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Orlando, FL

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MITRE TECHNICAL REPORT

EXECUTIVE SUMMARY

# Integrated Squad Training to Optimize Human Performance and Discourage Post-Traumatic Stress Disorder and Suicide

## FY13 Study Executive Summary and Overview Briefing

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# Abstract

The FY13 Army Study Program awarded the Army's Program Executive Office for Simulation, Instrumentation, and Training and The MITRE Corporation funds to conduct a study on Squad training to improve human performance and lower the likelihood of post-traumatic stress disorder and suicide. This study was the FY13 Army Study Program number one priority (ranked first out of 57 entries). The study team, in partnership with the Maneuver Center of Excellence, produced a Squad Integrated Training Approach that could develop more adaptive, resilient, and lethal Squads. The Squad Integrated Training Approach trains resilience, mental, and situational awareness skills in conjunction with traditional warrior skills. The team researched technologies that could be inserted into existing training aids, devices, simulators, and simulations to enable the Squad Integrated Training Approach by presenting Squads with more combat realistic exercise experiences. Using a structured portfolio analysis approach, the team also identified combat stressors and the best collections of the technology infusions to address them. Finally, the team identified the need for an Instructional Strategy and a Gradual Stress Exposure Model for the Squad Integrated Training Approach, and proposed their development and a demonstration and evaluation of the concept at Ft Benning, GA. The team submitted this proposal to the FY14 Army Study Program, which selected it for award (ranked first out of 56 entries), again as the top priority project.

# Executive Summary

## Background

*The time is 0530, still dark and cold, in a mountainous Afghan village. A Squad of US Soldiers navigates the stench-filled narrow village roads and alleyways en route to join up with Third Platoon and establish a traffic control point. They are alone and dismounted. The Squad's vehicles, unable to traverse the narrow roads, are positioned elsewhere to provide remote fire support if required – and if possible. They are on high alert; an attack on Bravo Company just two days earlier, with improvised explosive devices and rocket-propelled grenades near the village, left two Soldiers killed. The Squad Leader, SSG Johnson, 22 years of age, observes an indigent limping into an alley – the same beggar reported by Bravo Company before the attack. SSG Johnson observes, but does not fully register, as the woman who bakes bread every morning hurriedly gathers her morning's work and enters her house. It suddenly becomes very quiet and still. The Squad is alone. SSG Johnson's first concern is to stay focused – his Squad of nine Soldiers, average age of 19, is relying on him. Have we prepared SSG Johnson and his Squad to make the right decisions, to observe and understand, and to remain focused and resilient in the face of stressors that they will certainly face in next few terrifying moments? Body armor protects them physically. Do they have any mental armor?*

## Bottom Line Up Front

In FY13, as the top priority study of the Army Study Program, Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI) and The MITRE Corporation investigated how to improve existing Squad training devices to train the cognitive skills that provide Soldiers better mental armor. The team hypothesized that so preparing Soldiers prior to combat would not only promote optimal human performance but also would discourage later development of Post-Traumatic Stress Disorder (PTSD) and suicide. The study directly supports the Army's Ready and Resilient Campaign objective of Soldier Resilience.

Early in the study, the team discovered that the Maneuver Center of Excellence (MCoE) has instituted new training programs to develop three sets of cognitive skills that are the foundation of mental armor - resilience, mental performance, and situational awareness (SA). Improving optimal human performance in Soldiers requires developing all three of these skills sets. Resilience skills are those needed to adapt effectively to adversity. Mental skills (derived from sports psychology) are those required to focus on a complicated task despite distractions. SA skills are those required to observe and evaluate cues from the physical environment and, even more importantly, the human domain, in order to anticipate and properly react to future threats. These emerging programs of instruction show great promise, but they currently reach a limited number of Soldiers and are infrequently available to Soldiers.

The Army's challenge is how to make cognitive skills training available to every Soldier and as routine as fundamental warrior skills training. However, the training continuum of the Train/Ready phase of the Army Force Generation (ARFORGEN) is already crowded just to train Soldiers in warrior skills. The deep budgets cuts facing the Army severely affect every unit's training budget and funding for training

programs and devices. The team realized that the solution requires maximizing training benefit across the skill sets from every training hour and training dollar.

In response, the team developed the Squad Integrated Training Approach. This approach integrates cognitive skills training into the existing warrior skills training programs across the entire training continuum, using existing training devices injected with technology to simulate realistic combat stressors. Programs, such as the 2011 OSD Deputy Assistant Secretary of Defense Rapid Fielding Office-sponsored Future Immersive Training Environment (FITE) joint capability technology demonstration (JCTD), have already established the efficacy of integrating training for cognitive skills with warrior skills training and the use of combat realistic training devices<sup>1</sup>. The Army needs to develop and execute a strategy to institutionalize the Squad Integrated Training Approach cost-effectively across the Army.

## Recommendations

The study team recommends that the Army develop a strategy with an End to develop cognitive skills - mental, resilience, and SA - in Soldiers. The Way is the Squad Integrated Training Approach. The needed Means are:

1. Continue and expand the Army's new emphasis on Soldier cognitive skills development.
2. Incorporate cognitive skills development in the Army Training Strategy and Army Learning Model.
3. Establish requirements and funding for cognitive training using current training devices.
4. Inject high return on investment technologies into existing training devices for warrior skills to emulate combat stressors that exercise essential cognitive skills.
5. Enhance current warrior skills instructional methodology to insert cognitive skills.
6. Develop a gradual stress exposure model.
7. Empirically evaluate, through rapid experimentation, the effectiveness of the Squad Integrated Training Approach in improving performance and discouraging PTSD and suicide.

## Detailed Findings

Psychological research and supporting literature indicates and all subject matter experts consulted concur, that gradual, systematic exposure to combat realism combined with exercising coping skills discourages depression, PTSD, and suicide. The team did not find a study that definitively and scientifically proves this. However, the team asserts that the preponderance of evidence and

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<sup>1</sup> "FITE demonstrated the capability to provide an effective environment to foster cognitive and decision-making skills and build self confidence via both the scenarios and the post-scenario AARs. All 44 trainees agreed that FITE could help provide better combat preparation and the platoon leadership and SMEs concurred." Future Immersive Training Environment Joint Capability Technology Demonstration Spiral 1 Limited Joint Operational Utility Assessment Report June 2010 Prepared for: Deputy Commander, U.S. Joint Forces Command, Page 29.

experience, given the urgent need, warrants pursuit of the approach in parallel with the development of rigorous supporting data.

There is scientific evidence, however, that combat realistic training results in improved performance under combat conditions. The Army's Medical Simulation Training Center (MSTC) has been a frontrunner in combat realistic training through stimulation of visual, aural, olfactory, and haptic senses. Under simulated crossfire, Army medics in the MSTC must provide correct and timely medical treatment to mannequins that blink, breathe, scream, lose arms and legs, bleed, smell bad, squirt body fluids, and potentially die. The MSTC is the certification standard for Army combat medics. Additionally, other studies such as the one published by the Mind Fitness Training Institute<sup>2</sup>, focused on small tactical units, suggest that Soldiers training in environments that are more combat realistic have more confidence, mental acuity, and composure under stress.

The team formed a network of organizations that are performing research and developing capabilities and concepts needed to complete the Squad Integrated Training Approach. This network includes military and civilian research psychologists, engineers, and US Army training experts from the following organizations: the MCoE, the University of Southern California's Institute for Creative Technologies, the Office of Naval Research, the United States Marine Corps' Program Manager for Training Systems, the Walter Reed Army Institute of Research, an informal group of Army Sergeants Major, the Army Research Laboratory's Army Research Institute and Simulation Training Technology Center, and the University of Central Florida Behavioral Science Center.

Walter Reed provided the list of combat stressors that are the most significant contributors to PTSD. The team then surveyed and solicited from industry technologies that simulate the combat stressors when inserted into existing training devices. The team analyzed the technologies using a model that defines how a given technology portfolio contributes to the development of all cognitive skills using the Squad Integrated Training Approach. The model provided relative return on investments for various technology injections based on a training paradigm that strives to train cognitive skills throughout the training continuum.

The model indicates sharp increases in human performance for relatively little cost by adding software-centric solutions and low cost hardware to existing training devices. Additionally injecting hardware-based technologies, such as virtual targetry, into live training devices, achieves the highest levels of overall human performance and inserts cognitive skills training across the full training continuum. The portfolio analysis model represents a significant analytical capability developed by the team – one the team will continue to use for the second phase of the study in FY14 for trade-off and sensitivity analysis of technology portfolios.

The team also produced a plan – the Technology Insertion Roadmap – that identifies technologies for integration into existing training devices to address the cognitive training gaps. This Roadmap identifies a phased approach for implementing technologies into existing training aids based on how well they

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<sup>2</sup> Stanley, E. A. & Jha, A. P. (2009). Mind fitness: Improving operational effectiveness and building warrior resilience. *Joint Force Quarterly*, 55, 144-151.

contribute to human performance, their cost, and available funding. The team can use the portfolio analysis model to change the Roadmap based on different funding profile assumptions. The team's assessment is that the current version of the Roadmap – specifically the costs - is preliminary until the cost data can be further refined. This refinement will occur during Phase 2 of the study.

The team discovered that, even with technology insertion, some gaps in training cognitive skills persist. For example, one combat stressor occurs when a round hits a Soldier but his protective gear saves him. None of the technologies evaluated by the team scored well in this regard. These gaps exist due to a limited set of technology options available at this time and require a second review of emerging technologies. A new requirement for cognitive training would stimulate research, development, and investment in technology to fill these gaps.

The team also identified two significant gaps that the Army should evaluate filling to realize the Squad Integrated Training Approach. The study team recommends the Army extend the current warrior skills instructional methodology (i.e., program of instruction, scenario, instructor observation and control, and after action review approach) to include cognitive skills. The team also recommends that the Army develop a gradual stress exposure model to guide the rate at which Soldiers experience the stressors in the training environments and to ensure that cognitive skills increase in concert with exposure, or risk over-exposure to stress.

The team discovered that other services and organizations – notably the Navy, Marine Corps, FITE JCTD and law enforcement agencies – have created and evaluated similar cognitive skills-oriented instructional methodologies and stress exposure models and have collected training effectiveness data that the Army can leverage and customize for its Squads.

## Way Forward

The team proposed an FY14 Army Study Program study to develop a prototype Instructional Strategy for Integrated Training (ISIT) and Graduated Exposure Training Model (GETM) and to include their cost into the portfolio analysis. The team also proposed to inject some of the key technologies into existing Ft. Benning Squad training devices for demonstration and quick look evaluation of the Squad Integrated Training Approach from technical, training, and learning perspectives using the ISIT and GETM. The Army Study program, again as its top priority study, selected this proposal for award. The team has strengthened the network of partners to include formal arrangements with the MCoE, the Army Research Laboratory's Army Research Institute and Simulation Training Technology Center, and PEO STRI Program Managers of Squad training devices.

In the current and future operating environment, all Soldiers – not just Infantry – may be exposed to these stressors and require cognitive training to develop the mental armor to improve human performance and help protect them from PTSD and suicide. The Squad Integrated Training Approach is the Way to accomplish this End goal and the team recommends that the Army prioritize finding the recommended Means to support it.

# Foreword

The US Army is extremely good at training Soldiers in the eight forms of contact and getting them to perform those actions automatically. We do not prepare them, however, for the actual traumatic events that occur when engaging in combat.

Training in combat marksmanship and basic rifle marksmanship still occurs with paper and plastic targets. This training does not adequately prepare our warriors for the tasks we require them to do, which may possibly include taking a human life. We need graphic depictions of what Soldiers will experience (including death and wounding) via virtual targetry in the Close Quarters Battle Shoot Houses and in the virtual immersion trainer, Dismounted Soldier Training System.

A myriad of combat events can trigger *kinetic* actions, but we do not currently help our young men and women prepare for the *mental* challenges of being leaders on the modern battlefield. We must train them in the skills to conduct kinetic events, as well as judge if that is the proper event given the current space and time for their unit. Advanced Situational Assessment Training (ASAT) gives Soldiers the skills to avoid actions they need not take or perform necessary actions more effectively when in battle.

Being the leader of nine men and women, who are all younger and are very unsure of their surroundings, is perhaps one of the most stressful, and challenging things a Soldier faces. How does a Soldier handle that pressure? Our current training continuum does not expose Soldiers to the level of stress they will endure in combat. We must incorporate resilience and coping skills into our training scenarios to force consistent use and exposure. We must prepare our men and women to manage stress - rather than reject its effects - by providing visual, audio, olfactory, and tactile stimuli in graduated increments during training.


By placing the Squad and its leadership into a realistic environment, which includes death and wounding through use of avatars and ballistic actualization, we can reduce the initial shock of the first trauma they experience in combat and prepare them for the possible loss of a member of their unit. We must increase exposure to traumatic events, and infuse into Warrior Skills training environments – both live and virtual – both resilience and situational awareness so our Soldiers can achieve overmatch on the battlefields.

– SGM Ogden, PEO STRI and Samuel M. Rhodes, MCoE CSF2 Program Manager

# **Squad Overmatch Study I/ITSEC**

**3 December 2013**

**SGM Higgs**



**Army Study  
Program's  
#1 Proposal**



# Train As You Fight?

2EO  
**STRI**



## **Optimize squad performance and discourage PTSD and suicide**

- ☐ Integrate training for resilience, mental acuity, and advanced situational awareness into warrior skills training
- ☐ Replicate extreme stressors in existing live, virtual, constructive, gaming training environments

- ☐ **Focus on improving Squad level collective training**
- ☐ **Focus on developing Squad proficiency in Resilience, Mental Acuity, and Situational Awareness (collectively, the Study referred to these as Cognitive skills)**
- ☐ **Analysis focus on combat stressors**
- ☐ **Identify gaps in training Cognitive Skills, for the following TADSS**
  - **Army Games for Training (AGFT)**
  - **Combined Arms Collective Training Facility (CACTF)**
  - **Dismounted Soldier Training System (DSTS)**
  - **Engagement Skills Trainer (EST)**
  - **Shoot House (SH)**

# Current Training Paradigm

## Post Event Mental State

Accept    Reject    Adapt

Warrior Skills



Limited Realistic Stressors



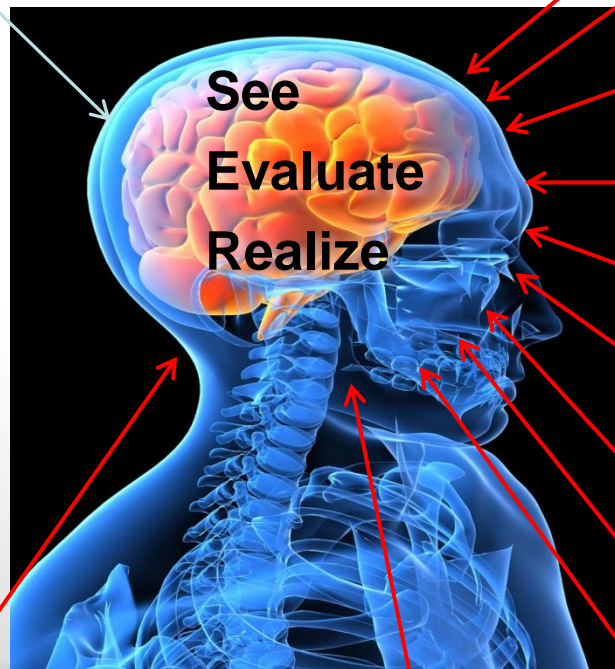
# Operational Environment (Combat)



## Warrior Skills

### Post Event Mental State

Accept      Reject      Adapt



Had a close call, was shot or hit, but protective gear saved you

Being responsible for the death of an enemy combatant

Exposure to Dead bodies or human remains

### Member of Patrol/Unit Killed in Action

Engaging enemy with direct fire or returning fire

Being responsible for the death of a noncombatant

Attack by enemy on Forward Operating base or patrol base Perimeter

Clearing or searching homes or buildings

**Seeing ill or injured women or children whom you were unable to help**

Wounded in action or have a team member wounded in action

Indirect fire attack from Incoming artillery, rocket, or mortar fire

Stressors defined by Walter Reed Army Institute of Research

# Objective Training Model



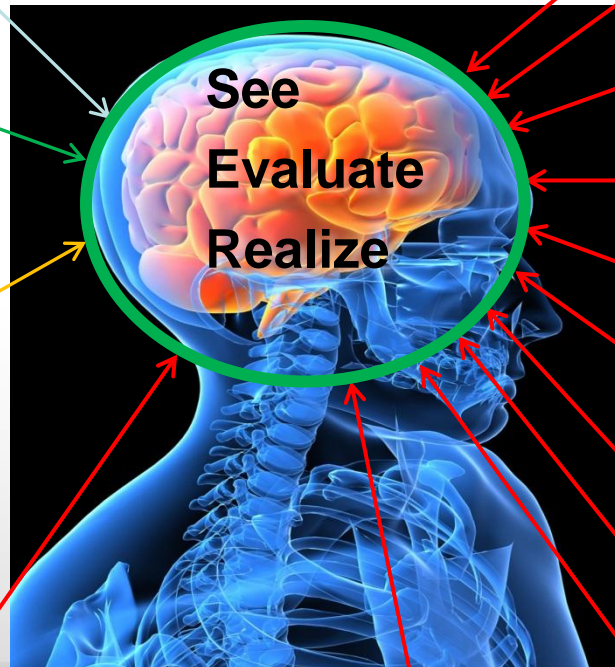
## Post Event Mental State

Accept      Reject      Adapt

**Warrior Skills**

**Resilience Skills**

**Situational Awareness Skills**



Had a close call, was shot or hit, but protective gear saved you

Being responsible for the death of an enemy combatant

Exposure to Dead bodies or human remains

**Member of Patrol/Unit Killed in Action**

Engaging enemy with direct fire or returning fire

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Stressors defined by Walter Reed Army Institute of Research

# Squad Integrated Training Approach



**Resilience and Mental Skills Training<sup>1</sup>**

**Warrior Skills Training<sup>2</sup>**

**Situational Awareness Skills Training<sup>3</sup>**

**Exercise in  
-Live and Virtual Environments –  
w/ EST, AGFT, DSTS, SH, CACTF**

**U.S. Army Objective is**

**Squad Overmatch**



1) Mental and Resilience Skills from CSF2 Program

2) Warrior Skills from Battle Drills

3) Situational Awareness Skills from the MCoE ASAT Program

# Squad Training Continuum

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# Squad Training Continuum (1)



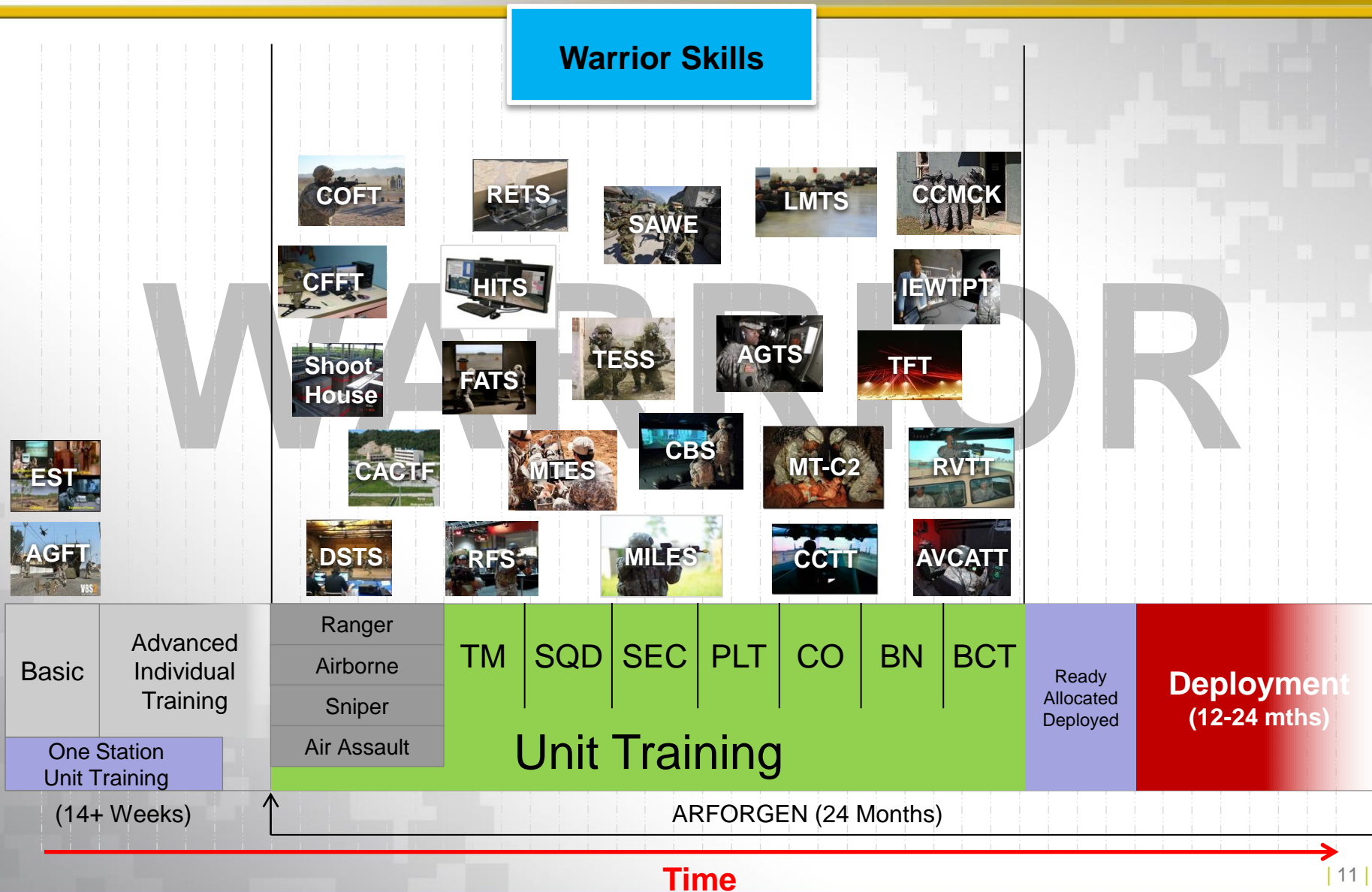
Typical Squad Training Cycle (diagram not to scale)

## Training Cycle



# Squad Training Continuum (2)

## Warrior Skills



# Existing Training Aids



Shoot House (SH)



Dismounted Soldier Training System (DSTS)



Engagement Skills Trainer (EST)



Army Games For Training (AGFT)



Combined Arms Collective Training Facility (CACTF)

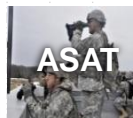


# Squad Training Continuum (3)



Resilience / Situational Awareness Training (Current)

# COGNITIVE



Time

# Technology Categories



Virtual Humans

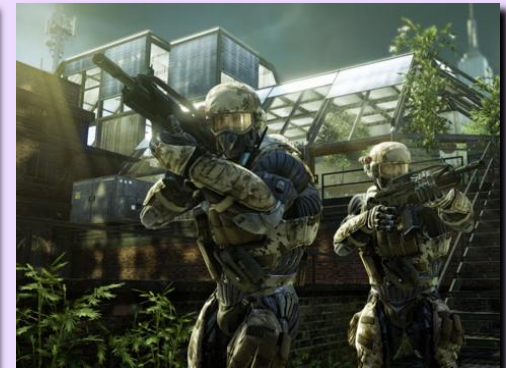


Graphic Realism

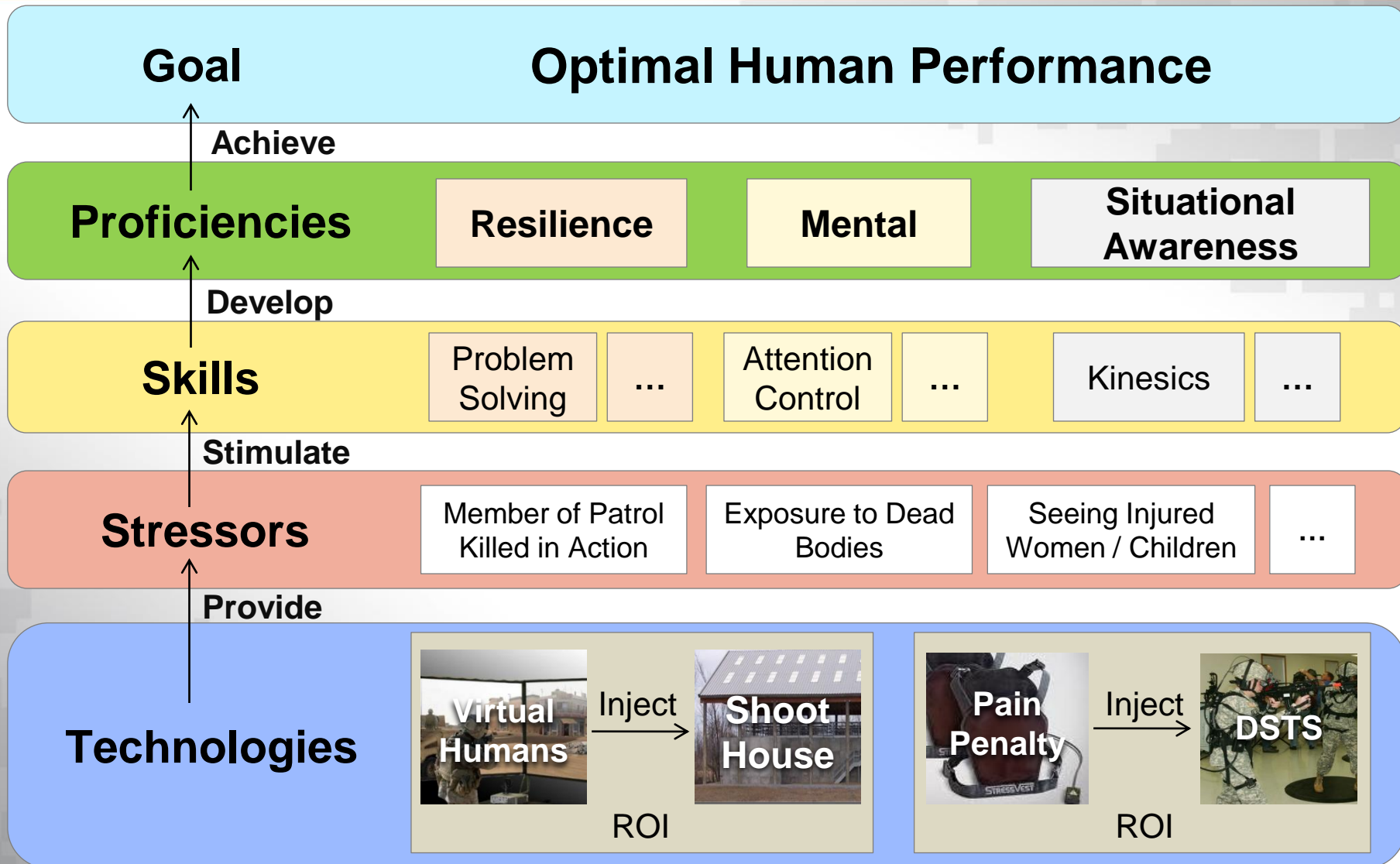
Smell



Pain

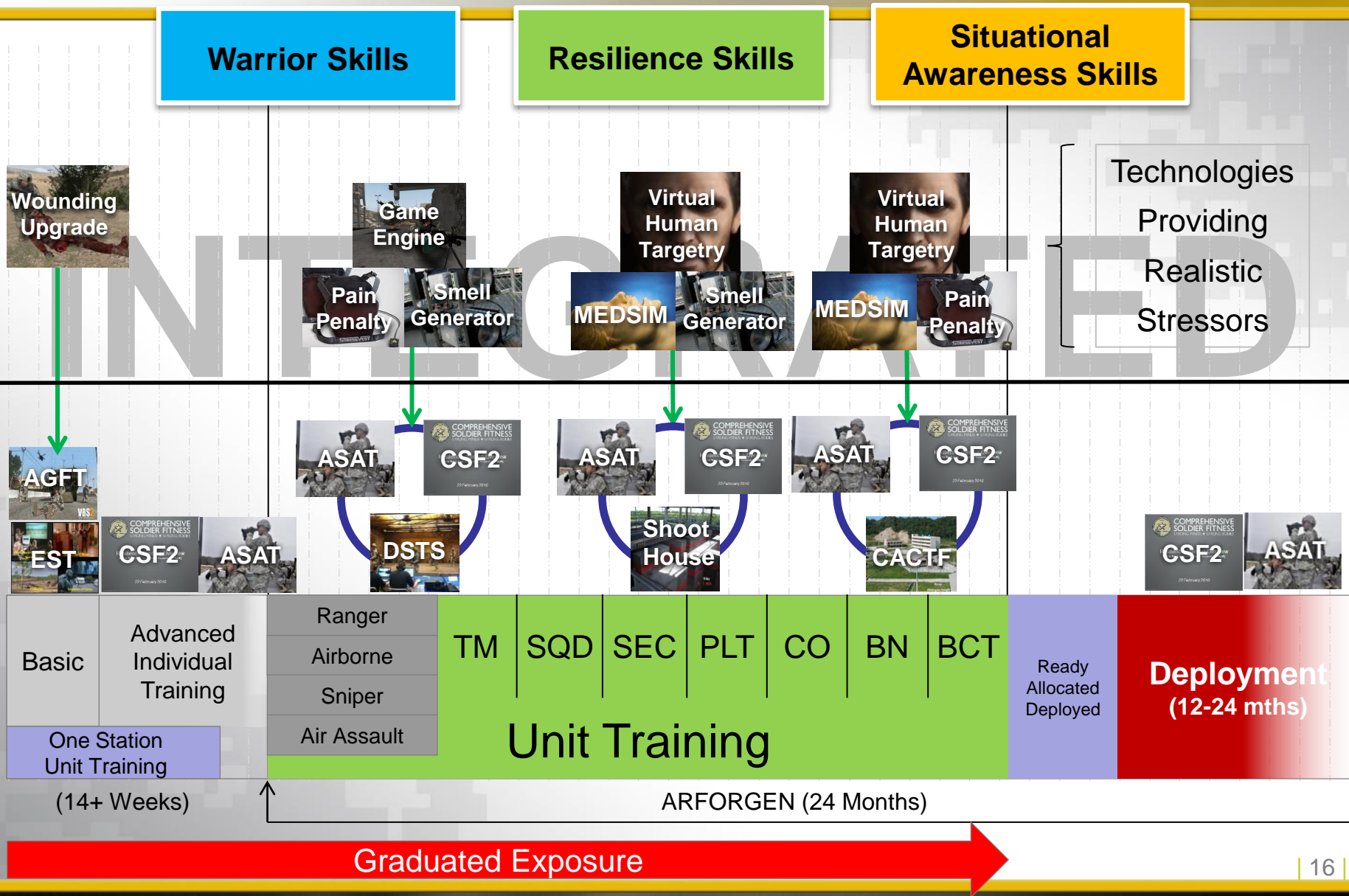


# Ongoing Technology Return On Investment (ROI) Analysis





# Squad Training Continuum (4) \* Notional \*



# Squad Overmatch Study Team FY13 & FY14



UCF Institute of Simulation and Training &  
USC Institute for Creative Technologies

Office of Naval Research



MCoE

MITRE

PEO STRI

ARI

ARL/HRED/STTC

PM TRASYS  
(USMC)

Walter Reed  
AIR

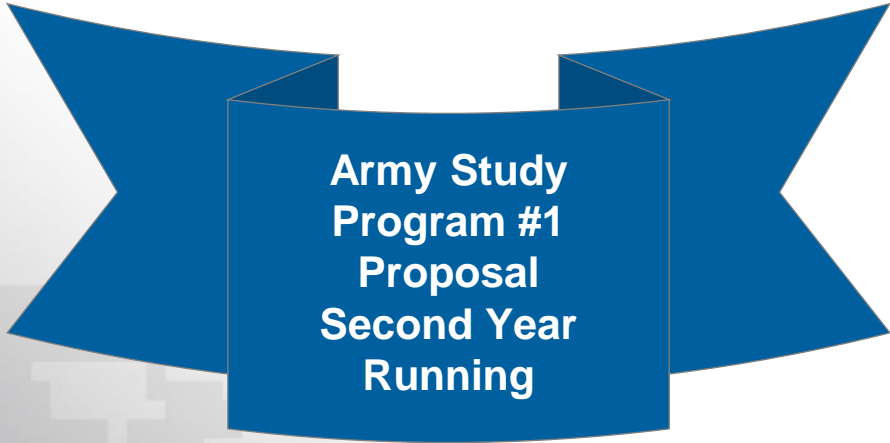




# FY13 Accomplishments



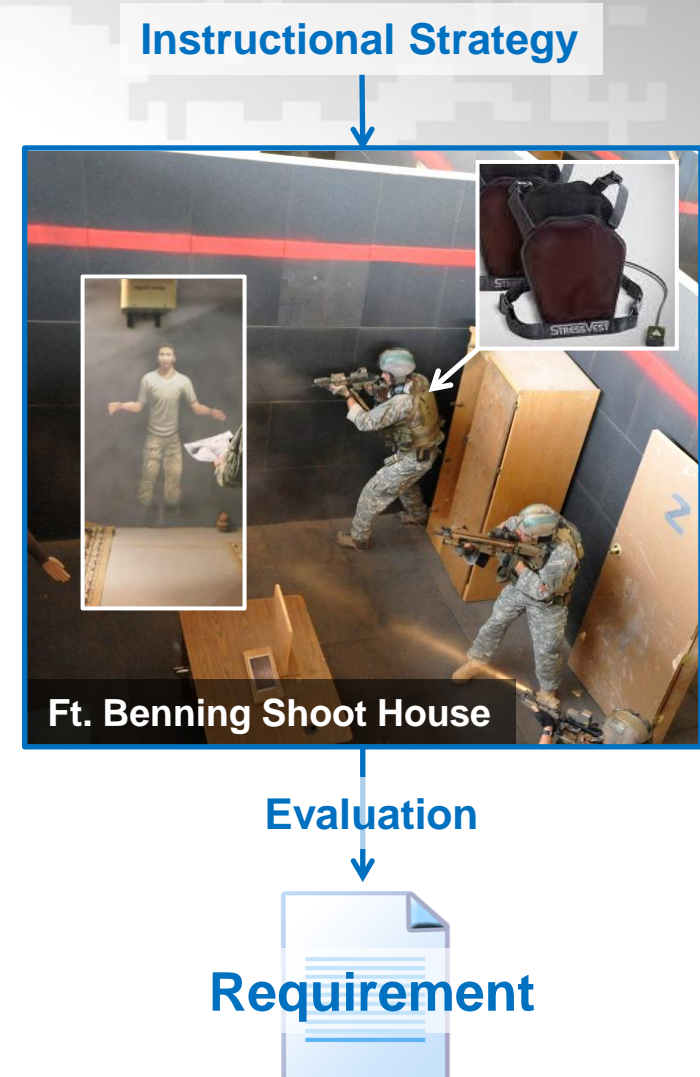
- ❑ Built the Squad Overmatch Study Team
- ❑ Developed Integrated Training Approach
- ❑ Identified gaps in current Programs of Record for Integrated Training
- ❑ Initial ROI analysis of technologies with respect to their capability to support Integrated Training
- ❑ Top priority Army Study Program for FY14

A blue ribbon graphic with a 3D effect, featuring a central rectangular panel and two flared ends.

**Army Study  
Program #1  
Proposal  
Second Year  
Running**

# FY14 Way Forward

- ❑ Develop instructional strategy and graduated exposure model
- ❑ Integrate technologies at Ft. Benning
- ❑ Conduct experimentation with squads
- ❑ Conduct effectiveness evaluation



# Squad Overmatch Study Contact Info



For comments, questions, suggestions, contact:

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