

## U.S. MARINE CORPS MORTAR TRAINING AID TO REDUCE EQUIPMENT REPLACEMENT COSTS



PROJECT	INTERACTIVE 3D MORTAR TRAINING
CLIENT	US MARINE CORPS
KEY OBJECTIVES	<ul style="list-style-type: none"> <li>▶ REDUCE EQUIPMENT REPLACEMENT COSTS</li> <li>▶ DEPICT OPERATION OF INTERNAL COMPONENTS</li> </ul>

course taught at the detachment to test the effectiveness of interactive 3D simulations.

The Common Core Mortar Weapon Systems component of the 2111 Small Arms Repair course, designed to teach maintenance procedures, disassembly/assembly, and operation of mortar weapon systems, was identified as having training challenges that could be addressed with 3D simulations. The first challenge was related to course structure:

- ▶ The course is instructed to entry-level students with no prior knowledge of or experience with the weapon system
- ▶ Each student was given a real mortar system for their training
- ▶ There was a high student to instructor ratio of 8:1

These factors resulted in high operator error, which raised training costs due to replacement of damaged equipment, and decreased the number of operable units in training environments.

A second challenge resulted from the use of a physical mortar for the instruction of assembly/disassembly procedures for the M224 60mm Mortar, a high-angle weapon that provides long-range indirect fire support.

*“By providing this training capability, not only will replacement costs be reduced, but the number of inoperable units will decrease and operational readiness will increase.”*

**Master Sergeant Mike Ryan**  
U.S. Marine Corps Aberdeen Detachment

### BACKGROUND

The U.S. Marine Corps Aberdeen Detachment is located at Aberdeen Proving Grounds (APG), Aberdeen, Maryland, and provides maintenance and repair training to Marines and soldiers in the areas of small arms, wheeled and tracked vehicles, and electro-optics. The Marines work closely with the APG U.S. Army Ordnance and Mechanical Maintenance School to provide advanced individual training.

### CHALLENGE

The U.S. Marine Corps Aberdeen Detachment was considering different technologies to improve training effectiveness and determined that interactive 3D simulations could supplement their current training method of using physical training devices. The U.S. Marine Corps Training and Education Command, responsible for evaluating training and education programs, approved the development of a virtual 3D training aid for one

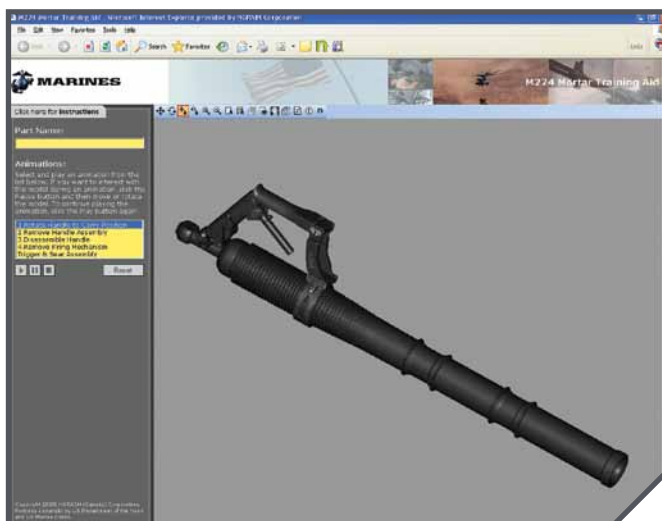
Due to the inability to show the operation of internal components using a real mortar, this equipment was often broken. The threads on the firing mechanism were being destroyed when inserted into sear housing because students could not see the internal components and the interaction between parts.

Without the ability to train on internals, the owning service was spending an average of \$23,000 per year on the barrel nut alone. The limitation of using only a physical training device resulted in increased training cost and poor student proficiency levels on procedures.

## SOLUTION

The U.S. Marine Corps Training and Education Command approved the development of a virtual 3D training solution for the M224 mortar. In collaboration with U.S. Marine Corps weapons subject matter experts, NGRAIN developed a 3KO® (3D Knowledge Object™) of the M224 mortar which included an animation of a cross-section into the trigger and sear housing to reveal the interaction of the parts.

With the interactive 3KO, students are able to familiarize themselves with the virtual assembly and procedures before working with the actual mortar. Some of the interaction capabilities include viewing part information, rotating and cross-sectioning the virtual equipment.



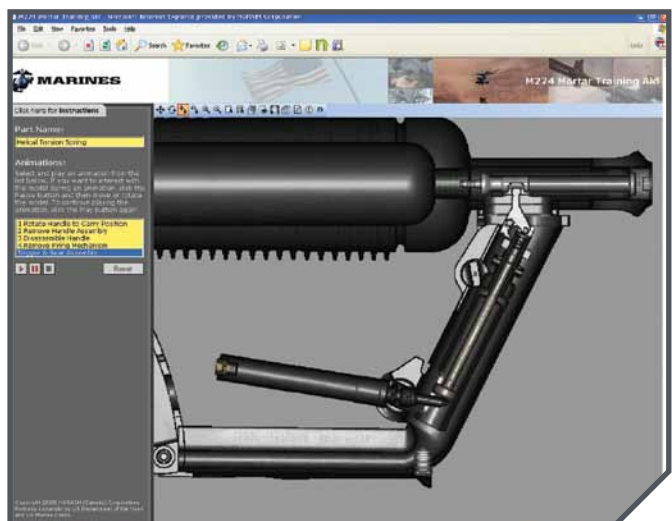
NGRAIN interactive 3D M224 Mortar

## RESULTS

The 3KO is currently being used in the Common Core Mortar Weapon Systems component of the 2111 Small Arms Repair course. This interactive 3D solution helps:

- ▶ **Reduce training cost** — Allowing students to engage in parts familiarization and skill acquisition via interactive 3D simulations results in less wear and tear on real equipment, and reduced replacement costs due to damaged equipment.
- ▶ **Improve time-to proficiency** — Providing a visual perspective on the internals via animations enables students to comprehend procedures more quickly and therefore engage in more practice time rather than theory.
- ▶ **Enhance operator performance** — Providing students the ability to train within an educational computer lab to improve their skills before working with the live weapon saves maintenance hours on fixing equipment due to improper disassembly and reassembly.

Master Sergeant Mike Ryan, U.S. Marine Corps Aberdeen Detachment, says, “The key value that NGRAIN has brought is the ability to effectively train personnel on how the parts interact with each other. By providing this training capability, not only will replacement costs be reduced, but the number of inoperable units will decrease and operational readiness will increase.”



A cross-section into the trigger and sear housing reveals the interaction of the parts