Creating Simulation Training Budget constraints continue to challenge Department of Defense programs requiring new and innovative approaches to reduce training cost and increase efficiency. Fortunately, the gaming industry is providing opportunities for the DoD to capitalize on massive commercial Research & Development in technologies that are directly transferable to the development of virtual training products. These technologies allow the development of interactive environments that can complement training and reduce the number of high-cost hardware trainers required, significantly reducing overall program training cost. Commercial-off-the-shelf (COTS) hardware and software is available which allows rapid development of prototypes that are exportable to numerous platforms to include Personal Computer, mobile, tablet, Virtual Reality, Augmented Reality, and Mixed Reality. Advanced VizLab The Advanced Vizlab is staffed by some of the industry's most talented engineers and artists and consists of video production equipment and commercial game development tools. The laboratory also houses state-of-the-art mixed-reality devices and facilities that Torch uses to stay on the leading edge of virtual training trends. Fully Immersive Environment High Fidelity Visuals Get Started Quickly Commercial Hardware Train Anywhere Explore Scenarios with complete freedom to move around and interact with virtual objects. MODELING DEVELOPMENT Digitizing Modeling and Simulations Torch manages, develops, and validates a variety of simulations and simulation tools, including emulators and simulators, to facilitate a complete understanding of the operational system environment. We develop simulations based on complex mathematical and phenomenology models for a variety of problem domains including the following: platform; interceptor; threat sensor; and Command, Control, Communications and Computers (C4). Torch incorporates these complex models into larger system simulations for analysis of system-wide problems in a variety of areas such as integrated air and missile defense, ballistic missile defense sensor and weapon performance, and integrated UAS weapon system performance. High-Fidelity 6-DoF

Physics-based modeling of interceptors, aviation platforms and threats, including detailed models of aerodynamics, guidance and control systems, navigation components, sensors, and data links.

Hardware-in-the-Loop

Modeling and simulation representations to support all-digital elements of system-level and component HWIL facilities including platform, interceptor, weapon control, battle management, and threat.

Threat Engineering

Model representations of adversary missiles, aircraft, drones, and towed targets, including trajectories, signatures, and lethality/vulnerability.

Virtual Engagement

High-fidelity interceptor models integrated with tactical systems to support live testing with actual targets, sensors, and weapon control components

Performance Analysis

Operational, battle space, and detailed engagement analysis using tools developed to support efficient production, collection, and analysis of performance data.

Verification & Validation

Refinement and validation of simulations utilizing test data that includes truth data from data collections such as flight tests, ground tests, and HWIL tests.

MULTI-SPECTRAL SCENE GENERATION Advanced State-of-the-Art Torch developed an innovative multi-spectral simulation software and modeling process that takes advantage of modern massively parallel hardware. Traditional terrain scene modeling solutions often require 2-4 weeks of execution time on a High-Performance Compute cluster, while Torch's solution completes the same work on a single computer using high performance GPU's in less than 24 hours. Our solution drastically reduced runtime allowed for many fidelity enhancements that were previously not feasible. Torch has also developed multi-spectral topography models for EO/IR and RF

bands in denied areas. These advanced technologies have broad applications in the development of advanced seekers, detection systems, and active protection systems.