

HAPTICS INTEGRATION WITHIN TC3 (BAA)



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In Tactical Combat Casualty Care (TC3) and specifically Care Under Fire (CUF), virtual reality (VR) is limited in how it can provide the necessary sensory input for realistic training and performance assessment on life-saving medical procedures. The duration of the research project is one year plus four options years. The U.S. Army was interested in experimenting with haptic glove systems integrated with weapons and other immersive technologies in VR environments to increase realism during CUF performance assessments.

Base Year Effort

In the base year, the focus was twofold. First, we generated a CUF haptics-based assessment, where we examined usability and functionality of the technologies. Second, we examined how haptics (in conjunction with other technologies) may influence the validity and reliability of pass and fail (“go” and “no go”) ratings during performance assessment. ECS conducted Alpha and Usability testing with individuals to measure the validity and reliability of the assessment.

Canine Effort

The U.S. Army was interested in training handlers for noticing symptoms of a MWD developing a heat injury while on the job. The research team used previous literature and curriculum review to develop a storyline for a specific training scenario of a dog developing heat injury.

Key Features

- Care Under Fire assessment reimaged on a 4-point scale
- Measuring the validity and reliability of the assessment
- Haptic Glove Comparison, Bebop, SensoryX, and VRgluv
- Weapon Comparison, Airsoft Rifle and Haptech M4
- Alpha and Usability Testing
- Development of Military Working Dog
- Construction of a heat injury scenario for training handlers
- Literature and Curriculum Review
- Interview with Mayo Clinic professionals for data collection



CRASH CART COUNTDOWN (VA SIMLEARN)

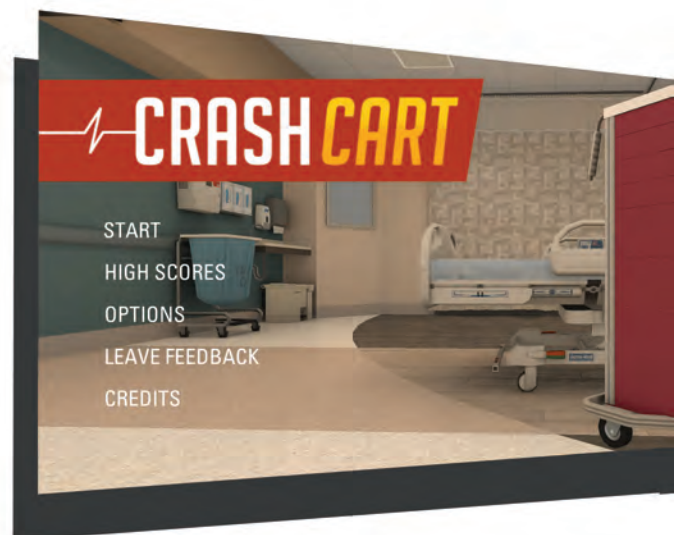
Enhancing Cognitive Recall Skills for Emergency Response Teams

ECS developed Crash Cart Countdown to engage trainees in an arcade-style 3D game that simulates rapid response emergency medical situations. The game utilizes medical equipment and supplies associated with standardized hospital emergency carts and prompts users to locate all necessary equipment in a situation where time is of the essence, then evaluates their efficiency and accuracy. Sequences are randomized during each play-through to enhance cognitive recall and produce precise evaluations of user knowledge. Organizations can also customize the carts to reflect the specific requirements of their facilities and workforce. The objective is to locate medical supplies and equipment within specific crash cart configurations with efficiency and accuracy.

This award-winning serious game has been designed to increase cognitive recall skills using an educational role-playing game-based approach. Originally developed for the VA, the primary audience of Crash Cart Countdown is Rapid Response Teams (RRT), Medical Emergency Teams (MET), and High Acuity Response Teams (HART). Enabling these teams to master these critical skills through training saves valuable time needed to locate supplies in an emergency.

Key Features

- Game-based 3D Interface – Provides the learner with a contextual method of locating equipment within the various carts used by the healthcare facility
- Integrated Leaderboard – Tracks player high scores to encourage friendly competition and increase replay value
- Customization Feature – Allows administration to tailor or update existing carts and content, as well as create new cart configurations



ADVANCED HAPTICS DEVELOPMENT TO SUPPORT MEDICAL SIMULATED TRAINING ENVIRONMENTS

(DHA Phase II SBIR)

Intergrating Haptic Devices to Improve Human Performance and Training Effectiveness

ECS has been awarded a Small Business Innovation Research (SBIR) project with the Defense Health Agency (DHA) entitled, Advanced Haptics Development to Support Medical Simulated Training Environments. This project will consist of designing and developing haptics-based virtual reality (VR) training systems to support combat medicine the U.S. Army's Synthetic Training Environment (STE) with potential expansion to the broader medical community. The research and development team includes ECS, Mayo Clinic (Jacksonville, FL), Florida to coordinate the usability study with medical professionals to capture feedback on the technology and training approach based on a prototype training scenario.

Our team is excited to contribute to this body of research related to human performance and training effectiveness for both the military and the medical community. By collaborating with HaptX and Mayo Clinic, this type of innovative work advances high-fidelity VR integration by blending state-of-the-art hardware and software solutions to deliver enhanced training to our Soldiers and to the broader medical community.

Year-One Objectives

- Partnered with HaptX & Mayo Clinic
- Training system for burn care treatment
- Multiplayer Tele-Teaching Scenario
- Mayo Clinic helping with usability with medical professional

Year-Two Objectives

- Multiplayer/MultiRole Care Under Fire Scenarios
- Explore STE integration opportunities
- Combat Life Saver (CLS) training
- Emergency personnel training
- Training Effectiveness Evaluation

BULK PETROLEUM SUPPLY CHAIN TRAINING COURSE

(DLA-E)

Integrating Expertise with the Learning of Science to Deliver Logistics Training

ECS is supporting the Defense Logistics Agency – Energy (DLA-E) by providing Subject Matter Experts (SMEs) and instructional design expertise to support analysis, design, development, implementation, and evaluation of several key DLA-E initiatives related to skilling and upskilling supply chain employees.

Our Instructional Science team worked closely with experienced SMEs to design, develop, and deliver the in-residence Joint Petroleum Course (JPC) and to conduct a supply-chain training needs assessment. Our team has extensive experience in energy, fuels, logistics operations, and policy, along with vast knowledge of instructional design, courseware development, and learning of science. They incorporated this unique Learning of Science and project management expertise to update and convert existing DLA courses while also developing new distance learning ones to enhance the quality and retention of the training.

After delivery of the courses, the team was asked to deliver additional work during an option year that included two additional courses. The team used the entire ADDIE (Analysis, Design, Development, Implementation, and Evaluation) Instructional Design process to deliver a Joint Petroleum Advanced Planning Course and an immersive Bulk Petroleum Storage Operator's Refresher Course simulation. Both of these courses are targeted at experienced Bulk Fuels professionals across the DoD.

Achievements & Expertise

- Supply-Chain Training Assessment
- Joint Petroleum Advanced Planning Course
- In-Residence Joint Petroleum Course
- Bulk Petroleum Storage Operator's Refresher Course



FN EXPERT

(FN America / FN Herstal)

Transforming Combat Shooter Training with Innovative Technology

ECS believes in investing in research and development to advance collaboration and innovation in order to deliver the best virtual and live training capabilities to our Warfighters. We are proud to partner with FN America to deliver the FN® Expert Marksmanship Trainer. This product is an integrated hardware/software system that provides instruction to both shooters and instructors.

ECS and FN are also exploring integrations with augmented reality (AR) and virtual reality (VR) sensors integrated with our state-of-the-art software system, combat shooters can strengthen their techniques immediately, as this advanced marksmanship trainer provides specialized real-time insight into the trainee's shooting techniques and performance.

Key Features

- Marksmanship training
- Instruction for both shooters and coaches
- Focus on fundamental shooting skills
- Wireless system capable of dry-fire and live-fire training on virtually any rifle or carbine, as well as selected pistols
- System can be used together with the shooter's assigned weapon and any optics or accessories the shooter already has
- Indoor & outdoor use
- Analyzes the shooter's performance
- Displays information in real-time on tablet or PC





GOALS OF CARE AND GERIATRICS CONVERSATIONS

(VA Sim Learn)

Enhancing Patient Care Communication Techniques with Virtual Training

ECS worked in collaboration with the VA SimLEARN program to design Goals for Care Conversations to hone skills in helping a patient and their family to make palliative care decisions with empathy and thoughtful care. Palliative care is specialized medical care for people with serious illnesses, focusing on providing relief from the symptoms and stress. Proactively conducting goals of care conversations with a patient with a serious illness is important in ensuring that the patient's values, goals, and treatment preferences are followed.

The purpose of the tool is to emphasize and reaffirm the importance of the relationship between practitioner and patient. The learner practices these skills in an immersive and realistic environment with immediate feedback from a virtual mentor to help reinforce important skills.

This virtual training program will help busy clinicians practice including the patient and their caregivers in making quality-of-life decisions.

ECS is improving the quality of healthcare services for America's Veterans through the application of simulation-based learning strategies to clinical workforce development.

Key Features

- High Fidelity Avatars – High-quality visuals for the patient and caregivers give a sense of realism and portray evocative responses.
- Challenging scenarios – Navigate through the challenging nuances of the soft skills of empathy and choosing not only what to say, but when and how to say it.
- Virtual Mentor and Review – A virtual mentor acts as a guide throughout the scenario to keep you on track and provide instant feedback, as well as remediation and review upon completion of a scenario.
- Ease of Access – Goals of Care Conversations uses WebGL to run natively in any modern browser without the need for additional software.

HAPTICS-ENHANCED AR TRAINING SYSTEM FOR CARE UNDER FIRE

(US Army CCDC STTC)



AR + Haptics CUF

U.S. Army Research Laboratory - HRED – STTC awarded a Small Business Innovation Research (SBIR) Phase I contract for a six-month project effort titled Haptics-enhanced Augmented Reality Training System for Care Under Fire. The research and development team included Engineering & Computer Simulations, Inc. (ECS), Quantum Improvements Consulting (QIC), and VRgluv (haptic glove manufacturer).

The research team followed a nine-step process to address the research questions and to ultimately create a CUF training flow concept reflective of a systematic process for placement of immersive technologies in the CUF training curriculum. The process began with a front-end analysis to determine what training was currently available and how it had been addressed in the past. The steps allowed for a detailed understanding of CUF training and how technological application could enhance it. This ultimately resulted in our CUF training flow concept which we used to create the feasibility demonstration.

The favorable results from the feasibility demonstration supported the team's hypothesis that optimal placement of technologies within a CUF training should be based on a systematic analysis of role-specific tasks and the identification of sensory and information intake required to make decisions when executing those tasks, rather than through arbitrary assignment or use of technology for technology's sake. Positive statements to support the findings included "the haptic feel of the weapon is very realistic" and "this provides the ability to simulate multiple different CUF scenarios with dynamic elements to surprise/confuse/test trainee response." Stakeholders provided insight into some challenges to consider with implementing this solution such as costs and durability of equipment, ease of use, buy-in from all users, fielding of the haptic-based weapon to training sites, and multiplayer/multi-instructor capabilities. With this new knowledge from the research, we were able to expand our knowledge of application with haptic technology which furthers our abilities in additional haptic and medical work in other contracts.

CH-47F BLOCK II CARGO HELICOPTER TRAINING (PM-CARGO)

PEO Aviation

Our dedicated team of Subject Matter Experts, Instructional Systems Designers and Software Developers support the U.S Army Program Executive Office Aviation, Project Manager Cargo's CH-47F Block II training program. ECS is tasked with the mission to provide the Soldier with comprehensive and engaging technical training that promotes job proficiency and increases mission success. ECS uses the ADDIE process to maximize training effectiveness and minimize unit mission disruptions to arrive at the best value solution for PM Cargo while providing optimal performance, the lowest cost of ownership, and the maximum return on investment.

To accomplish this, ECS purposely designed a software suite of adaptive, customized learning products and training tools that encourage critical thinking and target individual learner's level of learning and learning styles. The evolving software suite consists of Computer Based Training, Preflight Instructor Tool and Cockpit Desktop Trainer.

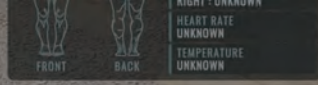
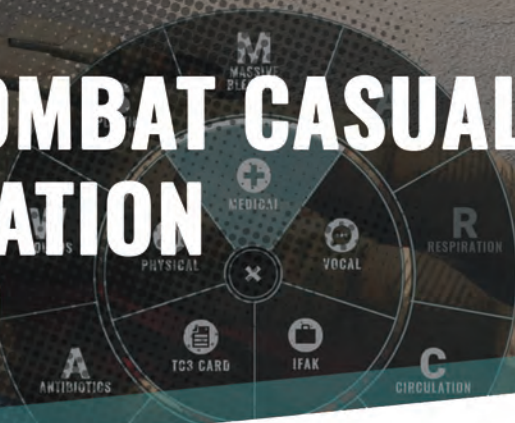
Key Features

- First Person Perspective
- High Fidelity 3D Immersive Environment
- 39 Interactive Courses Delivered (39 TLO, 93 LSAs)
- Computer Based Training for: Rated Crewmember, Non- Rated Crewmember, 15F, 15U, 15N, 15D
- Developed 3D Interactive Preflight Instructor Tool
- Cockpit Desktop Trainer – Developed in partnership with SAIC
 - Features current CH-47F and CH-47F Block II avionics software (CAAS)
 - Desktop and Touch Panel Control Interface
- Multi-Platform Delivery on Windows Standalone, WebGL and Mobile



TACTICAL COMBAT CASUALTY CARE SIMULATION

(US Army PEO-STRI)



Transforming Combat Medic Training through Immersive Technology

A recognized leader in military medical training, ECS has been developing the U.S. Army's Tactical Combat Casualty Care Simulation (TC3Sim) for over 16 years, continually investing in new and developing technologies. TC3Sim is a cognitive skills trainer for trauma medicine focused on the three preventable causes of death on the battlefield. The primary users of TC3Sim are Military, First Responders, Combat Medics, and Combat Lifesavers. ECS has delivered the updated cross-platform 2020 version of the application to support the existing training curriculum within the Army. This latest upgraded version, TC3Sim 2020, has transitioned to the U.S. Army Program Executive Office for Simulation, Training, and Instrumentation (PEO STRI).

The updated TC3Sim system architecture and content is continually leveraged to advance innovation through ongoing research at ECS. This research focuses on integrating various virtual reality (VR) and extended reality (XR) platforms with groundbreaking haptic technologies that enable realistic touch, force feedback, and precise motion tracking.

TC3Sim 2020 and the related research demonstrates how Warfighters can use immersive training to further enhance their training experience and learning opportunities. The goal of this transformational use of serious games, XR, and haptics technology is not only to improve the quality and retention of training but lead to more lives saved on the battlefield.

Key Features

- Extended gameplay to include Care Under Fire (CUF), Tactical Field Care (TFC), and Secondary Assessment
- Updated timeline-based After-Action Review (AAR) system for critical measures and detailed remediation
- Seamless multi-platform user experience across desktop, web browsers, and mobile tablets
- Multi-service scenarios and content including Army, USMC, Navy, and Air Force
- User profiles for the saving and loading of progress, completion, and proficiency



VA VIRTUAL MEDICAL CENTER (VA- VMC) (U.S. Department of Veterans Affairs)

Serving Veterans with State-of-Art Technology to Provide Accessible Healthcare Services

The Veterans Affairs (VA) Virtual Medical Center (VMC) is a continuously available virtual environment accessible to Providers, Veteran Patients, and their family members. It provides Veteran Patient access to validated medical materials and resources, improving healthcare information by connecting healthcare professionals and patients in a truly collaborative environment. Additionally, it provides VA Providers access to specialized medical reference materials and offers them a venue to communicate and collaborate in effective new ways. The VA-VMC provides two-way, real-time communication and care through meetings, scheduled events, conferences, and Virtual Medical Assistants. Specialized clinics are available to focus on the health issues that are of special concern to veterans. There are also Cybraries, Education Centers, and kiosks for any user to easily access a huge library of VA services, education, training, research, and wellness information. This geo-typical medical center improves accessibility, offers convenience of care, and meets the growing demand for affordable health care services for U.S. Veterans who may be located anywhere throughout the world.

The 24/7 availability of the VA-VMC enables Veterans to be able to connect with each other when they otherwise might not be able. Many Veterans in rural areas live hours away from the nearest VA Medical Center or clinic. Most recently the VA-VMC has proved useful during the COVID-19 pandemic, when many Veterans were forced to stay at home. In addition, during this period, a Decision Support System (DSS) Identifier (or “stop code” for accounting) was added to allow VA healthcare practitioners to use this code when providing services via the VA-VMC.

Key Features

- **Range of Environments** – Multitude of environments to reflect clinical and non-clinical settings
- **Content Management System** – Integrated content management system allows the VA to easily store, share and manage the VA curated and vetted content used in the virtual world
- **Scheduled Meetings** – Schedule public and private meetings that include presentations, screen sharing, and document sharing
- **Massively Multiplayer** – Existing capacity supports up to 1,000 concurrent users, scalable to more with zone instancing and load balancing
- **Conferences and Events** – Schedule public or invitation-only conferences and events in conference rooms, auditoriums, or custom-designed facilities
- **Customizable Avatars** – Users can customize their 3D avatars to enhance their immersion and participation through a sense of self-expression
- **Instructor Tools** – Use tools like presentations, shared documents, screen sharing, surveys, and more to improve learner engagement
- **Social Tools** – Connect with other users through private and group text chat, buddy lists, Voice Chat, and avatar emote animations
- **Browser-Based** – Experience the 3D Virtual World from directly within your browser without the need for any plugin or installation (This feature will be Available in 2021.)