Squad Overmatch (SOvM)
for
Tactical Combat Casualty Care:
Phase II Initial Findings Report

Optimizing Warriors…Achieving Squad Overmatch…Saving Lives

19 December 2016

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Dr. Kunkler:

The Squad Overmatch for Tactical Combat Casualty Care (SOvM-TC3) Study team is pleased to submit our Initial Findings of the Phase II Experiment conducted in June 2016 at Fort Benning, GA. The attached document provides a "quick look" account of experimental methods, findings, recommend new capabilities, testimonials, supporting organizations and recommendations. The experiment successfully leveraged the 2015 experiences and lessons learned to reduce risk and to improve the quality of the data collected. A full report with detailed findings and expanded recommendations will be provided by 1 March 2016. That report and our final report will have will have distribution restrictions.

On behalf of the SOvM-TC3 Study team, we want to thank you for your support of this work and hope that the contents of this report will inform you and our stakeholders of our progress.

Sincerely,

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1 Executive Summary

Sponsored by the Office of the Secretary of Defense for Health Affairs - Joint Program Committee 1, the Squad Overmatch (SOvM) Tactical Combat Casualty Care (TC3) research goal is to determine effective training methods and technologies that improve individual and team performance under stress to improve resilience and readiness and reduce preventable combat death. Training method guidelines, training technology capability recommendations, and a web-based train-the-trainer package will be delivered in 2017 that prescribe improvements to enable training and combat developers to augment their capabilities to enable units to implement SOvM training.

This report provides initial findings from the June 2016 field experiment that tested the effectiveness of the SOvM integrated training approach (ITA) in improving learning, attitudes, and skills for TC3, advanced situation awareness (ASA), resilience and performance enhancement (R/PE), team development (TD), and integrated after action review (iAAR). The Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI) led the primary study team: Army Research Laboratory, Human Research and Engineering Directorate (ARL HRED), Naval Air Warfare Center Training Systems Division (NAWCTSD), The MITRE Corporation, and Cognitive Performance Group (CPG). The US Army Maneuver Center of Excellence (MCoE), Maneuver Battle Lab, and the Clarke Simulation Center at Ft Benning, GA provided the training and simulation resources for the experiment.

Participants included four squads from the 82nd Airborne Division (Ft Bragg) and four squads from the 75th Ranger Regiment (Ft Benning), each augmented with a 68W medic from the 690th Ground Ambulance, 14th Combat Support Hospital (Ft Benning). The research team implemented a data collection plan that included measures of learning, cognitions, attitudes, and performance. Squads in the experimental condition participated in a three and one-half day ITA curriculum comprised of classroom instruction, virtual simulation based training, and three live mission training scenarios (M1, M2, and M3) in the outdoor McKenna urban training facility that was embedded with live role players and simulation technologies (e.g., non-pyrotechnic explosives, interactive avatars and medical mannequins). Control condition squads participated in one day of live training on the M2 and M3 scenarios with the same role players and technologies.

Findings show the ITA is an effective training method; Soldiers learned more, were better prepared and their squads accomplished the majority of their mission tasks during the live training exercises. All Soldiers in both conditions reported a strong motivation to participate, strongly positive attitudes about themselves and their squad members, and being more proficient in the skills after training.

2 Introduction

2.1 Background

The SOvM research project is sponsored by the Office of the Secretary of Defense for Health Affairs - Joint Program Committee 1 under the title TC3 Training for Readiness and Resilience. The goal of the three phase project (2015-2017) is to improve individual and team performance, tactical decision making, communications, and TC3 under stressful conditions to improve mission effectiveness and reduce preventable combat deaths.

To determine the training and technology prototypes that had the potential for improving Soldier and Marine, tactical first responder, and squad performance, the Phase I field study was conducted in the fall of 2015 at Ft Benning, GA as part of the Army Expeditionary Warfighting Experiment (AEWE 2016). The research team successfully demonstrated the SOvM ITA methods and technologies for developing knowledge and skills in TC3, ASA, R/PE, TD, and iAAR (Brimstin, Higgs, Wolf et al., 2015; Higgs & Wolf, 2015; Milham, Phillips, Ross, Townsend, Riddle, Smith, Butler, Wolf, Irizarry, Hackett, & Johnston, 2016; Ross, Johnston, Riddle, Phillips, Townsend, & Milham, 2016; Townsend, Milham, Riddle, Phillips, Johnston, & Ross, 2016). The ITA method is based on the theory and science of training for decision making under stress (Burke, Priest, Salas, Sims, & Mayer, 2008; Cannon-Bowers & Salas, 1998; Johnston & Cannon-Bowers, 1996; Johnston, Fiore, Paris, & Smith, 2013; Johnston, Napier, & Ross, 2015; Smith-Jentsch, Cannon-Bowers, Tannenbaum, & Salas, 2008) and effective training methods for care under fire and tactical field care (Kotwal, Butler, Edgar, Shackelford, Bennett, & Bailey, 2013; Kotwal, Montgomery, Kotwal, Champion, Butler, Mabry, Cain, Blackbourne, Mechler, & Holcomb, 2011).

The classroom-based instruction defines and develops knowledge and comprehension of the important cognitions and behaviors. Simulation-based training (SBT) develops individual and team skills for applying the cognitions and behaviors in event-based scenarios. Live team training exercises provide skills application employing simulated combat stressors in a controlled and safe environment. TC3 task stressors are incorporated into scenarios so that squad members can systematically practice skills as stressors are gradually increased from virtual to live training. Squad leaders and members focus on improving skills in iAARs conducted after each simulation and live training exercise. The “integrated” AAR approach has instructors and all squad members using a guided team self-correction method that enables them to take personal responsibility for identifying behaviors that need correction, focus on developing team cohesion, and setting specific, achievable goals for improvement (Smith-Jentsch et al., 2008).

Following the study, AEWE 2016 evaluators surveyed 63 Soldiers and Marines and reported the majority of them had strongly positive reactions to it. Strayer, Sabate, and Harbison (30 June 2016) summarized the findings in the AEWE 2016 final report: “The Squad Overmatch Tactical Combat Casualty Care effort provided realistic training and shortened the time required to develop a trained

and cohesive squad. Leaders endorsed the synergy gained by augmented reality, role players, advanced effects kits, and sensory cues to enhance training on casualty care" (p. 52).

- "99% of the 63 Soldiers and Marines surveyed felt the scenarios in Squad Overmatch were realistic enough to feel immersed in the training;
- 98% of the Soldiers and Marines felt the scenarios would help prepare them for combat;
- 84% of the Soldiers and Marines felt the TC3 improved their ability to treat and manage combat casualties; and
- 97% of the Soldiers and Marines felt that Squad Overmatch better prepared them for the Operational Environment" (p. 48).

2.2 Objective

The purpose of this report is to describe initial findings from the Phase II field experiment, conducted in June 2016, which tested the effectiveness of the ITA in improving learning, attitudes, and skills. As the SOvM project team lead, PEO STRI managed overall logistics and technology implementation, and worked with MCoE, the Maneuver Battle Lab, and the Clarke Simulation Center to access Ft Benning resources. ARL HRED was the principal investigator in charge of the ARL-approved research protocol and co-managed research plan execution with NAWCTSD. Refer to Appendix A for the June 23rd experiment out-briefing and refer to Appendix B for a complete list of project team participants. The Phase II final report will be provided in March 2017, will have the full details on analyses and findings, and will have limited distribution to the sponsor and key stakeholders. The final Phase III report will be delivered in December 2017 with limited distribution.

3 Method

3.1 Participants

Participants included eight US Army squads, each augmented with a 68W medic. The request for participation was initiated in January 2016, and was directed through the Commanding General, MCoE through the Chief, G3 Taskings/Headquarters Training and Doctrine Command G3/5/7 to US Army Forces Command (FORSCOM). FORSCOM requested participation from the 82nd Airborne Division G3 Operations at Ft Bragg who coordinated with a battalion to provide four squads. PEO STRI coordinated with the 75th Ranger Regiment at Ft Benning to provide an additional five squads. One of these squads scheduled for the experimental condition left prior to experiment completion due to operational requirements. To balance possible differences in expertise, each condition had two 82nd Airborne squads and two 75th Ranger Regiment squads. The 690th Ground Ambulance with the 14th Combat Support Hospital at Ft Benning provided the 68W medics.

3.2 Design

The design was quasi-experimental using a partial-treatment control group with pretests and multiple posttests (Cook and Campbell, 1979). It was expected that the composition of the experimental and control groups would be similar (e.g., had similar Military Occupational Specialties, experiences and training profiles) since the 82nd Airborne and 75th Ranger Regiment squads each belonged to the same platoons. The research team implemented a five-week data collection plan that included measures of learning, cognitions, attitudes, and performance. Squads in the experimental condition participated in a three and one-half day ITA curriculum comprised of classroom instruction, virtual simulation based training, and three live training scenarios (M1, M2, and M3) in the outdoor McKenna urban training facility that was enhanced with live role players and simulation technologies (e.g., interactive avatars, non-pyrotechnic explosives, and trauma mannequins). Control condition squads participated in one day of live training on the M2 and M3 scenarios with the same role players and technologies.

3.3 Integrated Training Approach

The instructional materials, virtual and live scenarios, and simulation technologies used in the 2015 study were revised and adapted for the 2016 experiment (refer to Higgs and Wolf (2015) for more details). PEO STRI, supported by The MITRE Corporation and sub-contractors, led the operation and execution of instruction and training by providing operational oversight and support to the classroom instruction, virtual and live scenario development and execution, and coordination with the MCoE who provided technical support and technology insertion into virtual and live training.

The ITA learning objectives were:

- TC3 - Develop knowledge and skills for communication and decision making in managing combat casualties in care under fire and tactical field care. The TC3 instruction was based on the XVIII Airborne Corps Surgeon's Office, Casualty Response Training for Dragon Leaders. The 690th Ground Ambulance provided the TC3 instructors.
- ASA - Develop knowledge and cognitive skills in pattern and threat recognition and decision making, to include identifying and interpreting proxemics, kinesics, autonomics, geographics, and atmospherics; and applying decision heuristics. Refer to Brimstin and Wolf (2015) for further details. MCoE provided the curriculum and instructor support.
- R/PE - Develop knowledge and skills in maintaining tactical effectiveness under combat stress to include application of acceptance, "what's important now," deliberate breathing, self-talk and buddy-talk, grounding, and personal AAR. The Walter Reed Army Institute of Research (WRAIR), Research and Transition Branch provided the R/PE curriculum and instructors.

- TD - Develop knowledge and skills in teamwork to include information exchange, communication delivery, supporting behavior, and initiative/ leadership. The TD curriculum was adapted from the NAWCTSD Team Dimensional Training method (Smith-Jentsch et al., 2008). CPG provided the TD instructors.
- iAAR - Develop knowledge and skills in using the team self-correction method in order to facilitate squad initiative, leadership, and ownership in AAR execution and performance processes and outcomes. The iAAR curriculum was adapted from the NAWCTSD Team Dimensional Training method (Smith-Jentsch et al., 2008). CPG provided the iAAR instructors.

Each of these training domains were selected based on prior research, and had already been shown to improve individual and/or team performance. Content domain Subject Matter Experts (SMEs) and instructional psychologists analyzed the existing programs of instruction and compressed them to focus on skills specific to developing squad performance. Classroom instruction was designed to be followed immediately by practical exercises in the virtual gaming and then live training environment to reinforce domain skills and help develop the behaviors needed to survive and win in combat.

The simulation and live exercises focused on the goal of "train as we fight" starting with the operations order and mission planning and concluding with pre-casualty evacuation and iAARs. The five virtual and live exercise scenarios were developed with an overarching story line that gradually increased in problem complexity and stressors with key events inserted to deliberately elicit TC3, ASA, and TD tasks, and R/PE behaviors. The scenarios presented typical stressors experienced by Soldiers during combat (e.g., combat casualties to civilians and soldiers, improvised explosive device (IED) explosions, and sniper fire) (Grieger, Cozza, Ursano, Hoge, Martinez, Engel, & Wain, 2006; Hoge, Castro, Messer, McGurk, Cotting, & Koffman, 2004).

Figure 1 depicts the ITA framework used in the experimental condition. Days 1 and 2 focused on instruction and skill development. The Day 1 morning session was comprised of TC3 and ASA classroom instruction designed to engage participants using mixed media and videos. Hands on practice with the Improved First Aid Kit II (IFAK II) and a Medical Simulation Training Centers (MSTC) trauma mannequin had Soldiers refresh their combat life saver skills in how to apply the three primary battlefield life saving devices: combat application tourniquet (CAT), chest decompression needle (CDN), and the nasopharyngeal airway (NPA). In the afternoon, TC3 and ASA skills were further developed in the Army Games for Training (AGfT) Virtual Battlespace 3 (VBS3) team training simulation, executing one scenario with an emphasis on TC3 and ASA. The VBS3 had the IFAK II as a capability enhancement TC3 plugin that included interactive CATS, NPAs, CDNs, occlusive dressings, TC3 cards, and bandages. Following the scenario, squads participated in the iAAR where they practiced questioning and response techniques; identified

tactical triggers, behaviors, solutions, and outcomes; and set goals for improvement. On day 2, classroom foundation training focused on R/PE, TD, and the iAAR; skills practice with a new VBS3 scenario that extended the previous day's storyline and emphasized all five domains. The iAAR set performance goals for the live training exercises.

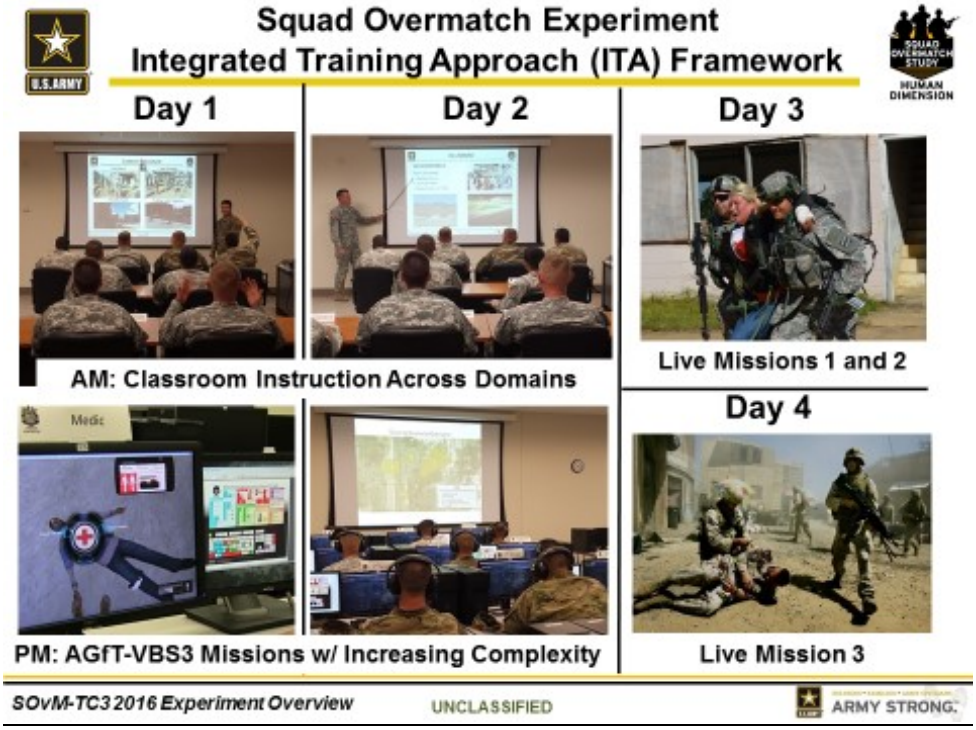

Figure 1. ITA Framework used in the experimental condition.

Days 3 and 4 focused on practical skill application in the live training scenarios that continued to gradually increase problem complexity and stressors in M1 and M2 on day 3, and M3 on day 4. Squads participated in an iAAR after each scenario. Live training was conducted in the McKenna urban training facility using a suite of TC3 simulators and technologies. Refer to Appendix A to see details and images of the training technologies. Technologies included: non-pyro technical devices simulating IEDs, gunshots, suicide bombs, booby traps; moulage (suicide bombers, IED effects, through-torso gunshot wounds and active bleeding); and the MSTC trauma mannequins with simulated injuries requiring the NPA, CDN, CAT, occlusive dressings, TC3 card, and bandages. Avatars of varying levels of fidelity and interactivity were used that required the squad members to observe and be aware of behaviors and cues exhibited during interactions, and to use these cues to develop a baseline situation awareness, enable identification of anomalies, and accomplish mission objectives. Bread and incense scents provided olfactory cues for developing a baseline of the village's pattern of life.

The paper casualty card was replaced with a prototype, smart-phone based, Multiple Integrated Laser Engagement System (MILES) Casualty Display Device (MCDD). Integrated with the MILES Individual Weapon System vest, a dynamic casualty displayed on the smart phone touch screen depicts injury severity including a realistic video of the specific wound (e.g., gunshot wound), the individual's tactical capabilities as a result of the specific injury (move, shoot, communicate), and dynamic updates of casualty status over time. The life-saving devices in the IFAK II – CAT, CDN, and NPA - were instrumented to wirelessly interface with the MCDD. If wounds were correctly assessed and treated through self, buddy, combat life saver or medic care in a timely manner, the squad member or civilian survived and, if not, the display depicted a "Died Of Wounds" condition.

3.4 Measures

Table 1 lists in alphabetical order the self-report questionnaires, tests, and observational measures that were administered.

Table 1. Self-Report Questionnaires.

Measure	Type	Background	Collection
AAR Climate Survey	Survey has 8 items, each with a 7 point rating scale and word pairs anchored at each end of the scale. Participants circled the number that best represented the climate established in the AAR in which they had just participated.	Developed by NAWCTSD specifically for the experiment and does not have published reliability or validity data associated with it.	Collected after each of 5 iAAR sessions in the experimental condition and following each of two AARs in the control condition.
Baseline Skills Survey	Respondents rated their current level of skill (beginner, advanced beginner, proficient, expert) on each of the learning objectives for TC3, ASA, R/PE, TD, and iAAR.	Developed by ARL specifically for the experiment and does not have published reliability or validity data associated with it.	Collected at the beginning and end of experiment in both experimental and control conditions.
Cognitive Workload	Respondents rated the difficulty they had in detecting and understanding cues that were presented during the scenario just completed. Scores ranged from 1 – 4, with a higher score indicating more difficulty, and thus higher cognitive workload.	ARL developed the measure and reported adequate internal consistency reliability (Cronbach's alpha > .7) across multiple studies.	Collected after each of 5 scenarios in the experimental condition and after each of two live training scenarios in the control condition.
Demographic Questionnaire	To identify experimental and control group similarities and differences, respondents provided relevant demographic information such as time in unit.	Developed specifically for the experiment and does not have published reliability or validity data associated with it.	Collected one time at the consenting session prior to conduct of the experiment.
Knowledge Test	A 65-item multiple choice test assessed participant knowledge about TC3, ASA, R/PE, TD, and iAAR.	This test was developed specifically for the experiment by content SMEs; it does not have published reliability or	In the experimental condition a complete pre-test was administered prior to start of classroom instruction on the first day, the post-test for TC3 and

Measure	Type	Background	Collection
		validity data associated with it.	ASA was administered at the beginning of day 2, and a post-test for R/PE, TD, and iAAR was administered at the end of day 2. In the control condition, a complete post-test was administered the day after the second live scenario exercise.
Motivation	Respondents rated the importance of and their willingness to successfully complete the training (on a scale of 0 to 100 for each question).	Developed by ARL, Fatkin & Hudgens (1994) validated the measure with a known group's comparison analysis.	Collected one time at the beginning of the experiment.
Performance Measures	The Targeted Acceptable Responses to Generated Events or Tasks (TARGET) Checklist is a structured observation checklist method that was used to design the SOvM scenarios for both virtual and live training exercises (Fowlkes, Lane, Salas, Franz, & Oser, 1994). Task events were identified by SMEs that were expected to elicit squad member demonstration of specific TC3, ASA, and TD tasks; acceptable responses to each of the events were determined a priori by team task analyses and SMEs.	Fowlkes et al. (1994) reported inter-observer agreement for TARGETs of 89% and internal reliability estimate (split half correlation with a Spearman-Brown correction) was .93. TARGET was not be used for R/PE because they are primarily cognitive behaviors that are not observable), and iAAR behaviors were scored during the AARs	During the scenarios, SMEs noted whether or not TC3, ASA, and TD task behaviors were exhibited by squad members. SMEs completed their ratings following the experiment using audio and video recordings collected during the exercises.
Shared Situation Awareness	Respondents rated their squad's ability to detect and understand cues that were presented during the scenario just completed. Scores ranged from 1 – 4, with a higher score indicating better shared situational awareness.	Matthews, Beal, and Pleban (2002) demonstrated discriminant and convergent validity of subscales in experiments with live and virtual environments.	Collected after each of 5 scenarios in the experimental condition, and before and after each of two live training scenarios in the control condition.
Situational Self-Efficacy (SSE) Scale (STATE)	Respondents rated from 1 to 10 their level of confidence in their own ability to do well in the upcoming scenario and then rate their level of confidence in the squad's ability to do well in the upcoming scenario.	SSE is a state measure that was modified by ARL to evaluate the predictive power of efficacy expectations about the squad's behavior or task performance. Sherer et al. (1982) found internal reliability alphas for two original sub-scales (General self-efficacy and Social self-efficacy) were .86 and .71, respectively.	Collected at the beginning of each scenario: 5 times in the experimental condition, and 2 times in the control condition.

Measure	Type	Background	Collection
Team Action Processes	Respondents rated 1 to 5 on a Likert-type scale the degree they agreed with statements that asked how well they thought their team performed together during the mission just completed. Processes such as coordination of actions and effective communication are probed. A higher score indicated better rated performance.	The Army Research Lab reported Cronbach's alpha = .88.	Collected after each of 5 scenarios in the experimental condition and after each of two live training scenarios in the control condition.
Team Cohesion	Respondents rated 1 to 5 on a Likert-type scale the degree they agreed with statements that asked how close a unit they thought their team was during the mission just completed. A higher score indicated higher rated cohesion.	The Army Research Lab adapted this measure based on prior research (Cronbach's alpha for the original measure ranges from .68 to .92 in multiple studies, e.g. Carless & DePaola, 2000; Zaccaro & McCoy, 1985).	Collected after each of 5 scenarios in the experimental condition and after each of two live training scenarios in the control condition.
Team Efficacy	Respondents rated 1 to 5 on a Likert-type scale the degree they agreed with statements that asked how confident the squad was in its ability to successfully perform and complete future missions together. A higher score indicated anticipation of more effective performance.	The Army Research Lab adapted this measure based on prior research (Cronbach's alpha > .90 in several independent studies, e.g. Orvis, Belanich, Mullin, & Orvis, 2004).	Collected after each of 5 scenarios in the experimental condition and after each of two live training scenarios in the control condition.
Team Performance	Respondents rated 1 to 5 on a Likert-type scale the degree they agreed with statements that asked the extent to which they thought their team successfully performed various goals and actions during the mission just completed. A higher score indicated better performance.	The Army Research Lab reported Cronbach's alpha > .80 across several studies.	Collected after each of 5 scenarios in the experimental condition and after each of two live training scenarios in the control condition.

3.5 Procedure

Table 2 presents an outline of the experimental condition procedure. Each of the three squads received the ITA by participating in seven sessions of training over three and one half days. A fourth squad (with which the ITA was initially piloted) participated in all but scenario M3. Sessions 1 through 4 for classroom and VBS3 SBT were conducted at the Ft Benning Clarke Simulation Center. Sessions 5 through 7 were conducted at the Ft Benning McKenna urban training and control facility. Days 1 through 3 were limited to no more than nine hours with one hour for lunch. Day 4 was limited to no more than four hours. Refer to Table 1 for details on administration of measures. Some pre-training measures were collected on a separate day at the consenting session prior to participants starting the first session. Selected measures were administered at the beginning of Session 1, then throughout sessions 1 through 7, and at the end of Session 7. SMEs completed the TARGET checklist during sessions 2, 4, 5, 6, and 7 for TC3, ASA, TD, and iAAR. Recordings of squad

member actions during virtual training, and audio and video recordings of squad members during live training were collected for use during the After Action Reviews, and for later use to complete assessments of squad performance.

Table 2. Experimental condition procedure.

Time of Day	Day 1	Day 2	Day 3	Day 4
Morning	Session 1 Pre-Training Measures Collection Classroom Instruction	Session 3 Classroom Instruction	Session 5 Technology Familiarization Training Live Exercise Scenario M1 and iAAR	Session 7 Live Exercise Scenario M3 and iAAR Squad Performance and iAAR Assessments Post Training Measures Collection
Afternoon	Session 2 SBT and iAAR Squad Performance and iAAR Assessments	Session 4 SBT and iAAR Squad Performance and iAAR Assessments	Session 6 Live Exercise Scenario M2 and iAAR	

Table 3 presents an outline of the control condition procedure. Each of the four squads participated in a single nine-hour day (with one hour for lunch) of live training scenarios M2 and M3 at the McKenna urban training and control facility. Some measures were collected on a separate day at the consenting session prior to participants starting Session 1. Measures were collected at the beginning of Session 1, throughout Sessions 1 and 2, and on the morning of Day 2 (which lasted no more than four hours). SMEs completed the TARGET checklist during Sessions 1 and 2 for TC3, ASA, TD, and iAAR. Audio and video recordings of squad member actions and communications were collected during training for use during the After Action Reviews, and for later use to develop assessments of squad performance.

Table 3. Control condition procedure.

Time of Day	Day 1	Day 2
Morning	Session 1 Pre-training Measures Collection Technology Familiarization Training Live Exercise Scenario M2 and Standard AAR Squad Performance and iAAR Assessments	Post Training Measures Collection
Afternoon	Session 2 Live Exercise Scenario M3 and Standard AAR Squad Performance and iAAR Assessments	

4 Initial Findings

Initial findings presented in this report are based on statistical analyses completed by the ARL HRED principal investigator and research team in the fall of 2016. They include results for Soldier experience levels, knowledge test and self-reported baseline skills assessment, attitudes, iAAR participation behaviors, and overall squad performance on TC3, ASA, and TD during scenarios M2 and M3.

4.1 Experience

Experience levels were about the same in both conditions. Findings were that Soldiers in each condition were about the same on range and representation in pay rating levels (E-2 to E6), with the majority of control (72.2%) and experimental (61%) condition participants listing themselves at pay rating E3 or E4. Control (average 7.7 months and range of 35 months) and experimental (average 6.3 months and range of 23 months) condition participants were about equal in amount of time served in their current position, with the majority of the control (78.4%) and experimental (77%) condition participants having served ten or fewer months.

4.2 Knowledge Test and Self-Reported Knowledge Gains

Before training began, the knowledge levels of experimental condition participants were nearly equivalent to the control condition participant post-test knowledge, demonstrating some basic knowledge of TC3, ASA, R/PE, TD, and iAAR. Following the ITA, small but significant gains in ASA and R/PE knowledge were found compared to the control condition post-test knowledge scores. While both groups reported significant increases in their own skill levels after training, the experimental condition Soldiers reported significantly greater gains in knowledge following training.

4.3 Attitudes

In general, the majority of Soldiers in both conditions:

- Had a strong willingness and saw significant importance in participating in the training;
- Had high levels of confidence in their own ability and their squad's ability to perform well prior to the live scenarios (M2 and M3) (Soldiers in the experimental condition did report significantly higher confidence in performing well as an individual before the M2 scenario compared to Soldiers in the control condition);
- Were strongly positive about their teamwork processes, efficacy, cohesion, and performance, and (with the exception of efficacy) these attitudes significantly increased in positivity over time;

- Who had lower levels of cognitive workload also had higher levels of situation awareness;
- Saw the iAAR climate following the live scenarios as strongly supportive and positive.

4.4 Participation in the AAR

ITA trained squads were better prepared for conducting the iAARs; they were observed to have demonstrated significantly more effective behaviors during the iAARs than the control condition squads who used a traditional AAR format. ITA trained squads demonstrated 36% (M2) and 43% (M3) more iAAR behaviors than the control condition squads, displaying the majority of (88%) of the expected M3 iAAR behaviors.

4.5 Squad Performance

The ITA trained squads were much better prepared for the final two live training scenarios; they were observed demonstrating significantly more TC3, ASA, and TD tasks than the control condition squads. Compared to the control condition squads, ITA trained squads demonstrated:

- 15% (M2) and 40% (M3) more TC3 tasks, completing the majority (78%) of the tasks during M3;
- 20% (M2) and 33% (M3) more ASA tasks, completing the majority (83%) of the tasks during M3; and
- 25% (M2) and 26% (M3) more TD tasks, completing the majority (86%) of the tasks during M3.

4.6 Independent Reports

In addition, strongly positive independent reports were provided by invited observers from US Army and USMC training centers. The US Army Brigade Modernization Command Warfighting Assessment Team wrote that:

> ”SOvM significantly improved individual Soldier performance, tactical first responder performance, and overall squad performance, consistent with its objectives. This training prepares units well for deployment and the realities of war. Soldiers often don't have the opportunity to apply SOvM type skills in a realistic tactical environment. The result is that skillsets degrade and Soldiers often fail to realize the value of the training, or get the chance to use their skills before they atrophy. SOvM, on the other hand, teaches the classes, conducts the virtual simulations, and then gives Soldiers the immediate opportunity to employ these skills in a tactical environment...designed to gradually tax their limits and ability to retain focus on continuing the mission.”

The USMC Training and Education Capabilities Division, Training and Education Command (TECOM), Marine Corps Combat Development Command reported in their trip report:

> "Background. SOvM is a training curriculum design integrating training methodologies and technologies to focus on human performance enhancement in lifesaving and teamwork skills using realistic virtual and live simulations. The goal is to increase situational awareness, resilience, and small unit teamwork/leadership. Areas of focus for this training design are categorized into five main themes; Team Development (TD), Advanced Situational Awareness (ASA, taken from USMC Combat Hunter), Resilience and Performance Enhancement (R/PE), TC3, and integrated After Action Report (iAAR). These focus areas are incorporated into a multi-day training event that incorporates classroom instruction, virtual simulation practice, and live simulation application followed by iAAR at each practical application."
>
> "Take Away. This is an ITA that focuses on developing teamwork, resilience at the small unit level, and ties the importance of casualty treatment into a team dynamic. Medical training is a key focus area, but the main goal is building team cohesion and resilience to operate in stressful situations. Also, a certain baseline level of understanding of casualty care is necessary prior to instruction. Another tenant is to rapidly incorporate a medic into an Army small unit (this may be unnecessary for Marine squads as the Corpsman is integrated by design whereas Army units receive a medic prior to an operation for a specific capability). In order to fully appreciate the value of this training methodology, it is important to analyze the current method of training and evaluation for Marine small units."
>
> "The training viewed by this author was of a high level of quality and efficiency. Subjects reported similar sentiments with regard to challenging and realistic training."

5 Conclusions and Recommendations

This study demonstrated that the SOvM ITA is an effective training method for improving learning and team performance: ITA trained squads were more prepared and accomplished the majority of their learning objectives during the live training exercises than squads that had just one day of live training with embedded technologies and a traditional AAR format. Furthermore, Soldiers in both conditions reported they were highly motivated to participate, and had strongly positive attitudes about themselves and their squad members, and felt they knew more about the five content areas following the training. In addition,

Appendix C lists a compilation of testimonials that were voluntarily provided by study participants in both the 2015 study and the 2016 experiment.

The following recommendations have begun to be incorporated in the Train-the-Trainer curriculum in preparation for the Phase III study in 2017:

- Allocate sufficient time for the instruction and training;
- Revise the curriculum to include additional classroom opportunities to apply the instructed skills;
- Encourage greater learner involvement during the instruction by asking questions and stimulating discussions;
- Revise the iAAR to better integrate training feedback on the five content areas and provide an instructor briefing guide that incorporates the changes for more effective conduct of the iAAR;
- Assess knowledge gained, attitude changes, and relevant performance outcomes for feedback in the iAAR;
- Develop instructional tutorials for the Train the Trainer curriculum, and for developing and implementing VBS3 scenarios and SBT materials;
- Provide guidance based on learning objectives on how to adapt live training assets to support improved training of squad tasks; and
- Develop automated tools that assist with timeline and storyline generation of scenarios that span virtual and live environments.

In addition, Appendix D presents an initial list of 12 proposed technology capability enhancements that are being provided to the US Army Combined Arms Training Center – Training (CAC-T).

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Acronyms

AAR	After Action Review
AEWE 2016	Army Expeditionary Warfighting Experiment 2016
AGfT	Army Games for Training
ARL HRED	Army Research Laboratory, Human Research and Engineering Directorate
ASA	Advanced Situation Awareness
CAC-T	US Army Combined Arms Training Center – Training
CAT	Combat Application Tourniquet
CPG	Cognitive Performance Group
CDN	Chest Decompression Needle
FORSCOM	US Army Forces Command
FY	Fiscal Year
iAAR	integrated After Action Review
IED	Improvised Explosive Device
IFAK II	Individual First Aid Kit II
ITA	Integrated Training Approach
M1	Mission Scenario 1
M2	Mission Scenario 2
M3	Mission Scenario 3
MCDD	MILES Casualty Display Device
MCoE	Maneuver Center of Excellence
MILES	Multiple Integrated Laser Engagement System
MSTC	Medical Simulation Training Centers
NAWCTSD	Naval Air Warfare Center Training Systems Division
NPA	Nasal Pharyngeal Airway
PEO STRI	Program Executive Office for Simulation, Training, and Instrumentation
R/PE	Resilience/Performance Enhancement
SBT	Simulation Based Training
SMEs	Subject Matter Experts
SOvM	Squad Overmatch

TARGET	Targeted Acceptable Responses to Generated Events or Tasks
TC3	Tactical Combat Casualty Care
TD	Team Development
TECOM	USMC Training and Education Command
VBS3	Virtual Battlespace 3
WRAIR	Walter Reed Army Institute of Research

APPENDIX A: 2016 SOvM Experiment Outbrief

The following slides were presented during the SOvM Experiment Outbrief at the McKenna training facility site, Ft Benning, GA, on 23 June 2016.

Realistic Training in a Complex World

To win and survive in ambiguity and chaos, home-station training must be more realistic, challenging, and affordable. Casualties are a Combat Reality.

Training

Reality

We Can Do Better!

- 87% of casualties who die, do so before reaching a medical treatment facility
- 24% OEF/OIF deaths were "potentially survivable"
- 3% Army Ranger deaths were "potentially survivable"

Integrated Training Approach

- ***Instruction, Practice, Application (crawl, walk, run)***
  - Classroom, gaming, integrated virtual and live simulations
- ***Experiential Learning*** & environment immersion
- ***Realistic*** missions and scenarios
- Combat ***Stressors*** and engaging ***Events***
- ***Introspective*** and ***Team Self Correction*** AARs

Learning Objectives

- Increase ***Situational Awareness***
- Develop ***Teamwork*** behaviors
- Emphasize ***Leadership*** *across the Squad*
- Improve ***Decision Making***
- Build psychological ***Resilience***
- ***Everyone*** *is a* ***1st Responder***

SOvM-TC3: Optimizing Warriors - Achieving Squad Overmatch - Saving Lives

SOvM-TC3 2016 Experiment Overview UNCLASSIFIED 4 ARMY STRONG.

2016 Video

SOvM-TC3

Improving Training Effectiveness

Optimizing Warriors

Achieving Squad Overmatch

Saving Lives

SOvM-TC3 2016 Experiment Overview UNCLASSIFIED 5 ARMY STRONG.

SOvM-TC3 Supporting Organizations

Program Executive Office for Simulation, Training and Instrumentation

Army Research Laboratory

Naval Air Warfare Center - Training Systems Division

Cognitive Performance Group

Walter Reed Army Institute of Research

Soldier Health • World Health

9 Squads: 82nd ABN & 75th Ranger Regiment

USMC PM TRASYS

- ***Including 21 POI, POR, and new technology insertion providers & products.***
- ***Team of distinguished SMEs across each domain supporting curriculum development, instruction, and integrated AARs.***

Transitioning to Organic Instructors

2015 Curriculum Development & Instruction

Curriculum Development Leads / Team / Instructors

- **ASA: Dr. Laura Milham / Mr. Bill Ross**
  SGM Higgs, SFC Lodahl, SFC Everett, SFC Wright, SSG Neth, Mr. Funke (R), Mr. Jones, Mr. Tubbs (R), Mr. Eggers (R), Mr. Butler, Mr. Ogden (R)
- **TD: Ms. Lisa Townsend / Dr. Joan Johnston**
  Dr. Milham, Mr. Butler, Mr. Ross (R), Ms. Smith, Mr. Holness, Dr. Franz, SGM Higgs, Pat Ogden (R)
- **R&PE: CDR Hank Phillips / Dr. Joan Johnston**
  Dr. Elliman, Mr. Rhodes (R), Mr. Ogden (R), Mr. Butler, Mr. Ross (R), Tony Best (R), Jay Nolet (R), Richard Gonzales (R)
- **TC3: Dr. Dawn Riddle / CDR Hank Phillips**
  COL Irizarry, MD, Dr. Kotwal (R), LTC Pairmore, MSG Chavaree, Mr. Montgomery (R), LTC DeLellis, SFC Lowe, Mr. Ross (R), Ms. Smith, Mr. Ogden (R), Dr. Milks, Mr. Colletti, Mr. Hackett, Mr. Butler
- **IAAR: Ms. Lisa Townsend / Mr. Pat Ogden**
  Dr. Johnston, SGM Higgs, Mr. Butler, Mr. Ross (R), Ms. Smith, Mr. Holness, Mr. Ogden (R)

2016 Experiment Instructors

Most are Current or Former Enlisted Personnel

Curriculum Instructors

- **ASA: Mr. Archer (R)**
- **TD: Mr. Ross (R)**
- **R&PE: Mr. Nolet (R) / Mr. Best (R)**
- **TC3: SFC Ham / SSG Mullin**
- **IAAR: 2ndLT Daugherty & Mr. Ross (R)**

ITA Framework

Day 1	Day 2	Day 3/4
		
AM: Classroom Instruction Across Domains		Live Missions with Increasing Complexity
		**Mission 1:** • Experiment Squad **Mission 2** • Exp. & Control Squads **Mission 3** • Exp. & Control Squads
PM: AGfT-VBS3 Missions w/ Increasing Complexity		

SOvM-TC3 is Balanced Across Multiple Life Saving Domains

Graduated Stress Exposure Training

Instruction → ***Practice*** → ***Application***

Classroom/Mobile → ***Gaming/Virtual*** → ***Live***

The SOvM TC3 Integrated Training Approach leverages existing Programs of Instruction (POI) and Programs of Record (POR) enhanced by realistic scenarios and technology to rapidly build Warrior skills

Team Development* (TD)
Information Exchange, Communication Delivery, Supporting Behavior, Initiative, and Leadership.

Resilience and Performance Enhancement (RPE)
Self composure and tactical focus under combat stressors.

Advanced Situational Awareness (ASA)
Pattern/threat recognition and decision making in complex environments.

Integrated AAR
Integrates 4 domains to reinforce and achieve simultaneous learning.

Tactical Combat Casualty Care (TC3)
Individual and collective skills to manage casualties in combat.

Building on Existing Warrior Skills Training

* Based on US Navy's Team Dimensional Training (TM) program.

Numerous Data Sources

Multiple data sources used to ensure that the right information about individual and squad performance is captured accurately

- **Self-Reported Attitudes & Experience**
  - ✓ Deployment History
  - ✓ Motivation & Stress Level
  - ✓ Resilience & Perf. Enhancement
- **Physiological Stress Data**
  - ✓ Salivary Alpha Amylase, Cortisol
  - ✓ Heart Rate Variability (Life Monitor)
- **Learning and SME Ratings**
  - ✓ ASA TARGETs
  - ✓ TD TARGETs
  - ✓ TC3 TARGETs
- **Tactical SME Ratings**
  - ✓ ASA BARS ratings
  - ✓ TD BARS ratings
  - ✓ TC3 BARS ratings
- **Knowledge Measures**
  - ✓ Content mastery tests
  - ✓ Situational Judgment Tests
- **Live Event Audio & Video Recordings**
  - ✓ Tactical Communications
  - ✓ Individual Squad member comms.
  - ✓ MOUT cameras
  - ✓ Go-Pro head-mounted cameras
- **VBS3 scenario recording**
  - ✓ Scenario capture & AAR playback

- **Over 1000 data points captured for each Soldier.**
- **Consolidated and reduced to yield individual and team performance indices.**

SOvM-TC3 2016 Experiment Overview UNCLASSIFIED 10 ARMY STRONG.

Training Effectiveness

Advanced Situational Awareness (ASA)
- Improved Decision Making Under Stress
- Greater Accuracy in Identifying and Prosecuting Hostiles (locals, threats, and KLEs)
- Anticipating and Adapting to Changing Threats

Team Development* (TD)
- Increased Capacity for Team Adaptation to Stress
- More Effective Communications
- Leadership, initiative, and self-correction

Resilience & Performance Enhancement (RPE)
- Manage Stress Levels in combat environments
- Maintain Focus and stay in the fight
- Supportive Team Behavior

Tactical Combat Casualty Care (TC3)
- Save Lives in TC3 environments
- Understand roles of First Responders and Leadership
- Function as a team to manage the TC3 environment

Integrated AAR
- Complements Tactical AARs by adding:
- Use of team self-correction to continuously improve performance
- Use of goal setting to improve teamwork skills

SOvM-TC3 2016 Experiment Overview UNCLASSIFIED 11 ARMY STRONG.

TC3 Training in Virtual Simulation

SOvM-TC3 Modeled the Improved First Aid Kit (IFAK) II in VBS3 Supporting Self, Buddy, CLS, and Medic/Corpsman Treatment

IFAK II modeled in VBS3 with interactive* components

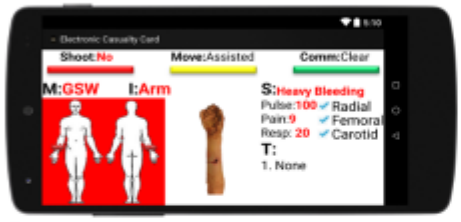
IFAK II Injury displayed and TC3 treatment selection / application

Tourniquet (2)*, Nasal Pharyngeal Airway*, Chest Decompression Needle*, Chest Seal*, TCCC Card*, Bandage*, Compression Bandage, Eye Shield, Gloves, Marker, Tape.

SOvM-TC3 2016 Experiment Overview UNCLASSIFIED 12 ARMY STRONG.

MILES TC3 Live Training

MILES Causality Display Device (MCDD) and instrumented life saving TC3 devices enable self, buddy, CLS, & Medic rescue in Live exercises




Tourniquet

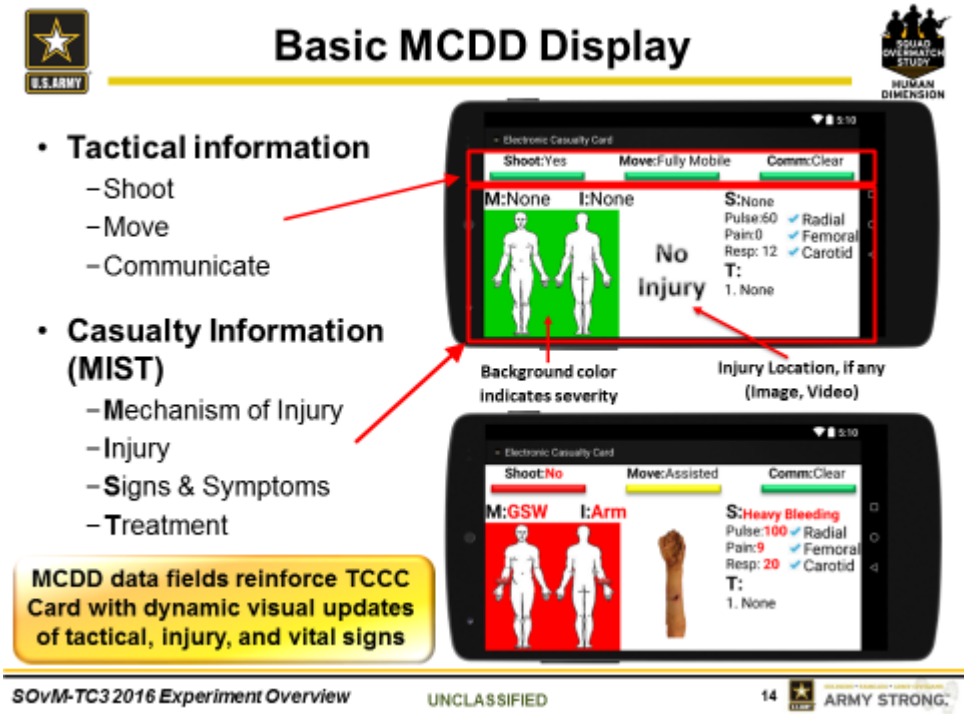

CDN

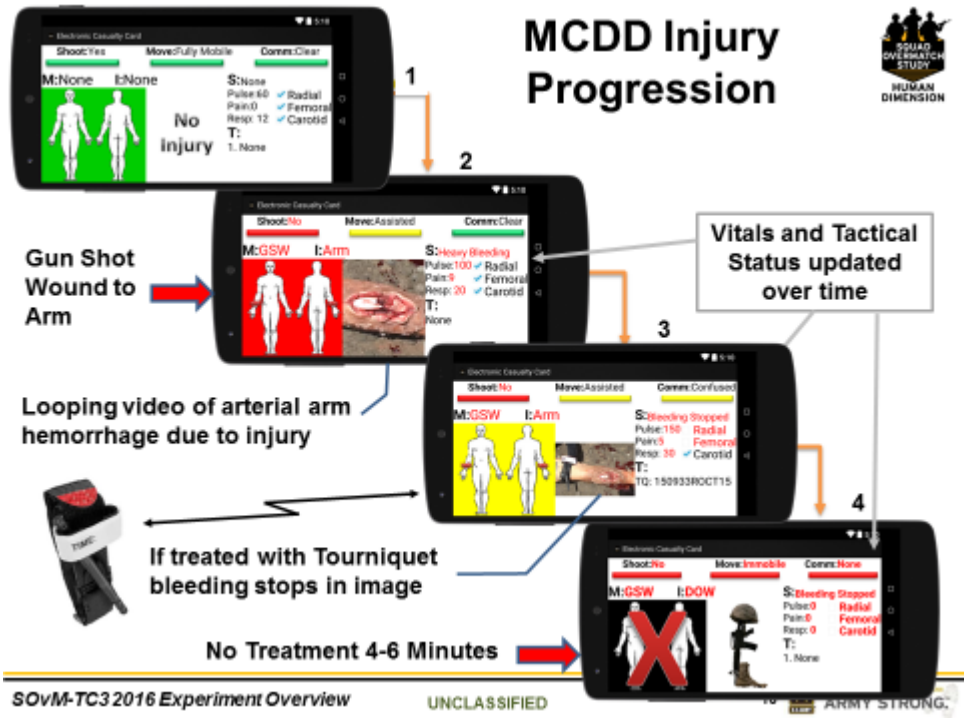

NPA

MCDD prototype replaces paper MILES casualty card that are over 30 years old

Innovative technologies **revolutionize** the **MILES** system **generating real time data to improve** the **Commander's Casualty Response System**, individual TC3 training, and AAR

SOvM-TC3 2016 Experiment Overview UNCLASSIFIED 13 ARMY STRONG.





Live Training Human Avatars

Current Training Presentation

Pop-Ups in house

SOvM-TC3 Avatars / MILES Interactive

Level 1

Scripted Dialogue / Trip Sensor Initiated

Bishop in Church Sanctuary

- ✓ *Multiple roles volunteering info*

Level 2

Dynamic Engagement with Soldiers/Marines

Hostiles and Hostages

- ✓ *Multiple locations*
- ✓ *Multiple roles*

Level 3

Fully Interactive Dialogue with Body Language and Eye Movement

Multiple Characters

- ✓ *Informant in church*
- ✓ *Captive mother*
- ✓ *HVT in hideout*

SOvM-TC3 2016 Experiment Overview UNCLASSIFIED 16 ARMY STRONG.

Non-Pyro Battlefield and Casualty Effects

Compressed Air Battlefield Effects: Suicide Bomber, Gun Shot Wound, IED, Booby Traps, Indirect Fire, Sniper Fire

Realistic Non-Pyro Battlefield Effects Eliminates the need for special transportation/storage (ASP) requirements. Safely and affordably implements Realistic Battlefield & Casualty effects using compressed air

SOvM-TC3 2016 Experiment Overview UNCLASSIFIED 17 ARMY STRONG.

Medical Simulation Training Centers (MSTC)

Casualty Training Mannequin

Moulage Components
(Amputations, Flesh Wounds, Blast Injuries)

The First Person to Place a Tourniquet Saves a Life….
Self Aid, Buddy Aid, CLS, or Medic!

Enabling Soldiers to Practice and Develop TC3 Skills
- Tourniquet Application, Chest Decompression, Airway Management -

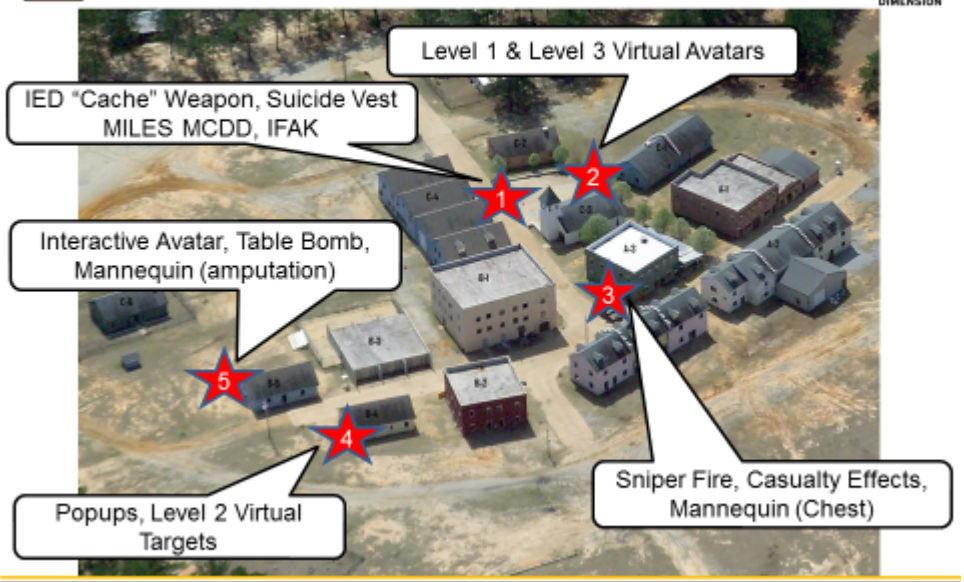
SOvM Training Strategy Comments

- **Squads**
  - 82nd ABN (SPC)
  - 690th Medic TC3 Trainer and AAR SME, SFC Ham
  - 75th Ranger Regiment, 3rdBn Bravo Co. (SL)
  - 82nd ABN – PL and IAAR facilitator 2ndLT Dougherty
- **ARCENT:** COL Chuck Allen, Director of Training
  - 1st to implement SOvM ITA beginning in NOV 2016 at Camp Buehring, Kuwait (per MG Hickman direction)
- **MCoE**: Dep. Dir. Training and Doctrine, Dr. Jay Brimstin
  - Warfighter & Institutional Training Support Package Update
  - 13 Capabilities allocated to existing and new CDD/CPD
- **Chief, Medical Training**, Office of the USASOC Surgeon:
  LTC Stephen DeLellis MPAS, PA-C

Next Steps

- **2016: Analyze Data, Validate, & Publish Findings by DEC**
  - ✓ Initial findings based on 2014 & 2015 data, surveys, and squad comments is that there is significant merit in the Integrated Training Approach to quickly train squads with improved squad performance across multiple domains and to include being a 1st responder under stress.
- **2017: Implement SOvM-TC3 at Multiple Locations for Refinement & Validation over 6-8 month period.**
  - ✓ ARCENT, Camp Buehring / 82nd ABN? / USMC/Camp Lejeune?)
  - ✓ Enhance Curriculum & Scenarios based on 2016 results & user input
  - ✓ Train the Trainer at each location
  - ✓ Develop the Draft Institutional / Warfighter Training Support Package
  - ✓ Publish findings, TSP, and recommendations by DEC 2017
- **2018: Further SOvM module enhancement is unfunded**
  - ✓ **ASA examples:** Expanded ASA, Tactical questioning, IED lane training, Cavalry
  - ✓ 19-23 POM and Requirements Development

Locations of Scenario Events



APPENDIX B: SOvM Project Team Participants

An integrated product team (IPT) approach was used that brought together the Research and Technology Developers (ARL HRED and NAWCTSD), the Training Developer (MCoE), the Combat Developer (CAC-T), and the Materiel Developer (PEO STRI) to design and develop an ITA curriculum that would rapidly develop key individual and team skills needed for TC3. The IPT collaborated with numerous organizations (across Department of Defense, other government agencies, academia, and industry) that provided extensive support and expertise from training and tactical research, behavioral psychology, measures, and data collection, instructional design, curriculum development, technology integration, and study execution. The following is a list of organizations that have so far supported the development and execution of the SOvM project since 2015.

Sponsors

- Army Study Program Management Office (CSA G8)
- Defense Health Program / Joint Program Committee 1

Core Study Team Organizations

- ARL HRED, Aberdeen Proving Ground and Orlando, FL
- Cognitive Performance Group, Orlando, FL
- MCoE, Ft Benning, GA
- NAWCTSD, Orlando, FL
- PEO STRI, Orlando, FL
- The MITRE Corporation, Orlando, FL

Supporting Organizations

- 14th Combat Support Hospital, Ft Benning
- Clarke Simulation Center, Ft Benning
- CAC-T, Ft Leavenworth, KS
- Dept. Homeland Security - Federal Law Enforcement Training Center, Glynco, GA
- Maneuver Battle Lab, Ft Benning
- McKenna Urban Training and Control Facility, Ft Benning
- Office of Naval Research
- Comprehensive Soldier & Family Fitness, MCoE, Ft Benning
- University of Central Florida Institute for Simulation and Training, Orlando
- US Army Special Operations Command Surgeon General's Office, Ft Bragg, NC
- USMC Program Manager for Training Systems, Orlando
- WRAIR, MD

Technology Providers

- XVIIIth Airborne Corps (Dragon Leader Course)
- ARA Corp. (MCDD)
- AGfT, PEO STRI
- Committee on TC3 (TC3 guidelines)
- Cubic (avatar machinima)
- Engineering Computer Simulations (TC3 Plugin)
- ExploTrain (battlefield/casualty effects)
- KForceGov/KGS (trauma effects mannequins)
- Laser Shot (virtual targetry)
- Leidos, SE Core (virtual McKenna urban training site terrain rendering)
- Mass Virtual (formerly Real Time Immersive) (Virtual Attain)
- MIL-SIM-FX (battlefield/casualty effects)
- Organic Motion (human controlled avatars)
- PEO Soldier (IFAK II)
- Perceptronics Solutions (SRTS)
- ScentAir (Scent delivery systems)
- SEKRI Industries (IFAK/TC3 devices)
- SETCan/StressVest (haptic devices)
- SIMmersion (AI interaction system)
- Threat Tec (Role-players)
- University of Southern California, Institute for Creative Technologies (Stress for Resilience in Virtual Environments, Captivating Virtual Instruction for Training)
- Yorktown, Inc. (Role-players)
- ZelTech (TC3 Instrumentation)

Supporting Units

- 75th Ranger Regiment, Ft Benning
- US Army, 3rd/3rd Infantry Division, Ft Benning
- 82nd Airborne Division, Ft Bragg, NC
- US Army 316th Cavalry Brigade, Ft Benning
- US Army, 690th Medical Detachment, Ft Benning
- USMC, II Marine Expeditionary Force, (II MEF), Camp Lejeune, NC

APPENDIX C: Testimonials

In the past 3 years, over 100 Soldiers and Marines have participated in the SOvM studies and the 2016 experiment, with their leadership either directly or indirectly observing their participation. At the beginning of the training both leadership and the participating squads voiced some skepticism about the value of the training they were about to undertake. In contrast, at the conclusion of training there was consensus on its added value. Typical comments from Soldiers and Marines, and their leadership were:

- "This is the best training I've ever had"
- "I wish I had this training before I deployed."
- "Why can't we get this training on a regular basis, once a year, twice a year?"

MG Hickman, US Army Central Command (ARCENT) Deputy Commander

> "I want SOvM implemented here at Camp Buehring [Kuwait] by Nov of this year [2016]. - SOvM will be operationalized at Camp Buehring 12 DEC 2016.

82nd Airborne Division Platoon Leader for squads (June 2016)

> "I think the Integrated Training Approach rapidly builds up their individual warrior skills as well as operating as a team. The development I saw from the squads from day one in the classroom up to the last day of the live iterations, I've never seen a squad make that sort of progress in such a short a timeframe and it really contributed overall to their readiness in deploying to achieve a mission."

82nd Airborne Division Battalion Commander, Ft Bragg, NC (post June 2016)

- "I can tell their time down at Benning paid off. We just finished out Platoon Live Fires, and the SOvM trained platoon easily had the best performance in the Battalion."
- "While most units have access to these courses, the ability to concurrently teach them kept the Paratroopers attention better and provided a more efficient training path."
- "I could see a stark difference in the Team Leaders ability to communicate with their Soldiers as well as up to the Squad Leader, how the Squad leaders were able to both cross talk to solve problems and efficiently report to the PL [Platoon Leader] and PSG [Platoon Sergeant]. They were clear and efficient in all of their communication which allowed for better situational awareness and greater flexibility for the leadership."
- "Their ability to solve medical problems while still fighting the fight was also a significant factor. The individual Paratroopers were very comfortable with self and buddy aid. This allowed leaders to continue the fight and not have to provide direct oversight to individual

casualties. This meant that the casualties had received better treatment at the point of injury and were more stable once they got to the casualty collection point."

75th Ranger Regiment Squad Leader (US Army Special Forces)

- "We have a very structured system in place for training, we have all these tasks we have to accomplish, I think it (SOvM) made our progression a lot quicker than if we had gone through a regular training cycle. … "We [squad] just started working together last week and I feel like I can do live fire as a squad very effectively".
- "We have never worked together before, usually takes a training cycle to get where we are right now".

316th Calvary Brigade Squad Leader

"I felt more confidence in them than I've ever felt in a squad member…If I had three days and all random squad members I think I would have had the same outcome… everyone was on the same page and I've seen it pay off."

Mr. Mike Johnson, Combined Arms Center – Training (CAC-T) Deputy Commander (Combat Developer that provides training capability requirements to the Materiel Developer PEO STRI for acquisition, fielding, and sustainment)

- "The SOvM study has shown that we can train small units quickly to build cohesive teams for combat."
- "It is a paradigm shift combining classroom instruction, gaming rehearsals and live training to meet outcomes based training objectives. SOvM replicates the complexities of the battlefield."
- "The medical training, using realistic mannequins, forces Soldiers to actually perform medical tasks to standard, holographic targets interact with Soldiers as they execute their mission and realistic battlefield effects are incorporated to add friction into the training."
- "The SOvM methodology improves Soldier learning, builds teamwork, replicates the complexities of the battlefield, and improves combat readiness."

APPENDIX D: Technology Recommendations to Enhance Training Realism

1. Interactive TC3 Integrated Into AGfT - Ability for AGfT to include TC3 1st responder, buddy and self-aid, and ASA skills practice, in addition to the existing shoot, move, and communicate skills development. (Note: SOvM Plug-in capability to be available on the Army MILGAMING website in mid-2017).

2. MILES Individual Weapons System Electronic Casualty Card - Update the paper MILES casualty card with a dynamic MILES casualty card that is associated to instrumented key life saving devices to accurately portray TC3 response independent of the hosting platform/display (e.g., embedded, net warrior app, or standalone).

3. Non-instrumented IFAK II - Enable Soldiers and Marines to practice TC3 first responder lifesaving skills in live exercises when instrumented MILES TC3 devices and dynamic displays are not available.

4. MSTC Trauma Mannequin - Ability to provide 1st responder, combat life saver, and medic TC3 training with realistic mannequins in classroom and live urban exercises.

5. Haptic Feedback - Enhanced weapons hit/kill signature of current MILES horn (vibration/ shock/ tingle) to improve event/behavior correlation.

6. Live Role Players – Provide live role players at urban training complexes to enable development and application of SOvM skills (e.g., conduct key leader engagements, tactical questioning, and casualty collection and evacuation).

7. Avatar Simulations – Provide a standardized functional architecture to govern avatars for all training domains and levels enabling group/individual behavior profiling. Enable advanced situational awareness training from a distance to close-up tactical questioning. Provide three levels of avatar simulations:
    - Level 1 – Avatar simulation that is responsive to MILES engagements. Provides Soldiers programmed or range operations selected responses in terms of information correlated to the military operations order and mission.
    - Level 2 – Avatar simulation that is responsive to MILES engagements, are controlled by motion or range operations, and engage soldiers in close quarters fire fights. Avatars include virtual representations of civilians/bystanders, hostages, terrorists,

and uniformed enemy that accurately record shooter identification, percentage of miss/hit/kill shots for AAR and performance scoring.

- Level 3 – Interactive avatars that respond to Soldier questioning, and present a full array of body language and ASA cues. Dynamic behavior escalation/de-escalation based on Solder questioning skills, speech dialect/accents, clothing and wounding modeling.

8. Non-pyro Battlefield Effects - Simulate battlefield effects with non-pyrotechnic solutions to eliminate ammo supply point and storage issues. Provide a universal/semi universal compressed air capability with attachments that can replicate gun fire, sniper fire, machine gun fire, suicide bombers, IEDs, table bombs, gunshot wounds (entry/exit), machine gun fire, sniper by both remote control and motion/trip sensors.

9. Moulage - Casualty effects for role players and mannequins that provide realistic injuries in close quarters and for first responder TC3 treatment.

10. Scent Generators – Implement scents that stimulate Soldier senses for ASA and TC3 cues.

11. Scenario Generation Capability - To optimize learning objectives, ability for implementing graduated stress exposure and logical scenario sequencing presentation in gaming, virtual, and live environments to correlate with the commander's intent and mission. Scenario correlation capability ensures commander's training objectives are met and reinforced in graduated complexity and presented in a logical order. Library of individual scenarios shall automatically sequence in logical progression. Ensures learning is accomplished and skill mastery is retained.

12. Semi-Automated Scenario Development and Integration Authoring Capability - Capability to assist units and technical site leads to develop mission specific learning objectives and related classroom/gaming/virtual/live scenarios for re-use and centralized cataloguing. Centrally approved "specific skill training modules" would be reflected as such, categorized for easy searching and be a complete plug-in curriculum training enabler. Partially developed modules would be available in the "catalogue" for others to use and expand on or complete, but would not be "certified". A searchable index form would assist in cataloguing the module for logical menu placement. Criteria for complete module certification would be provided to assist developers in creating a complete package and allow for unit credits/recognition as the author.