantage, although minimal because of its intuitive nature, is that users would need to download X3D viewer and become familiar with its controls for navigation.

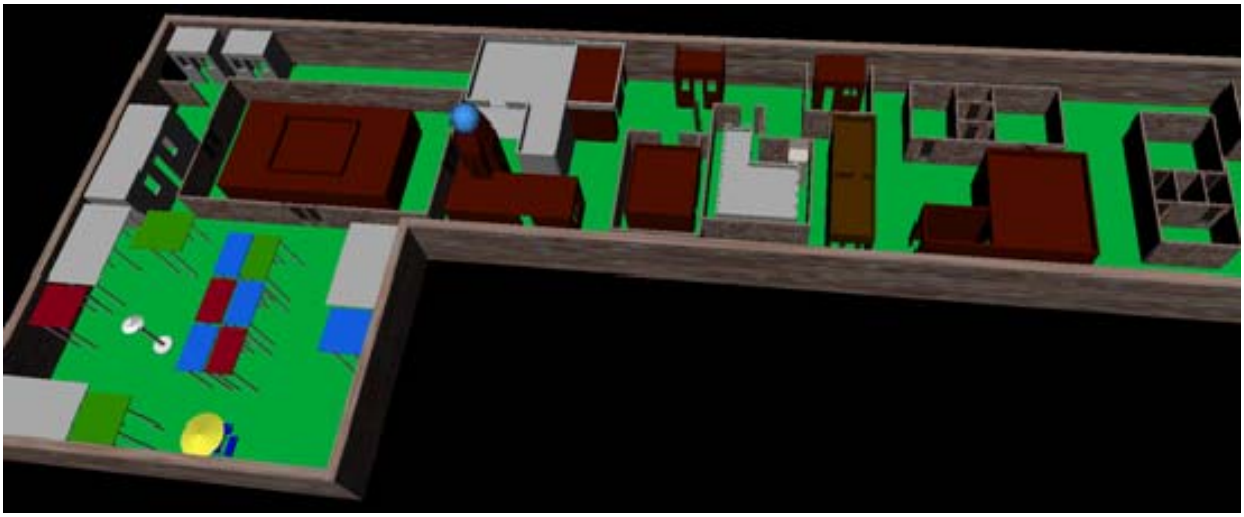

Figure 63. X3D model of the IIT.

Figure 64, generated using a viewpoint that is positioned at the level of an imagined enemy eye view illustrates the value of having a live-size 3D model of the environment and its potential advantages over a miniature replica (i.e., terrain model) of the environment, where one cannot see first-person view from street level.

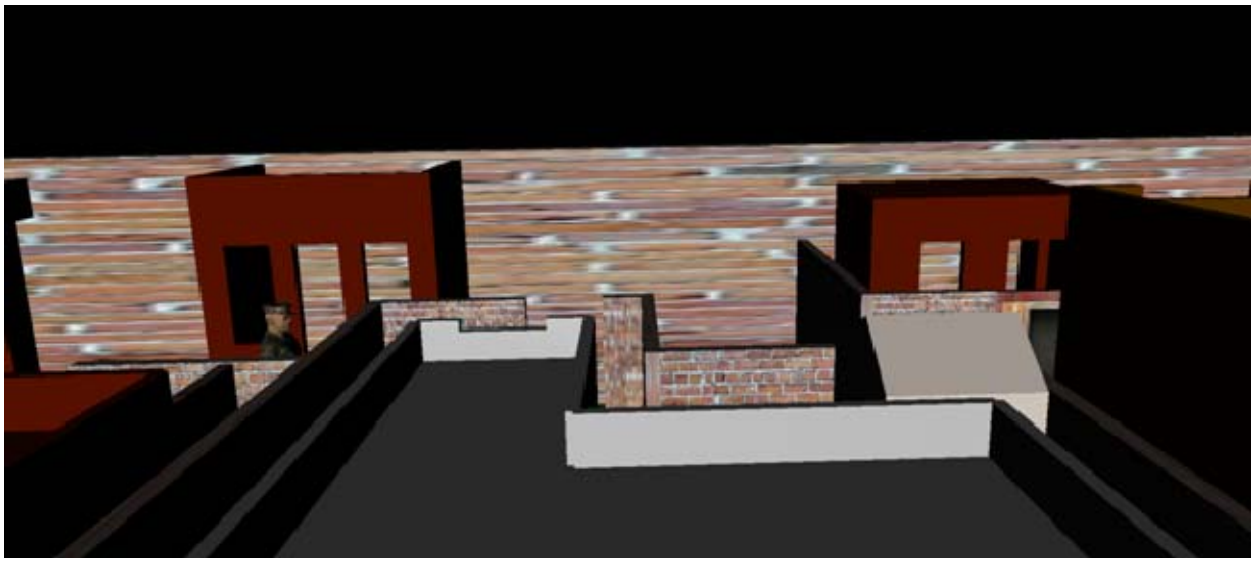

Figure 64. X3D street level viewpoint of the IIT model.

B. OTHER RELATED MATERIAL

Figure 65, provided by the IIT technological staff, shows a realistic-looking 3D model of the IIT and must be run in the Gamebryo application programming interface (API). This work could also be used for mission planning or AAR, and even has the potential to be further developed into a first person shooter game. An advantage of this data format is that it is a well-architected API that is designed to deliver outstanding performance with true multi-core/multi-platform capabilities. Gamebryo automatically handles nearly every animated value that can be specified when exporting from popular digital content creation tools. In addition, Gamebryo's Animation Tool lets the user blend between an arbitrary number of animation sequences. The new Emergent Terrain System extends the users palette and supports industry standard products like PhysX and SpeedTree. Gamebryo provides all the rendering, animation and special effects features the user needs to create any genre of game (Emergent Game Technologies, 2009).

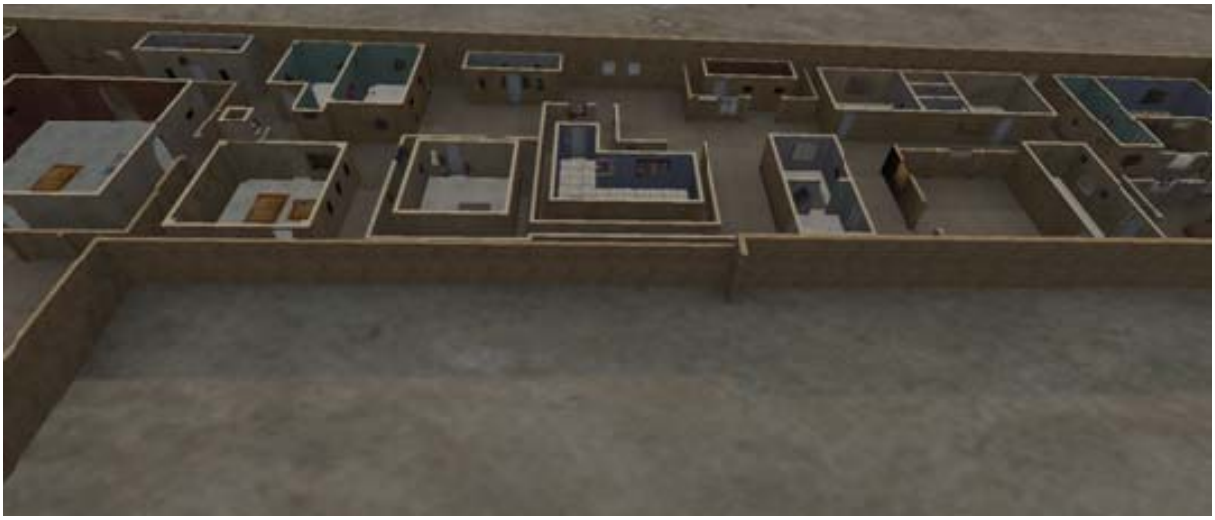

Figure 65. Gamebryo 3D model of IIT.

Similar to the X3D model, Figure 66 generated using a viewpoint that is positioned at the level of a Marine's imagined eye view illustrates the value of having a live-size 3D model of the environment and its potential advantages over a miniature replica (i.e., terrain model) of the environment, where one cannot see first-person view from street level.

Figure 66. Street level viewpoint of IIT 3D model in Gamebryo.

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IX. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

This chapter provides a comprehensive summary of all major results and conclusions made in this thesis. The text also elaborates a set of recommendations for future training in IIT as well as our suggestions for future research topics to be pursued with the goal of making the training in augmented environments more effective.

B. CONCLUSIONS

Based upon the research conducted in support of this thesis, it has become evident that to best support infantry immersion training, one should move away form the prevalent technology-centered approach, to a more beneficial training-objective (user) centered approach in training situations, where the use of innovative technical solutions is present to meet training objectives.

The need for continued immersion training for the infantry is evident. Current and future conflicts require improved combat preparation skills for the infantryman. We must strive towards simulation training for the infantry that meets the following requirements (but not limited to):

- Available for infantry units training aboard our major bases.
- Inoculates the rifleman with the sights, sounds, smells, and chaos of battle.
- Increases situational awareness skills.
- Tests moral, ethical and legal decision making.
- Trains small units to fight as one “weapon system.”
- Trains the Marines to operate in an urban environment among innocent civilians.

Based on the information gained from this study it has become evident that an environment needs to be created where we are not serving technology, but instead,

technology is serving us. To train correctly in this newly proposed manner, a process should be implemented where there is a shift from technology-centered activity to user-centered activities that provide tangible gains for the intended users.

The goal for this simulation-based training is to provide each Marine with a sense of combat prior to deploying into a combat environment. By continuing to push the ball forward from the already established IIT accomplishments, we can increase the effectiveness of immersion training for the infantry and will create a more confident and effective combat decision maker even under the most complex circumstances. We can also expect a better trained Marine who is able to diminish (ultimately, eliminate) friendly and innocent casualties by reducing collateral damage while accomplishing the mission at hand.

C. RECOMMENDATIONS FOR FUTURE IIT TRAINING

The observations conducted in preparation for and during the main study provided us with invaluable material and insights that could not have been possible to gain otherwise. As a result of that work and the results produced in our main study, we are able to make several recommendations related to the training that is conducted in IIT.

1. Scenario Support

The question of scenarios and the need to present appropriate (good) scenarios in particular order to the unit became evident very quickly during our observation. It is our recommendation that the IIT staff develops and tests a list of scenarios from easiest to hardest difficulty level before they get approved for use in IIT. The squad leader must reach a pre-established level of proficiency before moving to the next level. This will allow the platoon leadership to truly measure the proficiency of its squad leaders. By letting the IIT staff select the scenarios used in the training, an element of bias can be removed from the training. The goal for the platoon will be to reach its desired level of proficiency prior to its deployment.

2. Permanent Terrain Model

Terrain models have always served as an effective planning tool for the military. These models allow for a quick overview of a certain area. However, terrain models often take time to construct and therefore must be prepared well in advance, before planning can occur over the model. Currently, computer-based systems that deal with the terrain models allow production even in a very short time, assuming the needed raw data, including 3D data sets and a digital terrain model, already exist. A realistic model of the environment enables the user to memorize the details much better than a map and minimizes the risk of incorrect reading of a map. In addition, such models allow for an easy detection of a field of view from each point inside the 3D environment, something that is very important in war situations, and something that is not so easy to determine from a 2D map. It is also possible to easily evaluate the coverage of a fire position.

An improvement to the training at the IIT would be to simply provide a terrain model to the squads for their Confirmation Briefs. As seen in Figure 67, the Marines were forced to build a terrain model out of MRE boxes to support their planning efforts. The training value for building this terrain model was inconsequential because only the first patrol group on day one built it. The rest of the treatment group merely used the pre-existing terrain model to support their planning efforts. Value could be added for supporting the planning process at the squad level by working from an existing, generic terrain model. Another alternative would be to have a digital 3D model that the unit could review (navigate through) on a large screen, perhaps even having a combination of a physical motion capture model of the village (i.e., like the one built by the unit) and a digital 3D model that they can look at and navigate through if they want to enable close inspection of some position inside the 3D model (i.e., field of view from some position, or similar).

Figure 67. Squad Leader giving his Confirmation Brief over terrain model made of MRE boxes.

3. Grading System/Report Card

A standardized evaluation of the training at the IIT would most likely add training value and will likely increase the validity of the training. Similar to other simulation-based training, it is often appropriate to offer a variety of levels of expertise for the participants to progress through. To standardize the squad leader evaluation process, an evaluation system should be established. As a part of the framework we are proposing, the squad leader and his squad would be graded on the following performance traits (some other traits may be added, depending on the training objectives the unit chooses to address in their IIT training):

- Security
- Dispersion
- Communication
- Body Language
- Control
- Teamwork

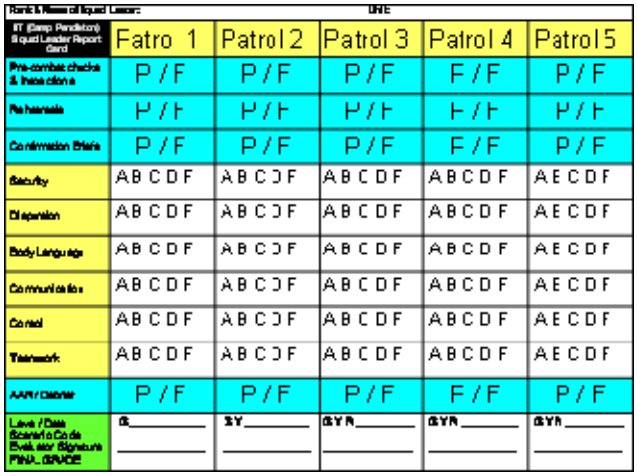
The suggested grading scale could be A through F, with A equaling 4.0 and F equaling 0. There would be three levels of difficulty for the scenarios (represented as GREEN = no enemy contact/engage with locals, YELLOW = small arms fire

engagement, and RED = IED and/or RPG attack.) The IIT instructor overseeing the squad training would randomly select an already established scenario at the specified level of difficulty while still meeting the pre-established training objectives set forth by the training unit's leadership.

If the unit is going through the IIT training environment for the first time, a squad leader (i.e., entire unit) would begin with a GREEN level scenario. To move to a YELLOW level scenario, the squad leader (unit) must achieve a grade equal to or greater than 3.0. The 3.0 scale would also apply to the YELLOW level scenario before being allowed to move to a RED level scenario. A unit's goal would be to achieve all RED level squad leaders. If the squad leader (unit) were to score below a 3.0 on two consecutive YELLOW or RED level scenarios then the squad leader would be required to drop a level and reestablish his grading report card status. In addition to these grading criteria, the MEFs five "Habits of Action" would also be enforced on a Pass/Fail basis. These five "Habits of Action" are:

1. Pre-combat checks/inspections
2. Rehearsals
3. Confirmation Briefs
4. After Action Reviews (AARs)
5. Debriefs

Figure 68 diagrams our proposed Squad Leader Report Card for the IIT. Instructor notes and additional instructions could be placed on the backside.



Rank & Name of Squad Leader:				UNIT	
IIT (Camp Pendleton) Squad Leader Report Card	Patro 1	Patrol 2	Patrol 3	Patrol 4	Patrol 5
Pre-combat checks & Inspections	P / F	P / F	P / F	F / F	P / F
Rehearsals	P / F	P / F	P / F	F / F	P / F
Confirmation Briefs	P / F	P / F	P / F	F / F	P / F
Security	A B C D F	A B C D F	A B C D F	A B C D F	A E C D F
Dispersion	A B C D F	A B C D F	A B C D F	A B C D F	A E C D F
Body Language	A B C D F	A B C D F	A B C D F	A B C D F	A E C D F
Communications	A B C D F	A B C D F	A B C D F	A B C D F	A E C D F
Control	A B C D F	A B C D F	A B C D F	A B C D F	A E C D F
Teamwork	A B C D F	A B C D F	A B C D F	A B C D F	A E C D F
AAR / Debrief	P / F	P / F	P / F	F / F	P / F
Level / Date Scenario Code Evaluator Signature PRINT GRADE	G_____ _____	SY_____ _____	GYR_____ _____	GYR_____ _____	GYR_____ _____

Figure 68. Proposed Squad Leader Report Card for the IIT.

4. Facility Upgrades/Improvements

In the case of the IIT and the training that is conducted there, the size of the environment influences the range of actions and operations that the unit can achieve there. The proper distance to establish a cordon around an IED is 300 meters. The current set-up of the IIT does not allow that to occur. We also recommend a permanent space set aside for the establishment of the SPOC. The Squad Planning Operations Center should be constructed in such a manner that supports the arrival and training of an infantry squad, whether or not its platoon or company is on site. The idea behind the development of the IIT was to support the infantry squads. All aspects of the training should allow for a squad leader who chooses to bring his squad to the facility for training, to be allowed to conduct the necessary training without any additional outside support other than the IIT staff and its associated personnel.

a. Squad Planning Operations Center — SPOC

Figure 69 depicts our layout for the SPOC during the main study using the treatment group. The SPOC contains all necessary equipment to support the realistic

training at the IIT, to include communications with the squad, intelligence activities and operational concerns. Ideally, manning for the SPOC would come from the training unit's leadership.

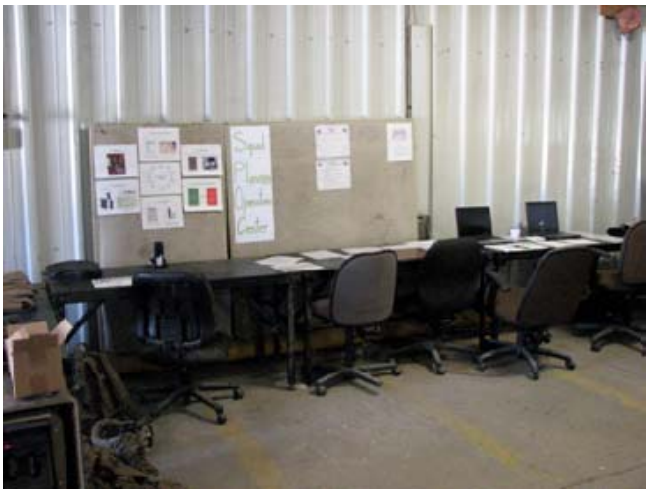


Figure 69. Squad Planning Operations Center (SPOC) layout during the main study at the IIT.

b. Health Concerns

A concern observed during our research at the IIT was the effect of the dirt inside the training environment on its permanent personnel after prolonged exposure. To make the training more realistic, dirt covers the floors and, as activity takes place, the dirt gets kicked up into the air. It was observed that one member of the IIT staff developed eye and sinus trouble as a negative reaction. To mitigate this concern, air filters have been added to help assist in clearing the air more quickly. Although the issue has been addressed, it is our recommendation that the situation continue to be studied, as the air filters will likely require close monitoring and frequent replacement. Strain on the air filter machines may also become costly over time.

D. RECOMMENDATIONS FOR FUTURE RESEARCH

This section provides a short list of recommended topics for future research opportunities.

Future research topics suggested by this thesis include, but they are not limited to:

1. Further integration of intelligence products in training: intelligence products need to have already been through the intelligence cycle so they have reached the utilization phase for the patrolling unit. Our recommendation is to conduct further research onsite at the IIT with squads forming as the participant pool, similar to our main study. Intelligence products should be created to rapidly support understanding of the situation and utilized for planning (i.e., on a sand table or terrain model).

2. Increase sample size: we would also recommend conducting a study with more groups of participants with the same MOS and age group utilizing the same scenarios for each squad.

3. Training effectiveness study: we recommend designing and organizing a training effectiveness study, that would include unit performance test prior to and after the IIT training, to evaluate performance improvement. Donald Kirkpatrick's (Kirkpatrick, 1994) training evaluation model would be a very good guide to follow for this research.

4. Automated training support evaluation system: our vision for the IIT is to implement a system that conducts automated (system supported) behavior analysis as an augmentation of human monitoring that usually happens in IIT. By using the appropriate sensor system, the movements of each Marine could be tracked and information about selected performance traits of each team member could be derived. Additionally, one would also want to record and analyze all radio and face-to-face communications passed among Marines and provide an automated understanding about that type of information as well.

5. Autonomous actors in training simulations: our vision includes an augmented environment with the combination of real-world (live person or robotic device) and computer-generated data (virtual reality/avatar support), where the computer graphics objects are blended into the real (physical) world of the user and the user not needing a special device (eye gear) to experience this mix.

APPENDIX A—FM 7-8 REACT TO CONTACT BATTLE DRILL

TASK: React to Contact (Platoon/Squad) (07-3-D9103)

CONDITIONS: The platoon/squad is halted or moving. The enemy initiates fires on the platoon/squad with an individual or crew-served weapon.

STANDARDS: The unit returns fire immediately. The unit locates and engages the enemy with well-aimed fire and causes at least one enemy casualty. The leader can point out at least one-half of the enemy positions and identify the types of weapons (such as small-arms, light machine gun).

References	Task Number	Task Title
STP 21-1-SMCT	071-311-2007	Engage Targets with an M16A1 or M16A2 Rifle
	071-311-2027	Load an M16A1 or M16A2 Rifle
	071-311-2029	Correct Malfunctions of an M16A1 or M16A2 Rifle
	071-311-2127	Load an M203 Grenade Launcher
	071-311-2129	Correct Malfunctions of an M203 Grenade Launcher
	071-311-2130	Engage Targets with an M203 Grenade Launcher
	071-312-3029	Correct Malfunctions of an M60 Machine Gun
	071-312-3031	Engage Targets with an M60 Machine Gun
	071-325-4407	Employ Hand Grenades
	071-326-0502	Move Under Direct Fire
	071-326-0503	Move Over, Through, or Around Obstacles (Except Minefields)
	071-326-0511	React to Flares
	071-326-0513	Select Temporary Fighting Positions
	181-906-1505	Conduct Combat Operations According to the Law of War
	181-906-1505-A	Conduct Combat Operations According to the Law of War
STP 7-11BC1-SM-TG	071-052-0006	Engage Targets with an M47 Medium Antitank Weapon
	071-054-0004	Engage Targets with an M136 Launcher
	071-312-4027	Load an M249 Machine Gun
	071-326-0501	Move as a Member of a Fire Team
STP 7-11BC24-SM-TG	071-052-0006	Engage Targets with an M47 Medium Antitank Weapon
	071-054-0004	Engage Targets with an M136 Launcher
	071-312-4027	Load an M249 Machine Gun
	071-326-0501	Move as a Member of a Fire Team
	071-326-5611	Conduct the Maneuver of a Squad
	071-326-5630	Conduct Movement Techniques by a Platoon
	071-420-0005	Conduct the Maneuver of a Platoon
STP 7-11BCHM1-SM	071-052-0006	Engage Targets with an M47 Medium Antitank Weapon
	071-054-0004	Engage Targets with an M136 Launcher
	071-312-4027	Load an M249 Machine Gun
	071-326-0501	Move as a Member of a Fire Team

References	Task Number	Task Title
STP 7-11BCHM24-SM-TG	071-326-5611	Conduct the Maneuver of a Squad
	071-326-5630	Conduct Movement Techniques by a Platoon
	071-420-0005	Conduct the Maneuver of a Platoon

ILLUSTRATIONS: N/A

TASK STEPS AND PERFORMANCE MEASURES:

1. Soldiers immediately assume the nearest covered positions.
2. Soldiers return fire immediately on reaching the covered positions.
3. Squad/team leaders locate and engage known or suspected enemy positions with well aimed fire, and pass information to the platoon/squad leader.
4. Fire team leader's control the fire of their soldiers by using standard fire commands (initial and supplemental) containing the following elements:
    a. Alert.
    b. Direction.
    c. Description.
    d. Range.
    e. Method of fire (manipulation and rate of fire).
    f. Command to commence firing.
5. Soldiers maintain contact (visual or oral) with the soldiers on their left or right.
6. Soldiers maintain contact with the team leader and indicate the location of the enemy positions.
7. The leaders (visually or orally) check the status of their personnel.
8. The squad/fire team leaders maintain visual contact with the platoon/squad leader.
9. The platoon/squad leader moves up to the squad/fire team in contact and links up with its leader.
    a. The platoon leader brings his RATELO, platoon FO, the squad leader of the nearest squad, and one machine gun team.
    b. The squad leader of the trail squad moves to the front of his lead fire team.
    c. The platoon sergeant moves forward with the second machine gun team and links up with the platoon leader, ready to assume control of the base-of-fire element.
10. The platoon/squad leader determines whether or not his unit must move out of the engagement area.
11. The platoon/squad leader determines whether or not his unit can gain and maintain suppressive fires with the element already in contact (based on the volume and accuracy of enemy fires against the element in contact).
12. The platoon/squad leader makes an assessment of the situation. He identifies--
    a. The location of the enemy position and obstacles.
    b. The size of the enemy force engaging the unit in contact. (The number of enemy automatic weapons, the presence of any vehicles, and the employment of indirect fires are indicators of enemy strength.)
    c. Vulnerable flanks.
    d. Covered and concealed flanking routes to the enemy positions.

13. The platoon/squad leader determines the next course of action (for example, fire and movement, assault, breach, knock out bunker, enter and clear a building or trench).
14. The platoon/squad leader reports the situation to the company commander/platoon leader and begins to maneuver the unit.
15. The platoon leader calls for and adjusts indirect fire (mortars or artillery). (Squad leaders relay request through the platoon leader.)
16. Leaders relay all commands and signals from the platoon chain of command.
17. The platoon sergeant positions the BFVs to observe and to provide supporting fires.
NOTE: Once the platoon has executed the React to Contact Drill, the platoon leader makes a quick assessment of the situation (for example, enemy size, location). He decides on a course of action. The platoon leader reports the situation to the company commander.

SUPPORTED T&EO'S

ARTEP NUMBER	T&EO NUMBER	T&EO TASK TITLE
ARTEP 7-10-MTP	07-2-1045	Conduct a Defense (Infantry Company)
	07-2-1081	Conduct a Link-up (Infantry Company)
	07-2-1090	Conduct a Movement to Contact (Antiarmor/Infantry Company)
	07-2-1135	Conduct a Raid (Infantry Company)
	07-2-1270	Conduct an Infiltration or Exfiltration (Infantry Company)
	07-2-1279	Conduct Convoy Escort (Antiarmor/Infantry Company)
	07-2-1315	Conduct Patrol Operations (Infantry Company)
	07-2-1342	Conduct Tactical Movement (Infantry Company)
	07-2-1369	Cross a Water Obstacle (Dismounted) (Infantry Company)
	07-2-1468	Take Action on Contact (Infantry Company)
	07-2-1477	Breach an Obstacle (Infantry Company)
	07-2-1486	Conduct Operations with Armored or Mechanized Infantry Vehicles in an Urban Environment (Infantry Company)
	07-2-2009	Conduct a Route Reconnaissance (Infantry Company)
	07-2-2027	Establish Observation Posts (Infantry Company)
ARTEP 7-12-MTP	07-2-1045	Conduct a Defense (Infantry Company)
	07-2-1081	Conduct a Link-up (Infantry Company)
	07-2-1090	Conduct a Movement to Contact (Antiarmor/Infantry Company)
	07-2-1135	Conduct a Raid (Infantry Company)
	07-2-1270	Conduct an Infiltration or Exfiltration (Infantry Company)
	07-2-1279	Conduct Convoy Escort (Antiarmor/Infantry Company)
	07-2-1315	Conduct Patrol Operations (Infantry Company)
	07-2-1342	Conduct Tactical Movement (Infantry Company)
	07-2-1369	Cross a Water Obstacle (Dismounted) (Infantry Company)
	07-2-1468	Take Action on Contact (Infantry Company)
	07-2-1477	Breach an Obstacle (Infantry Company)
	07-2-1486	Conduct Operations with Armored or Mechanized Infantry Vehicles in an

Urban		Environment (Infantry
Company)		
	07-2-2009	Conduct a Route Reconnaissance (Infantry Company)
	07-2-2027	Establish Observation Posts (Infantry Company)

ARTEP NUMBER	**T&EO NUMBER**	**T&EO TASK TITLE**
ARTEP 7-4-MTP	07-3-1081	Conduct a Link-up (Infantry/Mortar/Reconnaissance
Platoon/Squad)		
	07-3-1090	Conduct a Movement to Contact (Infantry/Reconnaissance
Platoon/Squad)		
	07-3-1144	Conduct a Screen (Infantry/Reconnaissance Platoon/Squad)
	07-3-1153	Conduct a Security Patrol (Infantry/Reconnaissance
Platoon/Squad)		
	07-3-1189	Conduct Actions at Danger Areas (Infantry/Reconnaissance Platoon)
	07-3-1216	Conduct an Infiltration or Exfiltration (Infantry/Reconnaissance
Platoon/Squad)		
	07-3-1270	Conduct Tactical Movement (Mounted or Dismounted)
(Antiarmor/Infantry/Mortar/Reconnaissance Platoon/Squad)		
	07-3-1288	Cross a Water Obstacle (Dismounted) (Infantry/Reconnaissance
		Platoon/Squad)
	07-3-1432	Take Action on Contact (Infantry/Mortar/Reconnaissance
Platoon/Squad)		
	07-3-2000	Conduct a Route Reconnaissance (Infantry/Reconnaissance
Platoon/Squad)		
ARTEP 7-5-MTP	07-3-1027	Breach an Obstacle (Infantry Platoon/Squad)
	07-3-1054	Conduct a Defense (Infantry Platoon/Squad)
	07-3-1081	Conduct a Link-up (Infantry/Mortar/Reconnaissance
Platoon/Squad)		
	07-3-1090	Conduct a Movement to Contact (Infantry/Reconnaissance
Platoon/Squad)		
	07-3-1126	Conduct a Raid (Infantry Platoon/Squad)
	07-3-1144	Conduct a Screen (Infantry/Reconnaissance Platoon/Squad)
	07-3-1153	Conduct a Security Patrol (Infantry/Reconnaissance
Platoon/Squad)		
	07-3-1189	Conduct Actions at Danger Areas (Infantry/Reconnaissance Platoon)
	07-3-1216	Conduct an Infiltration or Exfiltration (Infantry/Reconnaissance
Platoon/Squad)		
	07-3-1225	Conduct Convoy Escort (Infantry Platoon/Squad)
	07-3-1243	Conduct Operations with Armored or Mechanized Vehicles in an Urban

Environment		(Infantry
Platoon/Squad)		
	07-3-1270	Conduct Tactical Movement (Mounted or Dismounted)
(Antiarmor/Infantry/Mortar/Reconnaissance Platoon/Squad)		
	07-3-1288	Cross a Water Obstacle (Dismounted) (Infantry/Reconnaissance
Platoon/Squad)		
	07-3-1432	Take Action on Contact (Infantry/Mortar/Reconnaissance
Platoon/Squad)		
	07-3-2000	Conduct a Route Reconnaissance (Infantry/Reconnaissance
Platoon/Squad)		
ARTEP 7-7J-MTP	07-3-1027	Breach an Obstacle (Infantry Platoon/Squad)
	07-3-1054	Conduct a Defense (Infantry Platoon/Squad)
	07-3-1081	Conduct a Link-up (Infantry/Mortar/Reconnaissance
Platoon/Squad)		
	07-3-1090	Conduct a Movement to Contact (Infantry/Reconnaissance
Platoon/Squad)		
	07-3-1126	Conduct a Raid (Infantry Platoon/Squad)
	07-3-1144	Conduct a Screen (Infantry/Reconnaissance Platoon/Squad)
ARTEP NUMBER	**T&EO NUMBER**	**T&EO TASK TITLE**
	07-3-1153	Conduct a Security Patrol (Infantry/Reconnaissance
Platoon/Squad)		
	07-3-1189	Conduct Actions at Danger Areas (Infantry/Reconnaissance Platoon)
	07-3-1216	Conduct an Infiltration or Exfiltration (Infantry/Reconnaissance
Platoon/Squad)		
	07-3-1225	Conduct Convoy Escort (Infantry Platoon/Squad)
	07-3-1243	Conduct Operations with Armored or Mechanized Vehicles in an Urban
Environment		(Infantry
Platoon/Squad)		
	07-3-1270	Conduct Tactical Movement (Mounted or Dismounted)
(Antiarmor/Infantry/Mortar/Reconnaissance Platoon/Squad)		
	07-3-1288	Cross a Water Obstacle (Dismounted) (Infantry/Reconnaissance
Platoon/Squad)		
	07-3-1432	Take Action on Contact (Infantry/Mortar/Reconnaissance
Platoon/Squad)		
	07-3-2000	Conduct a Route Reconnaissance (Infantry/Reconnaissance
Platoon/Squad)		
ARTEP 7-8-MTP	07-3-1027	Breach an Obstacle (Infantry Platoon/Squad)
	07-3-1054	Conduct a Defense (Infantry Platoon/Squad)
	07-3-1081	Conduct a Link-up (Infantry/Mortar/Reconnaissance
Platoon/Squad)		

	07-3-1090	Conduct a Movement to Contact (Infantry/Reconnaissance Platoon/Squad)
	07-3-1126	Conduct a Raid (Infantry Platoon/Squad)
	07-3-1144	Conduct a Screen (Infantry/Reconnaissance Platoon/Squad)
	07-3-1153	Conduct a Security Patrol (Infantry/Reconnaissance Platoon/Squad)
	07-3-1171	Conduct a Tactical Road March (Dismounted) (Infantry/Reconnaissance Platoon/Squad)
	07-3-1189	Conduct Actions at Danger Areas (Infantry/Reconnaissance Platoon)
	07-3-1216	Conduct an Infiltration or Exfiltration (Infantry/Reconnaissance Platoon/Squad)
	07-3-1243	Conduct Operations with Armored or Mechanized Vehicles in an Urban Environment (Infantry Platoon/Squad)
	07-3-1270	Conduct Tactical Movement (Mounted or Dismounted) (Antiarmor/Infantry/Mortar/Reconnaissance Platoon/Squad)
	07-3-1288	Cross a Water Obstacle (Dismounted) (Infantry/Reconnaissance Platoon/Squad)
	07-3-1432	Take Action on Contact (Infantry/Mortar/Reconnaissance Platoon/Squad)
	07-3-2000	Conduct a Route Reconnaissance (Infantry/Reconnaissance Platoon/Squad)
ARTEP 7-90-MTP	07-3-1081	Conduct a Link-up (Infantry/Mortar/Reconnaissance Platoon/Squad)
	07-3-1270	Conduct Tactical Movement (Mounted or Dismounted) (Antiarmor/Infantry/Mortar/Reconnaissance Platoon/Squad)
	07-3-1432	Take Action on Contact (Infantry/Mortar/Reconnaissance Platoon/Squad)
ARTEP 7-91-MTP	07-2-1036	Conduct a Defense (Antiarmor Company/Platoon)
ARTEP NUMBER	**T&EO NUMBER**	**T&EO TASK TITLE**
	07-2-1090	Conduct a Movement to Contact (Antiarmor/Infantry Company)
	07-2-1279	Conduct Convoy Escort (Antiarmor/Infantry Company)
	07-2-1459	Take Action on Contact (Antiarmor Company/Platoon)
	07-3-1270	Conduct Tactical Movement (Mounted or Dismounted) (Antiarmor/Infantry/Mortar/Reconnaissance Platoon/Squad)

ARTEP 7-92-MTP	07-3-1081	Conduct a Link-up (Infantry/Mortar/Reconnaissance Platoon/Squad)
	07-3-1090	Conduct a Movement to Contact (Infantry/Reconnaissance Platoon/Squad)
	07-3-1144	Conduct a Screen (Infantry/Reconnaissance Platoon/Squad)
	07-3-1153	Conduct a Security Patrol (Infantry/Reconnaissance Platoon/Squad)
	07-3-1171	Conduct a Tactical Road March (Dismounted) (Infantry/Reconnaissance Platoon/Squad)
	07-3-1189	Conduct Actions at Danger Areas (Infantry/Reconnaissance Platoon)
	07-3-1216	Conduct an Infiltration or Exfiltration (Infantry/Reconnaissance Platoon/Squad)
	07-3-1270	Conduct Tactical Movement (Mounted or Dismounted) (Antiarmor/Infantry/Mortar/Reconnaissance Platoon/Squad)
	07-3-1288	Cross a Water Obstacle (Dismounted) (Infantry/Reconnaissance Platoon/Squad)
	07-3-1432	Take Action on Contact (Infantry/Mortar/Reconnaissance Platoon/Squad)
	07-3-2000	Conduct a Route Reconnaissance (Infantry/Reconnaissance Platoon/Squad)
ARTEP 7-93-MTP	07-5-1001	Conduct Surveillance (LRS Team)
	07-5-1002	Reconnoiter Area (LRS)
	07-5-1003	Reconnoiter Zone (LRS)
	07-5-1004	Assess Damage
	07-5-1101	Conduct Airborne Insertion
	07-5-1102	Conduct Helicopter Insertion/Extraction
	07-5-1103	Conduct Ground Infiltration/Exfiltration
	07-5-1107	Move Tactically (LRS)
	07-5-1108	Cross Danger Area
	07-5-1109	Cross Water Obstacle (LRS)
	07-5-1110	Establish Hide Site
	07-5-1111	Establish Surveillance Site
	07-5-1112	Conduct Linkup (LRS Team)
	07-5-1115	Establish a Patrol Base
	07-5-1201	Acquire a Target
	07-5-1401	Evade and Recover
	07-5-1406	React to Indirect Fire (LRS)
	07-5-1502	Establish/Recover a Cache
	07-5-1605	Consolidate and Reorganize (LRS)

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APPENDIX B—CONSENT FORMS (EXPERIMENT 1)

Naval Postgraduate School

Participant Consent Form &
Minimal Risk Statement

Introduction. You are invited to participate in a study entitled Integration of the intelligence cycle and the Infantry Immersion Trainer

Background: In October 2007, under Marine General James Mattis' guidance the Marine Corps and the Office of Naval Research (ONR) unveiled a $1.3 million prototype Infantry Immersion Trainer aboard Camp Pendleton, CA. It was constructed to improve Marine Corps combat skills across a wide range of military operations. Some of the tasks to conduct the simulation based training involve: 1) Tasks in an urban environment, 2) Room clearing, 3) Urban patrolling, and 4) Observation Point (OP) activities. For Marine Corps training, this event marked the start of a significant change from traditional field training techniques to computer based immersive training.

The IIT uses digital flats that depict combat images on large wall sized screens; the computer generated characters play a role of civilian villagers or insurgent fighters; physical artifacts like furnishings, doors and stairwells also add to the realism and can be rearranged to fit particular scenarios and alleviate the problem of going through the same boring scenario. All of this has been combined with other virtual effects such as explosions, loud sounds, smoke, and the horrible smells of combat. The training plan for the IIT is to tie the trainer into a constructive play that meets the units training objectives for "particular missions, roles and environments."

Although much effort has been dedicated on technology to support this training, there is still much work to be done with the fundamentals at the Battalion, Company, Platoon, Squad, and Fire Team levels. In a real combat environment, intelligence drives operations; however, this "train as you fight" concept has not reached fruition in the current setup at the IIT; intelligence is minimally factored into the training. This, we believe, could and should be appropriately addressed. Following review of the identified segments of training that could be improved, we will present training recommendations that can fully integrate all phases of the intelligence cycle and will better prepare the Marines for mission accomplishment in a combat environment.

Procedures. You be asked to conduct a walking patrol through an indoor an outdoor environment in the vicinity of Halligan Hall and Watkins Hall on the NPS campus. You will be given a briefing on the basics of patrolling and methods to gather intelligence during a patrol. You will conduct the patrol and gather information and report the critical pieces back to the Command and Control Operations Center. You will be asked to walk up and down stairs as well as traverse even and uneven surfaces. You be asked to locate items you determine as critical information back to the Command and Control Operations Center. At the conclusion of the briefing you will conduct a de-brief and complete a short survey. You will also be video taped and have still pictures taken during the execution of the patrol.

Risks and Benefits. I understand that this experiment does not involve greater than minimal risk and involves no known reasonably foreseeable risks or hazards greater than those encountered in everyday life. I have also been informed of any benefits to myself or to others that may reasonably be expected as a result of this research.

Compensation. I understand no tangible compensation will be given. I understand that a copy of the research results will be available at the conclusion of the experiment. You may contact the Principle Investigator (Dr. Amelia Sadagic or Dr. Nita Miller, asadagic@nps.edu or nlmiller@nps.edu) for a copy of the results after 1 April 2009.

Confidentiality & Privacy Act. I understand that all records of this study will be kept confidential and that my privacy will be safeguarded. No information will be publicly accessible which could identify me as a participant. I will be identified only as a code number on all research forms/data bases. My name on any signed document will not be paired with my code number in order to protect my identity. I understand that records of my participation will be maintained by NPS for three years, after which they will be destroyed.

Voluntary Nature of the Study. Participation in this study is strictly voluntary, and if agreement to participation is given, it can be withdrawn at any time without prejudice.

Points of Contact. I understand that if I have any questions or comments regarding this project upon the completion of my participation, I should contact the Principal Investigator, Dr. Amelia Sadagic or Dr. Nita Miller, 656-2281, asadagic@nps.edu or nlmiller@nps.edu. Any other questions or concerns may be addressed to the Navy Postgraduate School. IRB Chair, LCDR Paul O'Connor, 831-656-3864, peoconno@nps.edu.

Statement of Consent. I have been provided with the purpose, procedures, and duration of my participation in this research project and they have been fully explained. I understand how my identification will be safeguarded and have had all my questions answered. I have been provided a copy of this form for my records and I agree to participate in this study. I understand that by agreeing to participate in this research and signing this form, I do not waive any of my legal rights.

_____ _____

Participant's Signature Date

_____ _____

Researcher's Signature Date

Privacy Act Statement and Consent Agreement For Audio or Video Recording

I have received a thorough description of the purpose and procedures for specify audio and video recording during the course of the proposed research study. I give my consent to allow recording during participation in this study, and for those records to be reviewed by persons involved in the study. I understand that all information will be kept confidential and will be reported in an anonymous fashion, and that the recordings will be erased no later than 60 days from the completion of the study. I further understand that I may withdraw this consent at any time without penalty.

_____ _____

Participant's Signature Date

_____ _____

Researcher's Signature Date

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APPENDIX C—IRB REQUEST (EXPERIMENT 1)

Amela Sadagic, Ph.D.
MOVES Institute
Nita Lewis Miller, Ph.D.
Human Systems Integration Program
Operational Research Department
Heiko Abel, Shannon Ayers, and Craig Schwetje
Glasgow Hall
Naval Postgraduate School
Monterey, California 93943

831-656-2281
DSN: 756-2281
Fax: 831-656-9999
asadagic@nps.edu
nlmiller@nps.edu
hable@nps.edu
swayers@nps.edu
crschwet@nps.edu

To: Protection of Human Subjects Committee

Subject: Application for Human Subjects Review (Title): INTEGRATION OF THE INTELLIGENCE CYCLE AND THE INFANTRY IMMERSION TRAINER

PROJECTED START DATE: _____FEB_____/____20_____/_____2009_____
MONTH DAY YEAR

I am requesting approval of the attached experimental protocol, it outlines the methods and all applicable materials and forms that a participant will read and/or fill-out (i.e., consent forms privacy act statements, debriefing forms).

The Principal Investigator understands and accepts the following obligations to protect the rights and welfare of research subjects in this study:

I recognize that as the Principal Investigator it is my responsibility to ensure that this research and the actions of all project personnel involved in conducting this study will conform with the IRB approved protocol and IRB requirements/policies.

I recognize that it is my responsibility to ensure that valid informed consent/assent (unless explicitly waived by the IRB) has been obtained from all research subjects or their legally authorized representatives. I will ensure that all project personnel involved in the process of consent are trained properly and are fully aware of their responsibilities relative to obtaining informed consent/assent according to the IRB guidelines.

I will ensure all personnel involved in this study have completed the required IRB Training.

I will not initiate any change in protocol without IRB approval.

I have no conflict of interest negating me from performing this research.

I will maintain all required research records on file; and I recognize that the IRB is authorized to inspect these records at any time.

I will immediately inform the IRB Chair and NPS Dean of Research of any untoward event or injury that involves a research participant.

I understand that in the absence of a continuing review and approval, this research may not continue beyond the end of the approval period.

At the completion of this project, an End-of-Experiment Report will be submitted.

I will not commence this research, including subject recruitment, until I have received my NPS IRB application approval letter.

_____

(Signature of Principal Investigator)

Dr. Amela Sadagic **Dr. Nita Lewis Miller**

Application for Human Subjects Review	NPS IRB Number:
Principal Investigator(s): Co- PI(s)	**Dr. Amela Sadagic, Ph.D. MOVES Institute** **Dr. Nita Lewis Miller, Ph.D.** **Human Systems Integration Program** **Operational Research Department**
Title of Experiment:	INTEGRATION OF THE INTELLIGENCE CYCLE AND THE INFANTRY IMMERSION TRAINER
Approval Requested [X] New [ ] Continuing [ ] Amendment	
Requested Level of Risk [ ] Exempt [X] Minimal [ ] More than Minimal	
Work to be done in (Site/Bldg/Rm) Watkins Hall, Halligan Hall	Estimated date of completion (not to exceed one year from start date): 20 Mar 2009
Maximum number of participants: 24	Estimated length of each subjects participation: 4 hours (arrival-participate-depart)
Special Populations that will be Used as Participants: [X] Subordinates [ ] Minors [X] NPS Students [ ] Special Needs (e.g. Pregnant women) Participants will be junior enlisted Marines from the DLI. No participant is a direct subordinate to any researcher in the study but there is a possibility, although small, a participant may be a subordinate to a researcher in the future. In order to safeguard information participants will not record name, SSN, or any other identifying information on the questionnaire's or surveys in the study. All data collected will be cataloged by a random assignment of a participant number. Informed consent forms will be kept separate and secure during data analysis so that no attempt may be made to match a participant to a participant ID.	
Scientific Merit Review (Check all that apply) [ ] This research is part of a funded project: [X] This research is a student thesis (Attach a copy of the approved thesis proposal) [ ] Other (Attach a complete research proposal–Dept. Chair must sign Application Cover Letter)	

Outside Cooperating Investigators and Agencies:
None.
Participants will be from the Marine detachment at the Presidio of Monterey, DLI. Attached is an email message from the command acknowledging the request to utilize Marines from the command. The Marine DLI POC is SSG Smith.

[X] A copy of the cooperating institution's POC and CO's approval is attached.

Description of Research:

Overview

The primary purpose of this Pilot Study is to validate the need for an emphasis on the integration of the intelligence cycle supported by advanced technological solutions to more successfully train and measure the usefulness of their training at the Infantry Immersion Trainer (IIT). To fully support this objective, our Pilot Study will provide research data on how to best plan for a location and configuration of a Virtual Augmented Combat Operations Center (VA-COC) within 100 meters from the IIT for the Marines Operations/Intelligence Briefs and Debriefs.

The research objectives are to utilize current Battalion-level intelligence capabilities to augment the hyper-realistic training offered at the IIT and maximize the training potential that this training environment holds. We will investigate relevant performance trends as they are identified in current Urban Warfare Training segment in Mojave Viper and make sure those trends are properly addressed with training solutions. Design suitable combination of emerging technologies that can effectively support desired training objectives. It is planned to research and demonstrate the appropriate usage of intelligence capabilities to create a realistic combat experience and determine how to evaluate Marine's situational awareness using both quantitative and qualitative measurements. The final objective is to research and analyze the number and the length of training sessions required in the IIT to reach the desired level of targeted knowledge and skills.

Research Methods

The experiment is set to begin at 09:00 on February 21st and take one day to complete. There will be two group slots, from 09:00 to 12:00 for the first and from 13:00 to 16:00 for the second group. We will have one and a half additional days with a total of three backup slots on the 27th and 28th of February.

We plan to use NPS students and DLI Marines as participants, evaluators and as role-players for our Pilot Study. The participants are divided randomly and equally into two groups. Even though information about experience levels is collected, we will not control for combat or patrolling experience. The two groups are 1) a control group and 2) an experiment group:

Control Group: Depending on the number of participants, four to five (a fire team) or ten to twelve (a squad) participants will be given their Ops/Intel Brief outside the training building in a

school-circle. This simulates the current standard at the IIT. A leader will be randomly selected from amongst the fire team/squad using a double blind short straw method to lead the planning and conduct of the patrol. The participants will be provided with hard copies of the material available and will be afforded the opportunity to ask the briefer any questions for clarification. Following the patrol/lane-training, there will be a debrief/After-Action Review (AAR) in the same spot as the Ops/Intel Brief was given to capture lessons learned about their actions from during the exercise.

Experimental Group: Depending on the number of participants, four to five (a fire team) or ten to twelve (a squad) participants will be given their Ops/Intel Brief in the VA-COC room, simulating the Virtual Augmented Combat Operations Center, located within Halligan Hall, from where the patrol/lane-training will be conducted. A leader will be randomly selected using the double blind short straw method from amongst the fire team/squad to lead the planning and conduct of the patrol. Information will be displayed graphically with current visual support technology that an Infantry Battalion has access to. The participants will be provided with hard copies of the material available and will be afforded the opportunity to ask the briefer any questions for clarification. Following the patrol/lane-training, their will be a debrief/After-Action Review (AAR) conducted in the VA-COC to capture lessons learned and digitally show the participants what they did and evaluate their actions from during the patrol.

Each group will be given a survey just before the start of the experiment, and just prior and after each patrol sequence. A total of three patrol runs will be done for each team.
Each squad will be accompanied by one or more evaluators. Each evaluator will fill out an evaluation form to collect subjective as well as objective information on the squad's performance.
There will be a tape-recorded question and answers session after the end of the experiment to discover any flaws or misunderstandings the participants have with the setup, improve the current set-up and use this opportunity to gain more feedback that might not be caught in the questionnaires.

We expect to have changes in the setup for nearly every single run. This will most certainly affect the data generated from each run. As improvements in the setup are one of the main purposes of a pilot study, we are not much concerned with loosing power in the analysis of the data.
Our primary focus is to validate the procedure; therefore we do not anticipate to answer the hypothesis beyond each group that we are testing and will accept what appears to be a weak response variable.

Method of Subject Recruitment: (attach an additional sheet if needed). Major Craig Schwetje, NPS student and student experimenter, made contact with SSgt Smith of the DLI Marine Detachment via phone and email. Major Schwetje described the requirements to SSgt Smith to see if the detachment had enlisted Marines to solicit for the experiment. SSgt Smith confirmed the detachment had available personnel and a request for volunteers would be announced. Major Schwetje verbally provided SSgt Smith with an announcement format to request volunteers. SSgt smith read the verbal announcement at the close of business formation in order to announce volunteering for participation in the study. SSgt Smith collected a list of names of Marine volunteers over a three week period.

I have read and understand NPS policy on the Protection of Human Subjects. If there are any changes in any of the above information or any changes to the attached materials, I will suspend the experiment until I obtain new IRB approval.

SIGNATURE_____ DATE_____

APPENDIX D—SURVEY (EXPERIMENT 1)

Please fill in the following questionnaire. All information will be held confidential. If you need to expand any answer, please use the comments/suggestion section.

To be filled in upon arrival

1. Participant Number: _____

2. Date: February 21, 2009

3. Year of birth: _____ Age: _____

4. Service component: _____

5. Primary MOS or job specialty (Example–**0231** Intelligence Specialist): _____

6. Rank/Service: _____

7. Time in service: _____years _____months

8. When you think about your own knowledge of infantry tactics, techniques, and procedures, how would you rank them? (Please circle one number between 1 and 7 in each line)

#	**Knowledge and skills:**	→ Poor			**Your current level**			→ Excellent
1.	Receiving the Ops/Intel Brief	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2.	Planning for the Patrol	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3.	Movement of the Patrol	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4.	Interaction with the locals	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5.	Finding items of intelligence value	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6.	Reporting to HHQ during the patrol	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7.	Sharing/reporting intelligence for future missions	**1**	**2**	**3**	**4**	**5**	**6**	**7**

***** STOP FILLING THE QUESTIONNAIRE HERE *****

After the Ops/Intel Brief

1. Do you understand your mission?

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

Explain: _____

2. Was the Ops/Intel Brief clearly presented?

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

Explain: _____

3. What did you most like about how the Ops/Intel Brief was presented?

Explain: _____

_____

_____

4. What did you not like about how the Ops/Intel Brief was presented?

Explain: _____

_____

5. What do you remember as being the most important item of the Ops/Intel Brief?

_____

_____

6. What do you have in mind as the most important thing to look for during the patrol?

_____

_____

7. Who participated in developing the plan of action? Give a score to each person between 0 and 100, where the four scores add to 100. (A person would be given a score of near 100 only if they developed the plan entirely by themselves. The person would be given a score of near 0 if they provided minimal or no contribution in plan development).

The extent to which each person contributed in developing the plan of action:

Person (code name):	Score/100:
Fire team leader	
Gunner	
Rifleman	
Assistant Gunner	
Total Score:	**100**

8. Did you and your team change that plan during the training session that you just finished?

Y	N

a. If **YES**:

i) Was that change justified? **NO / YES** (circle one)

ii) Was that change well chosen? **NO / YES** (circle one)

iii) What was the change consisted of? Describe what was different from your original plan:

_____

_____

_____

9. Think back now about the session that you have just completed. Who did most of the talking? Give a score to each person between 0 and 100, where the four scores add to 100. (A person would be given a score of near 100 only if they did almost all the talking. They would be given a score of near 0 if they did almost no talking).

The extent to which each person did most of the talking was:

Person (code name):	Score/100:
Fire team leader	
Gunner	
Rifleman	
Assistant Gunner	
Total Score:	**100**

10. Overall, how cooperative was each of the other three people (check one value between 1 and 7 for each person).

Person (write the position s/he had) →	1st person:	2nd person:	3rd person:
1. Not at all–s/he was not cooperative at all			
2.			
3.			
4.			
5.			
6.			
7. Very much so–s/he was very cooperative.			

11. Any other comments or suggestions:

Comments:_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Suggestions: _____

_____

_____

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_____

***** STOP FILLING THE QUESTIONNAIRE HERE *****

After Patrol #1 (Outside Watkins). Please continue filling in the questionnaire.

1. Circle your role in the patrol that you just completed (circle one):

FIRE TEAM LEADER	GUNNER	RIFLEMAN	ASSISTANT GUNNER

2. Did you simulate loading and making ready your weapon?

Y	N

3. How many threats did you observe during the patrol?

   Personnel_____ Vehicle_____

4. How many threats did you report on during the patrol?

   Personnel_____ Vehicle_____

5. Did you collect any items of intelligence value?

   Yes_____ No_____

   If yes, please list and describe: _____

   _____

   _____

   _____

   _____

6. How many threats did you report on after the patrol?

   Personnel_____ Vehicle_____

7. Did you simulate clearing your weapon?

Y	N

8. What task was hardest for you?

   It was very hard to: _____

_____

   It was very hard to: _____

_____

   It was very hard to: _____

_____

It was very hard to: _____

_____

9. What task was easiest for you?

It was very easy to: _____

_____

It was very easy to: _____

_____

It was very easy to: _____

_____

It was very easy to: _____

_____

10. Rate your confidence in doing the following tasks in the training by checking one block for each task (**1** means you are **NOT** confident; **5** means you are **HIGHLY** confident):

NOT confident → **HIGHLY** confident

	1	**2**	**3**	**4**	**5**
Receiving the Ops/Intel Brief					
Planning for the patrol					
Movement of the Patrol					
Interacting with the locals					
Finding items of intelligence value					
Reporting to HHQ during the patrol					
Sharing/reporting intelligence for future missions					

11. Rate your overall success in executing the mission (1 = **NOT** successful, 5 = **VERY** successful)

I was (circle one): **NOT** successful → **VERY** successful

1	**2**	**3**	**4**	**5**

12. If you think that you were not very successful, what were the reasons for it?

I was not very successful because: _____

_____

I was not very successful because: _____

_____

I was not very successful because: _____

_____

13. If you think that you were very successful, what were the reasons for it?

I was very successful because: _____

_____

I was very successful because: _____

_____

I was very successful because: _____

_____

14. Who do you think provided the most valuable reporting? (Circle one):

FIRE TEAM LEADER	**GUNNER**	**RIFLEMAN**	**ASSISTANT GUNNER**

15. Do you have any suggestions for improving your familiarization with the training you just did?

_____

_____

_____

16. What do you remember as being the most important item of the Situation Update Brief?

_____

_____

17. What do you have in mind as the most important thing to look for during the 2nd patrol?

_____

_____

_____

_____

_____

18. Who participated in developing the plan of action? Give a score to each person between 0 and 100, where the four scores add to 100. (A person would be given a score of near 100 only if they developed the plan entirely by themselves. The person would be given a score of near 0 if they provided minimal or no contribution in plan development).

The extent to which each person contributed in developing the plan of action:

Person (code name):	Score/100:
Fire team leader	
Gunner	
Rifleman	
Assistant Gunner	
Total Score:	**100**

19. Did you and your team change that plan during the training session that you just finished?

Y	N

a. If **YES**:

iv) Was that change justified? **NO / YES** (circle one)

v) Was that change well chosen? **NO / YES** (circle one)

vi) What was the change consisted of? Describe what was different from your original plan:

_____

_____

20. Think back now about the session that you have just completed. Who did most of the talking? Give a score to each person between 0 and 100, where the four scores add to 100. (A person would be given a score of near 100 only if they did almost all the talking. They would be given a score of near 0 if they did almost no talking).

The extent to which each person did most of the talking was:

Person (code name):	Score/100:
Fire team leader	
Gunner	
Rifleman	
Assistant Gunner	
Total Score:	**100**

21. Overall, how cooperative was each of the other three people (check one value between 1 and 7 for each person).

Person (write the position s/he had) →	1st person:	2nd person:	3rd person:
1. Not at all–s/he was not cooperative at all			
2.			
3.			
4.			
5.			
6.			
7. Very much so–s/he was very cooperative.			

22. Any other comments or suggestions:

Comments: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Suggestions: _____

_____

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_____

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_____

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_____

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APPENDIX E—EVALUATION FORM (EXPERIMENT 1)

Please fill in the following form to the best of your ability. If you need to expand on anything, please use the comments/suggestion section.

Patrol #1 (Outside Watkins).

Section 0. Admin and Ops/Intel Brief: to be filled BEFORE patrol starts

1. Patrol Group Number: _____

2. Date: February 21, 2009

3. Do the participants appear to have a clear understanding of their mission? Please circle one number:

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

Explain: _____

4. Did the participants simulate loading their weapons?

	Simulated weapon loading
Fire Team Leader	
Gunner	
Rifleman	
Assistant Gunner	

Section 1. Time: fill in right at the BEGINNING of the patrol

5. Patrol start time: _____

<u>Section 2</u>: to be filled DURING the patrol

6. Did the participants report to each other someone was observing them?

	Reported (write one strike each time you hear it done)	TOTAL
Fire Team Leader		
Gunner		
Rifleman		
Assistant Gunner		

7. Did the participants report to HHQ that someone was observing them?

	Reported (write one strike each time you hear it done)	TOTAL
Fire Team Leader		
Gunner		
Rifleman		
Assistant Gunner		

8. Did the participants locate a weapons cache?

Y	**N**

a. When/Time? _____

b. How many weapons were seized? _____

c. Who found it: _____

9. Did the participants find any documents of intelligence value?

Who found it? ->> Intelligence found	Fire Team Leader	Gunner	Rifleman	Assistant Gunner
Intelligence found #1				
Intelligence found #2				
Intelligence found #3				
Intelligence found #4				
Intelligence found #5				
Intelligence found #6				
Weapon				

a. When did they reach the room (time)? _____

10. Did the patrol use their camera?

	Used camera (write one strike each time you hear it done)	TOTAL
Fire Team Leader		
Gunner		
Rifleman		
Assistant Gunner		

11. On a scale of 1 to 7, how much did the patrol use their note taking material? Please circle one number:

1 2 3 4 5 6 7

Not at all Somewhat Very much

12. Any other threat reporting? If so, explain: _____

_____

13. Do you have any suggestions for improving the training?

_____

14. Did the participants simulate clearing their weapons?

	Simulated weapon clearing
Fire Team Leader	
Gunner	
Rifleman	
Assistant Gunner	

15. Patrol end time: _____

<u>Section 3</u>: to be filled AFTER the patrol is completed

16. Did the participants perform adequately to complete their mission? Please circle one number:

1 2 3 4 5 6 7

Not at all Somewhat Yes, performance was very adequate

17. On a scale of 1 to 7, how motivated were the participants during the training? Please circle one

number:

1 2 3 4 5 6 7

Not at all Somewhat Very much

18. On a scale of 1 to 6, how well did the participants act as a team (and not as individuals)?

1 2 3 4 5 6

Not at all Very well

19. On a scale of 1 to 6, how often did the team leader request information from the team?

1 2 3 4 5 6

Not at all Very often

20. On a scale of 1 to 6, how often did the team members provide information to the team leader?

1 2 3 4 5 6

Not at all Very often

21. On a scale of 1 to 6, how strong (directive) was the team leader?

1 2 3 4 5 6

Not at all Very strong

22. On a scale of 1 to 6, how often was the authority of the team leader questioned?

1 2 3 4 5 6

Not at all Very often

23. On a scale of 1 to 6, how much trust did the team leader have in the team member's performance and reports?

1 2 3 4 5 6

Not trust at all Very much trust

24. On a scale of 1 to 6, how often did the team wait for decisions of the team leader?

1 2 3 4 5 6

Not at all Very often

25. On a scale of 1 to 6, how often did the team have arguments on patrolling strategies?

1 2 3 4 5 6

Not at all Very often

26. On a scale of 1 to 6, how well did the team members adopt their individual roles in the team?

1 2 3 4 5 6

Not at all Very well

27. Besides the official team leader, did an informal leader emerge?

Y	N

Section 4. Final Comments:

28. Any other comments or suggestions:

Comments: _____

_____

_____

_____

_____

_____

_____

Suggestions: _____

_____

_____

_____

_____

_____

_____

***** END of PATROL #1 EVALUATION *****

APPENDIX F—PILOT STUDY SCHEDULE (EXPERIMENT 1)

Master timeline sheet for pilot study

Action	Time	Responsible	Resources
1. Participants for control group arrive	0800	Experimenters1, 2, 3	(offer doughnuts)
2. Assign random IDs, form patrols, choose fire team leaders.	0800–0830	Experimenter1	
3. Patrolling class for all 3 groups	0830–0845	Experimenter1	
4. Intel training for fire teams	0845–0855	Experimenter3	all three
5. Rehearsals for all	0900–0930	Experimenters1, 2, 3	
6. Patrol 1 for Fire team 1	0940–1000	Experimenter3	
7. Patrol 1 for Fire team 2	0955–1015	Experimenter3	
8. Patrol 1 for Fire team 3	1000–1020	Experimenter3	
9. Debrief of Fire team 1	1005–1010	Experimenter3	
10. Debrief of Fire team 2	1010–1015	Experimenter3	
11. Patrol 2 for Fire team 1 (offer water)	1015–1035	Experimenter2	
12. Debrief of Fire team 3	1020–1025	Experimenter3	
13. Patrol 2 for Fire team 2 (offer water)	1025–1045	Experimenter2	
14. Patrol 2 for Fire team 3 (offer water)	1035–1055	Experimenter2	
15. Debrief of Fire team 1	1040–1045	Experimenter2	
16. Debrief of Fire team 2	1045–1050	Experimenter2	
17. Patrol 3 for Fire team 1	1050–1110	Experimenter1	
18. Debrief of Fire team 3	1055–1100	Experimenter2	
19. Patrol 3 for Fire team 2	1100–1120	Experimenter1	
20. Patrol 3 for Fire team 3	1110–1130	Experimenter1	

21. Debrief of Fire team 1	1115–1120	Experimenter1	
22. Debrief of Fire team 2	1120–1125	Experimenter1	
23. Debrief of Fire team 3	1125–1130	Experimenter1	
24. After Action Review and Debrief	1130–1155	All Hands	
25. Lunch	1200–1230	All Hands	Pizza & Soda
26. Participants for treatment group arrive	1300	Experimenters1, 2, 3	
27. Assign random IDs, form patrols, choose fire team leaders.	1300–1330	Experimenter1	
28. Patrolling class for all 3 groups	1330–1345	Experimenter3	
29. Intel training for all 3 groups	1345–1355	Experimenter1	
30. Rehearsals for all	1400–1430	Experimenters1, 2, 3	
31. Patrol 1 for Fire team 1	1440–1500	Experimenter3	
32. Patrol 1 for Fire team 2	1455–1515	Experimenter3	
33. Patrol 1 for Fire team 3	1500–1520	Experimenter3	
34. Debrief of Fire team 1	1505–1510	Experimenter3	
35. Debrief of Fire team 2	1510–1515	Experimenter3	
36. Patrol 2 for Fire team 1	1515–1535	Experimenter2	(offer water)
37. Debrief of Fire team 3	1520–1525	Experimenter3	
38. Patrol 2 for Fire team 2	1525–1545	Experimenter2	(offer water)
39. Patrol 2 for Fire team 3	1535–1555	Experimenter2	(offer water)
40. Debrief of Fire team 1	1540–1545	Experimenter2	
41. Debrief of Fire team 2	1545–1550	Experimenter2	
42. Patrol 3 for Fire team 1	1550–1610	Experimenter1	
43. Debrief of Fire team 3	1555–1600	Experimenter2	
44. Patrol 3 for Fire team 2	1600–1620	Experimenter1	
45. Patrol 3 for Fire team 3	1610–1630	Experimenter1	
46. Debrief of Fire team 1	1615–1620	Experimenter1	
47. Debrief of Fire team 2	1620–1625	Experimenter1	
48. Debrief of Fire team 3	1625–1630	Experimenter1	

49. After Action Review and Debrief	1630–1655	All Hands	
50. After experiment cleanup	1700–1730	All Hands	water

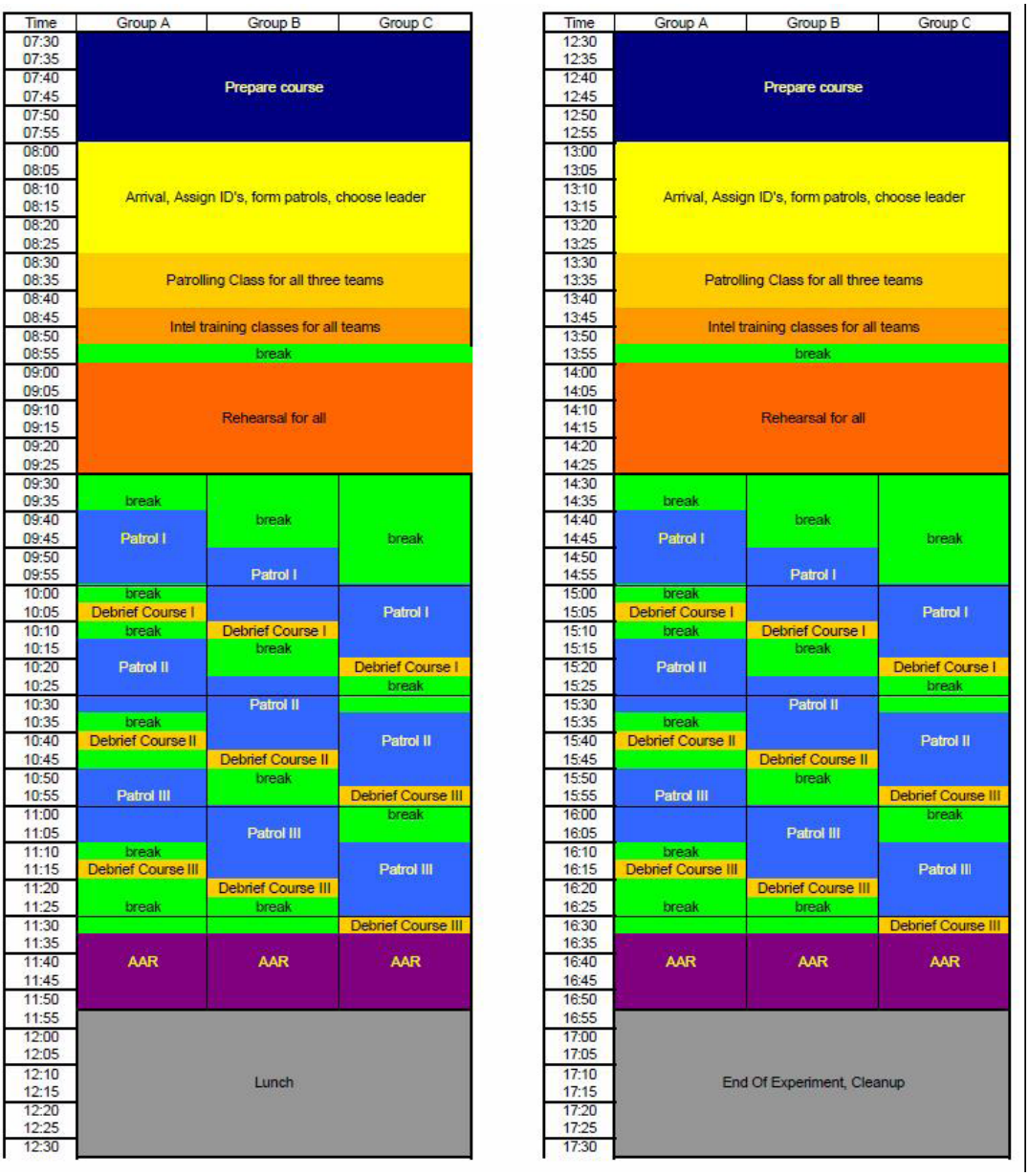

Table 1. Master timeline sheet for pilot study.

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APPENDIX G—PILOT STUDY SCENARIOS (EXPERIMENT 1)

ORIENTATION BRIEF FOR ECONOMY OF FORCE OPERATIONS IN THE TOWN OF NPS

GENERAL SITUATION:

3rd Battalion, 1st Marines has recently conducted a Relief in Place (RIP) with 3/509th INF BDE (-), US ARMY in the Babil Province. RCT 1, has tasked 3/1 to conduct Economy of Force Operations in the Babil Province as 2nd Battalion, 4th Marines (the remaining Battalion responsible for COIN/Security Operations in the Babil Province) has been directed to conduct a clearance in zone operation with ARMY CF in the Diyala Province.

As part of the Battalion's Economy of Force Operations, Companies have been tasked to conduct Active Reconnaissance in several villages on the Northern border of the Babil Province and prevent the infiltration and extraction of Al Qaeda forces from the Diyala Province. Your Company has been tasked to establish a Combat Outpost (COP) near the town of NPS, conduct an active reconnaissance of the area, and prevent/disrupt the flow of Al Qaeda forces into Diyala Province. No Coalition Forces have been active in the town of NPS for approximately 6 months, however, intelligence provided by RCT-1, compiled from multiple SIGINT and HUMINT assets, members of Al Sawah and Predator UAVs have identified that the town is being utilized as a crossing point for Al Qaeda forces desiring to cause instability in the Diyala Province. Three weeks ago, the local religious leader of NPS visited COP Snake in the Diyala Province and offered his willingness to work with CF. This information was turned over to RCT 1, whose Area of Operations includes the town of NPS in the Babil Province. The local religious leader has not been heard from since.

ORIENTATION:

Your boundaries are the walls of Watkins Hall. LZ Bullrush and LZ Condor have been established on the SE and NW corners of Watkins Hall. You are operating in an urban environment with no vegetation.

Mission. NLT XXX conduct an urban patrol outside the perimeter of Watkins Hall and search for enemy presence and lines of communication of possible enemy forces operating in the area.

NOTE: Main things that are being looked at are their movement in an Urban Area, reaction to an observer along the patrol route, and Intel collection activities.

TASK ORGANIZATION:

Squad Leaders will ensure the following are designated:

1 EPW/Detainee Team

2. AID/Litter Team

3. SSE Team

4. Other as directed by your Company Headquarters

COORDINATING INSTRUCTIONS:

Squad Leaders will ensure the following are briefed prior to departing:

1. No COMM Plan

2. Lost Marine Plan

3. Signal Plan

4. IAD to IED Unexploded

5. IAD to IED Exploded

6. IAD to Sniper Contact

7. IAD to SAF Ambush

8. CASEVAC Plan

9. Squad Leaders to ensure Marines have their T/E gear to include NATO 9-Line MEDEVAC Request, IED/UXO Report, and LZ Brief

ADMINISTRATION AND LOGISTICS:

A. Administration

1. Casualties: Air MEDEVACs, Utilize the NATO 9-Line Report Format, cherry picker

2. EPWs: Move them to a designated consolidation point, picked up by QRF.

SITUATION UPDATE #1

GENERAL SITUATION:

The enemy in the area has moved their operations into the building of Watkins.

ORIENTATION:

Your boundaries are the 1st floor of Watkins Hall. You are operating in an urban environment with no vegetation.

Mission. NLT XXX conduct an urban patrol through the 1st floor of Watkins Hall and search for weapons and other enemy related material IOT disrupt enemy activities operating in the area.

NOTE: Main things that are being looked at are their movement in an Urban Area and Intel collection activities.

TASK ORGANIZATION:

Fire Team Leaders will ensure the following are designated:

1 EPW/Detainee Team

2. AID/Litter Team

3. SSE Team

4. Other as directed by your Company Headquarters

COORDINATING INSTRUCTIONS:

Fire Team Leaders will ensure the following are briefed prior to departing:

1. No COMM Plan

2. Lost Marine Plan

3. Signal Plan

4. IAD to IED Unexploded

5. IAD to IED Exploded

6. IAD to Sniper Contact

7. IAD to SAF Ambush

8. CASEVAC Plan

9. Squad Leaders to ensure Marines have their T/E gear to include NATO 9-Line MEDEVAC Request, IED/UXO Report, and LZ Brief

ADMINISTRATION AND LOGISTICS:

A. Administration

1. Casualties: Air MEDEVACs, Utilize the NATO 9-Line Report Format, cherry picker

2. EPWs: Move them to a designated consolidation point, picked up by QRF.

SITUATION UPDATE #2

GENERAL SITUATION:

No change.

ORIENTATION:

Your boundaries are the 2nd floor of Watkins Hall. You are operating in an urban environment with no vegetation.

Mission. NLT XXX conduct an urban patrol through the 2nd floor of Watkins Hall and link-up with Chief Heiko IOT determine the status of the local religious leader (mentioned in the orientation brief) as well as the status of the local populace and enemy forces operating in the area.

NOTE: The participants will get an Intel dump from the Chief based upon how they interact with the Chief. If they don't try to get information, he gives them nothing; if they do a standard job, try to Cordon and Search in our designated room and play the Culture game, he will give the Marines some ambiguous information for them to report at the Debrief, requesting in return, items to improve the village's infrastructure and help stabilize the city. Main things that are being looked at are their movement in an Urban Area and Intel collection activities.

TASK ORGANIZATION:

Squad Leaders will ensure the following are designated:

1 EPW/Detainee Team

2. AID/Litter Team

3. SSE Team

4. Other as directed by your Company Headquarters

COORDINATING INSTRUCTIONS:

Squad Leaders will ensure the following are briefed prior to departing:

1. No COMM Plan

2. Lost Marine Plan

3. Signal Plan

4. IAD to IED Unexploded

5. IAD to IED Exploded

6. IAD to Sniper Contact

7. IAD to SAF Ambush

8. CASEVAC Plan

9. Squad Leaders to ensure Marines have their T/E gear to include NATO 9-Line MEDEVAC Request, IED/UXO Report, and LZ Brief

ADMINISTRATION AND LOGISTICS:

A. Administration

1. Casualties: Air MEDEVACs, Utilize the NATO 9-Line Report Format, cherry picker

2. EPWs: Move them to a designated consolidation point, picked up by QRF.

APPENDIX H—CONSENT FORMS (EXPERIMENT 2)

Naval Postgraduate School

Participant Consent Form &
Minimal Risk Statement

Introduction. You are invited to participate in a study entitled INTEGRATING INTELLIGENCE ACTIVITIES AND BUILDING TEAMS WITH THE INFANTRY IMMERSION TRAINER

Background: In October 2007, under Marine General James Mattis' guidance the Marine Corps and the Office of Naval Research (ONR) unveiled a prototype Infantry Immersion Trainer—IIT aboard Camp Pendleton, CA. It was constructed to improve Marine Corps combat skills across a wide range of military operations. Some of the tasks to conduct the simulation based training involve: 1) Tasks in an urban environment, 2) Room clearing, 3) Urban patrolling, and 4) Observation Point (OP) activities.

The study that you will participate in is looking into different ways in which the training in IIT facility could be improved even further.

Procedures. You will be asked to conduct a walking patrol through an indoor an outdoor environment in the vicinity of the Infantry Immersion Trainer at Camp Pendleton, CA. You will be asked to walk along even and uneven surfaces. Prior to your participation you will be asked to fill in a short survey. You will then be asked to complete a set of tasks in several different scenarios; at the end of each scenario you will be asked to complete a short survey, after which an After Action Review (AAR) with entire team will be conducted. You will be videotaped and have still pictures taken during the execution of the patrol and AAR.

R**isks and Benefits.** I understand that this experiment does not involve greater than minimal risk and involves no known reasonably foreseeable risks or hazards greater than those encountered in everyday life. I have also been informed of any benefits to myself or to others that may reasonably be expected as a result of this research.

Compensation. I understand no tangible compensation will be given. I understand that a copy of the research results will be available at the conclusion of the experiment. You may contact the Principle Investigator (Dr. Amela Sadagic asadagic@nps.edu) for a copy of the results after 25 September 2009.

Confidentiality & Privacy Act. I understand that all records of this study will be kept confidential and that my privacy will be safeguarded. No information will be publicly accessible which could identify me as a participant. I will be identified only as a code number on all research forms/data bases. My name on any signed document will not be

paired with my code number in order to protect my identity. I understand that records of my participation will be maintained by NPS for three years, after which they will be destroyed.

Voluntary Nature of the Study. Participation in this study is strictly voluntary, and if agreement to participation is given, it can be withdrawn at any time without prejudice.

Points of Contact. I understand that if I have any questions or comments regarding this project upon the completion of my participation, I should contact the Principal Investigator, Dr. Amela Sadagic, 656-3819, asadagic@nps.edu. Any other questions or concerns may be addressed to the Naval Postgraduate School. IRB Chair, LCDR Paul O'Connor, 831-656-3864, peoconno@nps.edu.

Statement of Consent. I have been provided with the purpose, procedures, and duration of my participation in this research project and they have been fully explained. I understand how my identification will be safeguarded and have had all my questions answered. I have been provided a copy of this form for my records and I agree to participate in this study. I understand that by agreeing to participate in this research and signing this form, I do not waive any of my legal rights.

_____ _____

Participant's Signature Date

_____ _____

Researcher's Signature Date

Privacy act Statement and Consent Agreement for Audio or Video Recording

I have received a thorough description of the purpose and procedures for specify audio and video recording during the course of the proposed research study. I give my consent to allow recording during participation in this study, and for those records to be reviewed by persons involved in the study. I understand that all information will be kept confidential and will be reported in an anonymous fashion, and that the recordings will be erased no later than 60 days from the completion of the study. I further understand that I may withdraw this consent at any time without penalty.

_____ _____

Participant's Signature Date

_____ _____

Researcher's Signature Date

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APPENDIX I—IRB REQUEST (EXPERIMENT 2)

Amela Sadagic, Ph.D.
MOVES Institute
Craig Schwetje
Watkins Hall
Naval Postgraduate School
Monterey, California 93943

831-656-3819
DSN: 756-2281
Fax: 831-656-9999
asadagic@nps.edu
crschwet@nps.edu

To: Protection of Human Subjects Committee

Subject: Application for Human Subjects Review (Title): INTEGRATING INTELLIGENCE ACTIVITIES AND BUILDING TEAMS WITH THE INFANTRY IMMERSION TRAINER

PROJECTED START DATE: _____APRIL_____/____27_____/_____2009_____
MONTH DAY YEAR

I am requesting approval of the attached experimental protocol, it outlines the methods and all applicable materials and forms that a participant will read and/or fill-out (i.e., consent forms privacy act statements, debriefing forms).

The Principal Investigator understands and accepts the following obligations to protect the rights and welfare of research subjects in this study:

I recognize that as the Principal Investigator it is my responsibility to ensure that this research and the actions of all project personnel involved in conducting this study will conform with the IRB approved protocol and IRB requirements/policies.

I recognize that it is my responsibility to ensure that valid informed consent/assent (unless explicitly waived by the IRB) has been obtained from all research subjects or their legally authorized representatives. I will ensure that all project personnel involved in the process of consent are trained properly and are fully aware of their responsibilities relative to obtaining informed consent/assent according to the IRB guidelines.

I will ensure all personnel involved in this study have completed the required IRB Training.

I will not initiate any change in protocol without IRB approval.

I have no conflict of interest negating me from performing this research.

I will maintain all required research records on file; and I recognize that the IRB is authorized to inspect these records at any time.

I will immediately inform the IRB Chair and NPS Dean of Research of any untoward event or injury that involves a research participant.

I understand that in the absence of a continuing review and approval, this research may not continue beyond the end of the approval period.

At the completion of this project, an End-of-Experiment Report will be submitted.

I will not commence this research, including subject recruitment, until I have received my NPS IRB application approval letter.

_____

(Signature of Principal Investigator)

Dr. Amela Sadagic

Application for Human Subjects Review	NPS IRB Number:
Principal Investigator(s): Co- PI(s)	**Dr. Amela Sadagic, Ph.D., MOVES Institute** **Major Craig Schwetje, MOVES Institute**
Title of Experiment:	INTEGRATING INTELLIGENCE ACTIVITIES AND BUILDING TEAMS WITH THE INFANTRY IMMERSION TRAINER
Approval Requested [X] New [ ] Continuing [ ] Amendment	
Requested Level of Risk [ ] Exempt [X] Minimal [ ] More than Minimal	
Work to be done in (Site/Bldg/Rm) Camp Pendleton, CA/Infantry Immersion Trainer	Estimated date of completion (not to exceed one year from start date): 1 August 2009
Maximum number of participants: 150	Estimated length of each subjects participation: 8 hours (arrival-participation-departure)

Special Populations that will be Used as Participants:

[X] Subordinates [ ] Minors [ ] NPS Students [ ] Special Needs (e.g. Pregnant women)

Participants will be junior enlisted Marines from 1st Radio Battalion and Echo Company, 2d Battalion, 4th MAR. No participant is a direct subordinate to any researcher in the study but there is a possibility, although small, a participant may be a subordinate to the researcher in the future. In order to safeguard information participants will not record name, SSN, or any other identifying information on the questionnaire's or surveys in the study. All data collected will be cataloged by a random assignment of a participant number. Informed consent forms will be kept separate and secure during data analysis so that no attempt may be made to match a participant to a participant ID.

Scientific Merit Review (Check all that apply)

[ ] This research is part of a funded project:
[X] This research is a student thesis (Attach a copy of the approved thesis proposal)
[ ] Other (Attach a complete research proposal–Dept. Chair must sign Application Cover Letter)

Outside Cooperating Investigators and Agencies: None.
Participants will be from 1st Radio Battalion (RADBN) and Echo Company, 2d Battalion, 4th MAR (E/2/4) at Camp Pendleton, CA. Attached is an email message from the command acknowledging the request to utilize Marines from the command. The POCs for RADBN are SSgt Stokes, Christian or GySgt Carter, Samuel at 763-5986/4361. POC for E/2/4 is 1st Lt Borden, Jerome at 763-0816.

[X] A copy of the cooperating institution's POC and CO's approval is attached.

Description of Research:

Overview

The primary purpose of this study is to validate the need for an emphasis on the skill integration in support of advanced technological solutions with the goal of more successfully training. A case study that will be used in this in this effort is integration of the full intelligence cycle, and a specific training facility that study will focus on is the Infantry Immersion Trainer (IIT) located in Camp Pendleton. To fully support this objective, the study will provide research data on how to de-emphasize technology-centered approach, and emphasize skill integration approach (training-centered approach). This will be achieved by introducing a Squad Planning Operations Center (SPOC) configuration planned to be within 100 meters from the IIT for the Marines Patrol Briefs and Debriefs, designed specifically to support skill integration and full intelligence cycle. The design of SPOC also includes a design of a set of resources to be used for unit's work and briefings.

We plan to utilize current Battalion-level intelligence capabilities to augment the hyper-realistic training offered at the IIT and maximize the training potential that this training environment holds. We will investigate relevant performance trends as they are identified in current Urban Warfare Training segment in Mojave Viper and make sure those trends are properly addressed with training solutions. We will also design a suitable combination of emerging technologies that can effectively support desired training objectives. It is planned to (1) research and demonstrate the appropriate usage of intelligence capabilities to create a realistic combat experience, and (2) to determine how effective two alternative approaches were in Marines' training by using both quantitative and qualitative measurements collected in the study.

Research Methods

The experiment is set to begin at in April 2009 and will take two weeks to complete. There will be two units training at the IIT (RADBN and E/2/4), each for a one week period.

We plan to use the Marines from these two units as participants. The evaluators and role-players will be provided by the personnel permanently assigned to work at the IIT. The scenarios utilized during this training will be drafted by the IIT staff to meet the training units training requirements. The participants will be divided randomly and equally into two groups. Even though information about experience levels is collected, we will not control for combat or patrolling experience. The two groups are 1) a control group and 2) an experimental group:

Control Group: Depending on the number of participants, twelve to thirteen (a squad size element) participants will be given their Patrol Brief outside the IIT in a school-circle just like what is normally done at the IIT during their training. This is the current standard at the IIT. Following the patrol, there will be a debrief/After-Action Review (AAR) in the same spot as the Patrol Brief was given to capture lessons learned about their actions from during the exercise. This is the current standard at the IIT.

Experimental Group: Depending on the number of participants, twelve to thirteen (a squad size element) participants will be given their Patrol Brief in the SPOC, located within 100 meters from

the IIT. Briefing information will be displayed graphically with current visual support technology that an Infantry Battalion has access to. The participants will be provided with hard copies of the material available and will be afforded the opportunity to ask the briefer any questions for clarification. Following the patrol, their will be a debrief/After-Action Review (AAR) conducted in the SPOC. The purpose of the debrief/AAR will be to capture lessons learned, reinforce the skill set that is expected to be perfected during the training sessions, illustrate the results that Marines achieved, and provide constructive critique and guidance for follow-up sessions.

Each group will be given a survey just before the start of the experiment, and just prior and after each patrol sequence. A total of five patrol runs will be done for each team. Both control and experimental groups will go through the same set of scenarios.

Each squad will be accompanied by one or more evaluators. Each evaluator will fill out an evaluation form to collect both qualitative and quantitative information on the squad's performance. There will be a tape-recorded question and answers session after the end of the experiment to clarify any potential misunderstandings (Note: questionnaire forms will be administered prior to the team briefing and team discussion). We will use this opportunity to gain more feedback that might not be caught in the questionnaires.

Method of Subject Recruitment: Major Craig Schwetje, USMC (NPS student) made initial contact with Tom Buscemi (Director, I MEF Battle Simulation Center, Camp Pendleton) over a year ago. The two have been in contact frequently since that time via phone, email, and in person at the IIT. Major Schwetje has described the requirements to Mr. Buscemi. Mr. Buscemi then provided the training schedule to coordinate with the two units mentioned earlier (i.e., RADBN and E/2/4) to see if these units could support the experiment.

I have read and understand NPS policy on the Protection of Human Subjects. If there are any changes in any of the above information or any changes to the attached materials, I will suspend the experiment until I obtain new IRB approval.

SIGNATURE_____ DATE_____

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APPENDIX J—SURVEY (EXPERIMENT 2)

Please fill in the following questionnaire. All information will be held confidential. If you need to expand any answer, please use the comments/suggestion section.

To be filled in upon arrival

1. Participant unit and squad number: _____
2. Date: April 27 – May 8, 2009
3. Year of birth: _____ Age: _____

4. Billet: _____
5. Primary MOS or job specialty (Example–**0231** Intelligence Specialist): _____

6. Rank/Service: _____

7. Time in service: _____years _____months

8. When you think about your own knowledge of infantry tactics, techniques, and procedures, how would you rank them? (Please circle one number between 1 and 7 in each line)

#	**Knowledge and skills:**	→ Poor			**Your current level**			→ Excellent
8.	Receiving the Brief	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9.	Planning for the Patrol	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10	Movement of the Patrol	**1**	**2**	**3**	**4**	**5**	**6**	**7**
11	Interaction with the locals	**1**	**2**	**3**	**4**	**5**	**6**	**7**
12	Finding items of intelligence value	**1**	**2**	**3**	**4**	**5**	**6**	**7**
13	Reporting to HHQ during the patrol	**1**	**2**	**3**	**4**	**5**	**6**	**7**
14	Sharing/reporting intelligence for future missions	**1**	**2**	**3**	**4**	**5**	**6**	**7**

***** STOP FILLING THE QUESTIONNAIRE HERE *****

After Brief #1.

1. Do you understand your mission? Please circle one number that reflects your opinion.

   1 2 3 4 5 6 7

   Not at all Somewhat Yes, clearly

   Explain: _____

2. Was the Brief clearly presented? Please circle one number that reflects your opinion.

   1 2 3 4 5 6 7

   Not at all Somewhat Yes, clearly

   Explain: _____

3. What did you most like about how the Brief was presented?

   Explain: _____

   _____

4. What did you not like about how the Brief was presented?

   Explain: _____

   _____

5. What do you remember as being the most important item of the Brief?

   _____

6. What do you have in mind as the most important thing to look for during the patrol?

   _____

7. Any other comments or suggestions:

   Comments: _____

   _____

   Suggestions: _____

   _____

***** STOP FILLING THE QUESTIONNAIRE HERE *****

After Patrol #1.

1. Circle your role in the patrol that you just completed (circle one):

SQUAD LEADER	MEMBER FIRE TEAM 1	MEMBER FIRE TEAM 2	MEMBER FIRE TEAM 3

2. Did you load and make ready your weapon before departing on the patrol?

Y	N

3. How many threats did you observe during the patrol?

   Personnel_____ Vehicle_____

4. How many threats did you report on during the patrol?

   Personnel_____ Vehicle_____

5. Did you collect any items of intelligence value?

   Yes_____ No_____

   If yes, please list and describe: _____

   _____

   _____

   _____

6. How many threats did you report on after the patrol?

   Personnel_____ Vehicle_____

7. Did you clear your weapon upon return to friendly lines?

Y	N

8. What task was hardest for you?

   It was very hard to: _____

   _____

It was very hard to: _____

_____

It was very hard to: _____

_____

It was very hard to: _____

_____

9. What task was easiest for you?

It was very easy to: _____

_____

It was very easy to: _____

_____

It was very easy to: _____

_____

It was very easy to: _____

_____

10. Rate your confidence in doing the following tasks in the training by checking one block for each task (**1** means you are **NOT** confident; 7 means you are **HIGHLY** confident). Please circle one number that reflects your opinion.

NOT confident → **HIGHLY** confident

	1	**2**	**3**	**4**	**5**	**6**	**7**
Receiving the Brief							
Planning for the patrol							
Movement of the patrol							
Interacting with the locals							
Finding items of intelligence value							
Reporting to HHQ during the patrol							
Sharing/reporting intelligence for future missions							

11. Rate your overall success in executing the mission (1 = **NOT** successful, 7 = **VERY** successful). Please circle one number that reflects your opinion.

I was (circle one): **NOT** successful → **VERY** successful

1	**2**	**3**	**4**	**5**	**6**	**7**

12. If you think that you were not very successful, what were the reasons for it?

I was not very successful because: _____

_____

I was not very successful because: _____

_____

I was not very successful because: _____

_____

13. If you think that you were very successful, what were the reasons for it?

I was very successful because: _____

_____

I was very successful because: _____

_____

I was very successful because: _____

_____

14. Who do you think provided the most valuable reporting? (circle one):

SQUAD LEADER	**MEMBER FIRE TEAM 1**	**MEMBER FIRE TEAM 2**	**MEMBER FIRE TEAM 3**

15. Do you have any suggestions for improving your familiarization with the training you just did?

_____

_____

_____

16. What do you remember as being the most important item of the Brief?

_____

_____

17. What do you have in mind as the most important thing to look for during the next patrol?

_____

_____

18. The following questions (a through g), deal with the virtual people displayed on the wall. Please answer if applicable. On a scale of 1 to 7, please circle a number for the following statements:

a. I perceived that I was in the presence of real people when the people displayed on the wall were in the room.

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

b. I felt that the people displayed on the wall were watching me.

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

c. The thought that the people displayed on the wall are not real people crossed my mind often.

1 2 3 4 5 6 7

Not at all Somewhat Very often

d. I looked at the people displayed on the wall often.

1 2 3 4 5 6 7

Not at all Somewhat Very often

e. The people displayed on the wall appeared to be real to me.

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

f. I perceived the people displayed on the wall as only computerized images, not people.

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

g. I believed that the people displayed on the wall represented real people.

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

19. Any other comments or suggestions:

Comments: _____

_____

_____

Suggestions: _____

_____

_____

_____

***** STOP FILLING THE QUESTIONNAIRE HERE *****

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

The remaining questions are to only be answered following your final patrol.

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

19. Based on your military experiences, on a scale of 1 to 7, please circle a number in each of the following statements:

a. This training was an effective way to train me how to patrol in an urban environment.

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

b. This training was an effective way to train me how to patrol in an urban environment versus other urban environment training that I have done in the past. (Please either circle N/A or a number between 1 and 7).

1 2 3 4 5 6 7 N/A

Not at all Somewhat Yes, clearly Not Applicable

c. Having experienced actual urban environment patrolling, this training was an effective way to train me how to patrol in an urban environment. (Please either circle N/A or a number between 1 and 7).

1 2 3 4 5 6 7 N/A

Not at all Somewhat Yes, clearly Not Applicable

20. This training improved my urban patrolling skills.

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

21. This training improved my information gathering skills.

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

22. Any other comments or suggestions:

Comments: _____

_____

_____

_____

_____

_____

_____

_____

_____

Suggestions: _____

_____

_____

_____

_____

_____

_____

_____

_____

***** STOP FILLING THE QUESTIONNAIRE HERE *****

Thank you for volunteering to participate in this study.

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APPENDIX K—EVALUATION FORM (EXPERIMENT 2)

Please fill in the following form to the best of your ability. If you need to expand on anything, please use the comments/suggestion section.

Patrol #1.

<u>Section 1. Admin and Brief for Patrol #1</u>: to be filled BEFORE patrol starts

1. Unit/Squad Number: _____

2. Date: April 27 – May 8, 2009

3. Do the participants appear to have a clear understanding of their mission? Please circle one number:

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

Explain: _____

4. Did all the participants load their weapons? Please circle 'YES' or 'NO':

YES	NO

5. Did the squad leader load his weapon?

YES	NO

6. If someone did not load his weapon, how many in each billet did not do it? (Use tick marks or just write in a total):

	Simulated weapon loading
Fire Team Leader	
Gunner	
Rifleman	
Assistant Gunner	

****
****

Area for notes: _____

***** DONE UNTIL AFTER THE PATROL *****

Section 2. Patrol #1: to be filled AFTER the patrol

1. Did the participants report to each other someone was observing them? Please circle one number:

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

Explain: _____

2. Did the participants report to HHQ that someone was observing them? Please circle one number:

1 2 3 4 5 6 7

Not at all Somewhat Yes, clearly

Explain: _____

3. Did the participants locate a weapons cache? Please circle 'YES' or 'NO':

YES	NO

b. How many weapons were seized? _____

c. Who found it: _____

4. Was there supposed to be a weapons cache for this scenario? Please circle 'YES' or 'NO':

YES	NO

5. Did the participants find any documents of intelligence value? Please circle 'YES' or 'NO':

YES	NO

b. How many documents were found? _____

c. Who found them: _____

6. Was there supposed to be documents of intelligence value for this scenario? Please circle 'YES' or 'NO':

YES	NO

Area for notes: _____

_____

_____

_____

_____

_____

_____

_____

****
****

7. Did the patrol use their camera? Please circle 'YES' or 'NO':

YES	NO

8. On a scale of 1 to 7, how much did the patrol use their note taking material? Please circle one number:

1 2 3 4 5 6 7

Not at all Somewhat Very much

9. Do you have any suggestions for improving the training?

_____

_____

10. Did the participants clear their weapons? Please circle 'YES' or 'NO':

YES	NO

11. Did the squad leader clear his weapon? Please circle 'YES' or 'NO':

YES	NO

12. If someone did not load his weapon, how many in each billet did not do it? (Use tick marks or just write in a total):

	Simulated weapon loading
Fire Team Leader	
Gunner	
Rifleman	
Assistant Gunner	

****
****

Area for notes: _____

_____

_____

_____

_____

_____

_____

_____

****
****

13. Did the participants perform adequately to complete their mission? Please circle one number:

1 2 3 4 5 6 7

Not at all Somewhat Yes, performance was very adequate

14. On a scale of 1 to 7, how motivated were the participants during the training? Please circle one number:

1 2 3 4 5 6 7

Not at all Somewhat Very much

15. On a scale of 1 to 7, how well did the participants act as a team (and not as individuals)? Please circle one number:

1 2 3 4 5 6 7

Not at all Very well

16. On a scale of 1 to 7, how often did the squad leader request information from the squad? Please circle one number:

1 2 3 4 5 6 7

Not at all Very often

17. On a scale of 1 to 7, how often did the squad members provide information to the squad leader? Please circle one number:

1 2 3 4 5 6 7

Not at all Very often

18. On a scale of 1 to 7, how strong (directive) was the squad leader? Please circle one number:

1 2 3 4 5 6 7

Not at all Very strong

19. On a scale of 1 to 7, how often was the authority of the squad leader questioned? Please circle one number:

1 2 3 4 5 6 7

Not at all Very often

****
****

Area for notes: _____

_____

_____

_____

_____

20. On a scale of 1 to 7, how much trust did the squad leader have in the squad's performance and reports? Please circle one number:

1 2 3 4 5 6 7

Not trust at all Very much trust

21. On a scale of 1 to 7, how often did the squad wait for decisions of the squad leader? Please circle one number:

1 2 3 4 5 6 7

Not at all Very often

22. On a scale of 1 to 7, how often did the squad have arguments on patrolling strategies? Please circle one number:

1 2 3 4 5 6 7

Not at all Very often

23. Did the squad leader use proper formations for the movement? Please circle 'YES' or 'NO':

YES	NO

24. If contact was made with the enemy, did the squad leader take appropriate action? Please circle 'YES' or 'NO':

YES	NO

Section 3. Final Comments for Patrol #1:

1. Any other comments or suggestions:

Comments: _____

_____

_____

_____

Suggestions: _____

_____

_____

***** END of PATROL #1 EVALUATION *****

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APPENDIX L—IIT STUDY SCHEDULES (EXPERIMENT 2)

Master timeline sheets for IIT study

Control Group

Master timeline sheet for pilot study. SUBJECTS: Control group (27 APR - 1 MAY)								GROUPS					
	Action	Time period	Duration (min)	Person responsible	Others involved (helpers)	Resources needed	Note	1	2	3	4	5	6
*	Recharge camera batteries	Night before	All night	Craig		Batteries / chargers	charge batteries						
1	Set up	0600 - 0730	90	Craig	IIT staff	all items							
2	**Participants arrive**	0730		Craig	IIT staff								
3	**Issue consent forms**	0730 - 0800	30	Craig	IIT staff & Training unit	Consent forms and pencils / pens							
4	**Ask Instructors how many scenarios the unit will go through**	0745 - 0800	15	Craig	IIT staff								
5	**Brief and provide Intel refresher class**	0800 - 0815	15	Craig	Training unit	briefing slides	ASK IF EVERYONE CAN SIT IN ON IT – ASK TO USE THE PROJECTOR						
6	" "	" "	" "	Craig	" "	" "	Emphasize camera use and reporting procedure (reporting to unit leader and to higher command).						
7	**Make camera available to the unit + make sure unit appoints 1 Marine to handle the camera (show how camera works)**	0815 - 0830	15	Craig	Training unit	camera	have the Marine sign for the camera						
8	**Fill out the questionnaires**	0830 - 0845	15	Craig	Marines	questionnnaires	Make sure the patrol is not the last iteration						
	COLLECT QUESTIONNAIRES	TBD	TBD	Craig	Marines		collect pens and pencils too						
9	**Conduct patrol**	0845 - 0930	45	Craig	Marines & Instructors	notes and camera	follow in trace as a 2d observer						
10	**Fill out the questionnaires**	0930 - 1000	15	Craig	Marines & Instructors	questionnnaires	In final patrol unit will fill out the final questionnaire.						
11	**COLLECT QUESTIONNAIRES**	TBD	TBD	Craig	Marines & Instructors		collect pens and pencils too						
12	**TURN ON CAMCORDER**	TBD	TBD	Craig			(use pre-labeled miniDV tape)						
13	**Count and collect camera pictures; as well as charts that unit made in given scenario.**	TBD	TBD	Craig	Training unit	camera & laptop	(camcorder recording)						
14	**Conduct AAR (by instructor) – important to be done AFTER they filled in their questionnaire. Record AAR with camcorder.**	TBD	TBD	Craig	Marines & Instructors	camcorder & video tapes	LABEL video tapes						
15	**TURN OFF CAMCORDER**	TBD	TBD	Craig									

Table 2. Control Group master timeline sheet for IIT study.

Treatment Group

Master timeline sheet for pilot study. SUBJECTS: Control group (4 MAY - 8 MAY)								GROUPS					
	Action	Time period	Duration (min)	Person responsible	Others involved (helpers)	Resources needed	Note	1	2	3	4	5	6
*	Recharge camera batteries	Night before	All night	Craig	/	Batteries / chargers	charge batteries						
1	Set up Squad Planning Operations Center (SPOC)	0600 - 0730	90	Craig	IIT staff	all items							
2	**Participants arrive**	0730		Craig	IIT staff								
3	**Issue consent forms**	0730 - 0800	30	Craig	IIT staff & Training unit	Consent forms and pencils / pens							
4	**Ask Instructors how many scenarios the unit will go through**	0745 - 0800	15	Craig	IIT staff								
5	**Brief and provide Intel refresher class**	0800 - 0815	15	Craig	Training unit	briefing slides	ASK IF EVERYONE CAN SIT IN ON IT – ASK TO USE THE PROJECTOR						
6	" "	" "	" "	Craig	" "	" "	Emphasize camera use and reporting procedure (reporting to unit leader and to higher command).						
7	**Make camera available to the unit + make sure unit appoints 1 Marine to handle the camera (show how camera works)**	0815 - 0830	15	Craig	Training unit	camera	Have the Marine sign for the camera. Train someone as the 2d observer						
8	**Fill out questionnaires**	0830 - 0845	15	Craig	Marines & Instructors	questionnnaires	Make sure the patrol is not the last iteration						
9	**COLLECT QUESTIONNAIRES**	TBD	TBD	Craig	Marines	/	collect pens and pencils too						
10	**Conduct patrol**	0845 - 0930	45	Craig	Marines & Instructors	notes and camera	work with Intel Marine in SPOC						
11	**Fill out questionnaires**	0930 - 1000	15	Craig	Marines & Instructors	questionnnaires	In final patrol unit will fill out the final questionnaire.						
12	**COLLECT QUESTIONNAIRES**	TBD	TBD	Craig	Marines & Instructors		collect pens and pencils too						
13	**TURN ON CAMCORDER**	TBD	TBD	Craig			(use pre-labeled miniDV tape)						
14	Before AAR	TBD	TBD	Craig	Marines		Ask them to provide a report for intel representative						
15	Before AAR	TBD	TBD	Craig	Marines	laptop, paper notebooks, paper sheets	As well as charts (this includes counting and collect camera pictures that unit made in given scenario. MAKE NOTES OF PICTURES IF UNABLE TO DOWNLOAD -- RECORD BY SCENARIO. This is in place of unit making intel products themselves.						
16	Before AAR	TBD	TBD	Craig	Marines		Emphasize the Intel cycle and camera use as part of the Intel cycle						
17	**Count and collect camera pictures; as well as charts that unit made in given scenario.**	TBD	TBD	Craig	Training unit	camera & laptop							
18	**Conduct AAR (by instructor) – important to be done AFTER they filled in their questionnaire. Record AAR with camcorder.**	TBD	TBD	Craig	Marines & Instructors	camcorder & video tapes	LABEL video tapes						
19	**TURN OFF CAMCORDER**	TBD	TBD	Craig									

Table 3. Treatment Group master timeline sheet for IIT study.

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