ADVANCED USE OF FORCE SIMULATION USING THE WTET

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ABSTRACT

The Weapons Team Engagement Trainer (WTET) was developed by the Naval Air Warfare Center Training Systems Division (NAWCTSD) to simulate a variety of close quarter combat/threat situations and create a more realistic environment for tactical training. The system is currently being commercialized through a cooperative agreement between NAWCTSD and Firearms Training Systems, Inc. which will result in a more efficient insertion of the product into the military and law enforcement market. Additionally, NAWCTSD and the National Institute of Justice (NIJ) are participating in a cooperative agreement to make the prototype system available to military, federal and local law enforcement agencies for use in Orlando, FL. until the commercial version is available. This effort serves a valuable training need, creates a research opportunity for validating the effectiveness of the system, and provides a test bed to make improvements to future versions of the system.

This paper provides an overview of the WTET system, as well as detail on the use of the system for training and validation. Included will be a full description of the WTET components and capabilities; detail on the cooperative effort between government and industry to create a training and research environment; a discussion of the current training being employed with the prototype; and a description of the training effectiveness evaluation currently being conducted on the WTET.

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INTRODUCTION

The judge finally signed the search warrant, operation Flash Gordon is a go. SWAT Team Alpha is called to muster. Intelligence confirms the suspects are heavily armed, the probable location within the dwelling that they might be found, and that there is a strong possibility of innocent people co-located in the home. Commander Tom Honor briefs SWAT Team Alpha on the specifics of the operation including individual duties and responsibilities. At 0442 the following morning operation Flash Gordon commenced, and at 0446 the dwelling is secured with two very dangerous suspects in custody, a cache of guns and explosives taken off the streets, and the innocent cohabitants shaken but unharmed.

How was the SWAT team able to perform this complex and highly dangerous task with minimum incident or negative consequence and maximum effect? How were they able to elicit the right level of force in a situation that required multiple levels of force? The answer lies in selection and training. SWAT teams are comprised of elite officers that are selected for duty based on their experience, knowledge, skill, attitude, ability, and professionalism. Currently, for the purposes of selection, law enforcement agencies use a battery of tests to determine an officer's merit on the aforementioned dimensions. Although selection is a very important variable in determining who a good cop will be this paper will focus on the other side of the coin, training.

If there is an organization where training is of utmost importance, as much or more so than the military, it is the Law Enforcement Agency (LEA). By virtue of having to *serve* and *protect* their constituency, police officers must adhere to a unique set of roles and responsibilities. Unlike the military where the enemy and targets are defined and the rules of engagement are relatively straight forward; law enforcement officers are in an environment where "targets," "enemy," and the rules of engagement change from moment to moment and situation to situation. This creates a condition of chaos where the officers must act and react in an ever changing flow of real-time events and circumstances. For example, a traffic stop turns from routine to radical when a rogue runaway in a stolen car tries to run down the police officer. Or when a SWAT team is working a high stress hostage stand-off that has dragged on for six hours when suddenly an unknown child from an adjacent room runs between the SWAT team and the assailant at the same moment an unexplained loud bursting sound is heard. In Another example, police officers are securing a gang related disturbance in the midst of a crowded nightclub where innocent bystanders resemble gang members. In each of these examples the routine quickly takes a chaotic turn where the officers must make split second decisions regarding level of force to employ so as to protect themselves and their innocent constituency while completing the police action in a confusing environment.

Unfortunately police actions, at times, result in negative consequences, i.e., police brutality, innocent bystanders put in harms way, or the arrest of the wrong person(s). In an effort to minimize negative police actions and maximize police effectiveness LEA's employ a wide range of training techniques, e.g., classroom instruction, role playing, force on force exercises, computer based training, and simulators. The relative merit of these techniques come into question in light of the increasing complexity of crime, knowledge and skills of the criminals, terrorism, and the attention of the media and courts to recent threat encounters. Our police officers are repeatedly exposed to situations that require *use of force* decision making in real-time under stressful conditions. Training plays a paramount role in ensuring police officers are prepared to make the right decisions and employ the optimal level of force given the specific circumstances at that specific moment.

This paper provides and overview of the advancements in Law Enforcement (LE) *use of force* training as well as other traditional areas of LE training through the medium of the Weapons Team Engagement Trainer (WTET). Although this paper is geared to public LE training, its contents are also applicable to military special operation teams.

WTET Purpose and Description

The WTET was developed in the small caliber weapons laboratory at the Naval Air Warfare Center Training Systems Division (NAWCTSD). The WTET Evolved out of a late 1980's Marine Corps' request for a close quarter combat simulator having the following requirements: (which at the time were unavailable)

1) The system must have shoot-back ability, i.e., the video-based adversaries have the ability to shoot and "kill" the trainees.

2) The trainees are to be untethered from any hardware so as to enable freedom of movement.

3) Continuous aimpoint tracking and recording for the purposes of feedback/debriefing.

4) A multiple room environment that is reconfigurable.

The WTET is a close-quarter combat simulator that allows up to nine trainees to engage interactive video adversaries in hostage rescue, room clearing and terrorist encounters in a multiple room configuration. The prototype is unlike any other system available today as it provides multiple-person tactical teams practice and feedback in coordinated multi-room assaults, threat-encounter decision making, weapon handling and firing, and multiple sensory stimulation through a reconfiguable physical environment. In addition, situation awareness, communication, sensitivity, team tactics, individual positioning, use of cover and planning and organizing can be trained.

The present version of the system utilizes current computer-assisted capabilities in the areas of:

- Large-screen projected hostage rescue/hostile encounters
- Modular designed, expandable training environment
- Infrared trainee detection and threat shootback
- Spread-Spectrum Radio data communications
- Video disk scenario storage

- Continuous training team weapon aimpoint tracking
- Detailed instructor-automated individual and team performance through mission replay, and
- Directional sound through digital audio components.

Each trainee wears a wireless data communication system transmitting and receiving trainee status to the system computer. The system computer controls the modular video stations that project threat engagement scenarios located in a multiple room configuration. Trainees/team members enter the rooms and must take cover, just as they would in an actual engagement, to avoid being "shot" by video adversaries.

On screen adversaries and neutrals are interactive with the trainees through the use of intelligent branching and tracking of trainee position and weapon information through the system computer. That is, the video adversaries change their behavior based on the behavior of the trainees. The behavior of the trainees is defined as their physical location and weapon aimpoint. For example, if a trainee keeps his weapon aimed at the adversary the adversary will surrender unless programmed otherwise, or conversely if the trainee does not point his/her weapon at an adversary, chances are the adversary will engage the trainee.

Currently, trainee weapon choice is the M-16, MP-5, or the Colt 45 revolver. Two of the four MP-5's have recoil capabilities. These two weapons are outfitted with a CO_2 powered recoil that activates each time the trigger is pulled. System patents are held on the weapon aim tracking system, the trainee location and shootback system, target interaction techniques and the overall system integration.

Each trainee's weapon aimpoint is continuously monitored in real time before, during, and after trigger pull using a high-speed infrared spot tracker. This information is used to generate a scenario replay that that allows the trainees to view their weapon aimpoints and where their shots were fired. Other forms of feedback include video and audio recordings of the training team during the exercise. All relevant behaviors concerning team position, movement, room entry, threat coverage and the timing associated with these behaviors are provided through the scenario replay system. In addition to the WTET generated feedback, other behavioral and cognitive dimensions were added to the current feedback system to

enhance the training environment. An explanation of these facets will be highlighted in a future section of this paper.

Interagency Cooperative Agreement

Modeling, simulation and training technology is used extensively by the military to improve human and system performance. Through this technology, the military is able to reduce the costs of training, improve the quality of the training provided and ultimately contribute to military readiness by preparing personnel for war. Many of the training systems and technology developed for the military can be applied to the LE community. With the increase in peacekeeping operations for the military, there is a potential greater overlap between training requirements for the military and training requirements for the LE community. The memorandum of understanding between the Department of Defense and the Department of Justice represents a commitment to share technology to address requirements and to work together to meet emerging needs.

This agreement has laid the groundwork for technology transfer from the Department of Defense to the public and private sectors. An example of technology transfer effort is computer-based training. While the cost of computer based training systems is decreasing, these systems are still beyond the budget of most law enforcement agencies in the U.S. Therefore, information and resource sharing efforts are required to capitalize on the use of these systems for training distribution and standardization. Technology transfer literally describes the application of U.S. Department of Defense technology to other sectors of the economy. Spawned by budget reductions and widespread user needs, these efforts have opened doors for innovative methods of transitioning research and development products. As part of this program, the Naval Air Warfare Center Training Systems Division (NAWCTSD) and the National Institute of Justice (NIJ) have established an agreement to rapidly transition training resource information and technology to the law enforcement community. Part of this agreement covers an effort to make the prototype WTET available to law enforcement agencies for training immediately.

In addition to transitioning WTET for the purposes of training LE personnel, the system has been undergoing commercialization for the past year through a program which pairs a government laboratory (NAWCTSD) with an industry partner (Firearms Training Systems, Inc.) in an effort to better address user needs and leverage DoD research investments. The commercialized system will take the prototype technology of the WTET and expand its current capabilities to match the needs of the LE community. For example, weapons and scenarios specific to LE, weapon recoil, computer and digital technology upgrades will be added. More importantly the new WTET will allow trainees to demonstrate the full *use of force* reactionary continuum for each threat encounter exhibited by the WTET simulator. This will be achieved either by the programmed branching of the simulations via trainee weapon point or location, or by instructor interaction with the ongoing simulation. Matulia (1982) proposes the *use of force* continuum as a decision making process that starts with perception leading to evaluation and decision, and resulting in action. The correct level of force (action) employed for a given situation is one of the primary training needs of the LE community today (Star Mountain/NIJ, 1995). *Use of force* training along with weapon handling skills, communication, planning & organizing, situation awareness, sensitivity, judgment & decision making, team tactics, and individual positioning are the training objectives of the WTET.

Furthermore, as part of the commercialization process, NAWCTSD and Fats, Inc. will be installing the first test version of the commercialized WTET system at the Los Angeles County Sheriff's Department Laser Training Village in late 1998. There, local, state and federal agencies in California will use it. A more detailed report on the commercialization can be found in Horey, 1996.

Current Training and Evaluation of WTET

The cooperative agreement between NIJ and NAWCTSD has allowed the WTET to be employed as a trainer for local, state and federal law enforcement agencies. As of June 1, 1998 over 1000 officers have used the WTET as part of their respective training programs since late January 1998. Since the scenarios currently in the WTET data base were built for demonstration purposes, NAWCTSD personnel with the help of local police officers had to retrofit these scenarios into training scenarios. This did not entail modifying the scenario content, but rather designing a context within which the scenarios were plausible and producing a performance measurement system to measure success and provide meaningful

feedback. To do this, the following methodology was employed.

Assembled were a number of Subject Matter Experts (SMEs) from local LEA's and FATs, Inc. Under the guidance of NAWCTSD personnel SMEs reviewed the scenarios, discussed context options, and decided upon standardized contexts for the WTET scenarios. Along with the *contexted* scenarios, a standardized scenario pre-brief was produced and used as *intelligence* for trainees before entering the scenario.

The performance measurement system was next task to be completed. First, the panel of SMEs was asked to define in general terms the phases of a police operation, any police operation that involves interaction with a potential threat. Examples range from a traffic stop to a SWAT operation. It was agreed that all police actions evolve through the following phases, staging, entry, cover, engagement, assessment, and secure.

The next step required the building of a taxonomy to represent all the Knowledge, Skills, and Abilities (KSAs) a competent police officer should possess. SMEs were asked to produce a list outlining all the general dimensions of KSAs for police officers. The taxonomy produced was defined with the following dimensions: sensitivity, team tactics, individual positioning, planning & organizing, judgment & decision making, communication, situation awareness, and weapon handling. Although there is a certain amount of overlap in these dimensions, it was produced, along with the phases of a police operation, to form a matrix or framework from which a performance measurement system can be built. Also it should be noted that the *use of force* continuum is represented, nested, and can be defined within a collage of the aforementioned dimensions and phases of police operations, i.e., situation awareness, judgment & decision making, communication, entry, engagement, and assessment. Therefore, correct *use of force* for a given situation within WTET scenarios is a natural byproduct of the performance measurement system applied to assess and provide feedback for trainees using the WTET. For example, shoot don't shoot, communication techniques, method of entry, method of engagement directly apply and define *use of force.*

The matrix was formed when the dimensions of KSAs are placed on the x-axis and the phases of a police operation are placed on the y-axis. The SMEs were asked to define

behaviorally and cognitively what a police officer should be doing and thinking for the intersection of each phase with each dimension for a particular that situation/scenario. Therefore the intersection of each dimension with each phase represents a cell of behaviors and cognition's that a police officer should be eliciting or not eliciting given the set of circumstances. This effort produced a very large matrix of behaviors and thoughts that was too cumbersome to use as an online real- time assessment tool.

To increase the utility of the assessment matrix for instructors, who would be using this assessment/evaluation tool in real time, the SMEs were asked to boil down and prioritize the most consequential behaviors and cognitions from the matrix intersections. This allowed for the creation of a usable checklist composed of the most important behaviors chronologically sequenced with the scenario situations. The scenario situations become cues for the instructors to watch and assess specific behaviors that have been determined through the prior analysis and are represented on the performance measurement tool. Cognition assessment in real time was determined to be unfeasible, therefore questionnaires designed to tap the thoughts of the police officer were composed and were to be given to the trainee immediately after a scenario performance.

The combination of feedback generated by WTET (number of shots fired, hits, misses, continuous aimpoint, and location of shots fired) and the behaviorally anchored performance measurement checklist offers the instructors a powerful tool to change behavior (including *use of force*), assess and track performance of individual and teams over time, use as a selection instrument, remediation, and to identify deficiencies in other training areas that might have negative transfer to a real time combat situation.

As part of the agreement with NIJ, NAWCTSD is to perform a Training Effectiveness Evaluation (TEE) of the WTET. A TEE is designed to determine the impact training has on knowledge, skills, cognitions and abilities of the trainees, in this case police officers being trained with the WTET. Ideally, a TEE should measure the amount of training to transfer to the operational setting as defined by target objectives and KSA's. This rarely is feasible due to organizational constraints and data contamination by an undeterminable amount of potentially confounding variables.

The WTET TEE was designed to assess reaction to training and changes in thoughts and behavior while using the simulator. At the time of this paper the TEE has been completed, only data analysis and report writing remain. Presented now is the approach and methodology employed for the TEE.

With the help of a local LEA's subjects and instructors were obtained for use in the TEE. The instructors were trained in the proper use of the performance measurement tool, described in the previous section, and used as the standardized method of data extraction. The instructors were held constant throughout the duration of the TEE. Also, the subjects were screened to be regular beat officers, so as to exclude any SWAT personnel or special agents who might skew the data by virtue of more experience and/or training. The experimental design consisted of three groups of 18 subjects each, a control group and two experimental groups. Each group is put through a set of three different scenarios in two-man teams. Instructors used the standardized performance checklist to assess the performance of each subject in real time through each of the three simulations. After the set of three scenarios the subjects are given a questionnaire to gather demographics, reaction to training, and measure situation awareness (a cognitive measure).

The control group was used as a reference to judge the relative learning of the two experimental groups. After each scenario subjects in this group were not given any feedback on their performance even though the instructors gathered data on their performance using the performance measurement tool. The first experimental group received WTET generated feedback after each of the three scenarios, i.e., they received data regarding total shots fired, hits, misses and were able to watch the replay of the scenario with the aspect of continuous aimpoint tracking and where their respective shots were fired. The final experimental group was provided WTET generated feedback along with instructor feedback composed from the performance measurement tool after each of the three scenarios. The instructor feedback consisted of reinforcement for positive behaviors and coaching feedback for behavior areas that needed to be improved.

It is hypothesized that the control group will show small amounts of improvement in behavior due to acclimation to surroundings and to their partner. Experimental group one should show noted improvement over the control group due to the WTET generated feedback as they work through the set of three scenarios. Experimental group two will show significant improvement in performance as compared to the control group and experimental group one.

Lessons Learned and Future Directions

Training environments such as the WTET provide a research test bed for a wide range of theories and hypotheses related to individual and team performance issues. Such as, determining variance and predictors of trainee reactions and performance under stress, evaluating the effects of different personal characteristics on trainee behavior, determining the ideal cover patterns for different size reaction teams, evaluating communication patterns, to name a few.

Using the WTET as a research test bed has merit, but the undeniable and primary application of WTET should be as a training system. This conclusion is drawn from the reaction of 1000+ trainees and instructors that have used the system. They all attest to the fact that the WTET, when properly instructed, is the most powerful training they have experienced as a LE officer. In addition to this observation, the following is a discussion of lessons learned and conclusions that have surfaced by virtue of conducting the WTET training.

There is no substitute for real-time, high fidelity, full-task simulations, if the training is evaluated with a behaviorally anchored performance measurement device. In addition, it should be teamed with a highly professional instructor staff that knows and understands the scenarios, the cues nested within the scenarios, the training objectives, the performance measurement device, and how to deliver meaningful feedback. Evidence of this conclusion was derived from the reactions of the trainees and instructors, the breakdown of fundamental behaviors during scenarios, amount of learning that transpired, and negative transfer of training from other part-task training. Many of the trainees exhibited signs of physical distress after a two-minute scenario; this was not a function of physical exhaustion but rather psychological stress. In other evidence, trainees have been taught time after time in other forums about fundamental weapon handling skills (to name only one skill), but when confronted with a WTET situation the majority reverted to or employed improper techniques. Also, when on the firing range learning

marksmanship skills, trainees are told to keep their weapons at the "low ready" for safety reasons, but this has negatively transferred to the combat situation/simulation in WTET where the trainees are supposed to have their guns up and be looking down the barrel. Furthermore, it should be noted that the relationship between marksmanship skills on the range and in the WTET is very low. This is not due WTET reliability, but rather to WTET's realism, i.e., unpredictable and dangerous, the antithesis of a sterile firing range. In other words, officers that were rated excellent on the firing range did not guarantee proper weapon handling in a WTET situation. These are just a few examples that highlight the problems of part-task training in sterile environments for occupations that deal with dangerous situations, uncertainty, and chaos. Part-task training is beneficial for initial and recurrent skills training, but should not be used as a criteria of weapon handling performance.

Due to the ability of the WTET scenarios to portray situations that are chaotic and ever changing it was noted that the initial plans broke down quickly in the WTET environment. Team after team would develop a plan of assault before entering the scenario situation only to find their static plan quickly fell apart in the fluid situation. This necessitates a need for an additional area of training to help combat planning deterioration and make decisions and act in real time. The method proposed for testing with the WTET is RREACT (Real Time Reaction to Environmental Antecedent Cues Training). This entails training the perception of specific antecedent cues in the environment that signify a change from plans and implementing the proper type of reaction in real time. Objectives of the RREACT training program will be, planning contingencies, heuristics based on antecedent cues, and how to react in a team fashion in real-time. For example, before entering a potential hostile situation teams usually plan sectors of fire ("I have left you have right"), but sometimes all the action (adversaries) will gravitate to one side of the room and the plan falls apart resulting in negative consequences. For this event REACT would train the officers to perceive this movement, understand that this change now supercedes the function of the original plan and act accordingly, ("I have top, you have bottom"). Therefore, now both officers will have their weapons trained on a specific area where the

action is, ensuring maximum coverage and minimizing risk.

A standardized set of post scenario questions needs to be developed for the instructors to use in the feedback session to tap the trainee's cognitions for the corresponding incidents in the situation. This will enable the instructor to correct certain mindsets that might be impeding optimal behavior. For example, one scenario depicts two females in a scene, one is standing and verbalizing in a commanding manner and the other is sitting with cowering body language and hidden hands. Invariably the officers *assume* the female sitting is a hostage/no threat. This was determined during the feedback sessions by the WTET's continuous aimpoint tracking depicting both officers weapon aimpoint was at the female standing. When ask why they did not aim or speak to the woman sitting, they always replied, "I assumed she was innocent because of her body language." This can be and has been a fatal mistake for officers.

The beads of sweat, hyperventilation, breakdowns in communications and plans, improper weapon handling skills and cover, missed shots, etc., exemplify the need for more training systems like the WTET. The WTET has revealed that the technology of continuous aimpoint tracking, untethered multiroom scenarios, scenario branching, real-time behavior assessment, post-hoc cognitive analysis, and shoot back capabilities are all viable, reliable, and highly needed training solutions for the LE community as well as Special Operation Teams in the military. The capability of the WTET to better train *use of force,* communication, team tactics, sensitivity, weapon handling, use of cover, planning and organizing, and other training objectives is unchallenged when compared to the traditional methods of part-task, lecture, and role play training.

A final note, the use of the WTET and its two minute scenarios has also emphasized the need and potential of WTET type trainers that have longer training scenarios, higher fidelity, increased options and branching, and increased interactivity. Furthermore, the capability to link trainers and run a common problem with multiple agencies (Distributed Interactive Simulation) should be investigated. This will no doubt force standardization of policies and procedures as well as increase the efficiency and effectiveness of the operation.

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