



# Maintenance training for ground combat systems

For years, military maintenance training has been a collection of classrooms, static displays, view graphs, and on-the-job training. However, changing demographics, next generation learning methodologies, and cost-effectiveness are forcing military organizations to look at maintenance training in new ways.

CAE has developed blended maintenance training solutions that combine simulation-based instruction and courseware with hands-on hardware-based trainers. Our suite of military maintenance training solutions provides a more realistic and practical training experience for students in the classroom, at home, or in the vehicle.

Maintenance training for today's complex and heavily-digitized ground combat systems requires methods that combine the logic and analysis of diagnostic skills with remove-and-replace hardware skills. CAE's maintenance training solutions typically employ a combination of desktop trainers (DTs) and hands-on trainers (HOTs). DTs and HOTs are part of an integrated training system that moves students from the classroom, to a hands-on trainer, and then to an actual combat system to make optimal use of all training resources and minimize training expense. CAE has also developed distributed training applications which use simulation to support skills acquisition and practice through web-based learning.



## Emphasizing learning by doing

CAE emphasizes a 'learning by doing' approach through the use of high-fidelity simulations designed to accomplish training goals. In these state-of-the-art training simulations, the students must perform all of the steps that they would perform in the real world, and they can observe the outcomes of their actions. Most of CAE's maintenance training solutions combine both hands-on trainers and desktop-based virtual maintenance trainers in an advanced learning environment to provide end-to-end training for operators and mechanics.

## High-fidelity, high-functionality simulations

CAE's desktop trainers are designed to run on standard personal computers, either on a network or in stand-alone mode. The training applications use high-fidelity, high-functionality simulations of the various systems, and their virtual environments feature extensive modelling of the equipment to maximize realism. The interactive visual and aural simulation accurately mimics the behavior of the actual vehicle. Students perform procedures on the simulated systems in a virtual environment just as they would on the actual systems, and the simulations respond just as the real equipment would. Other system components such as human machine interfaces and specialized test equipment simulations also are included in a desktop trainer to provide a complete training environment.

## From connecting cables to advanced diagnostics

Modern ground combat systems like the Multiple Launch Rocket System (MLRS), the High Mobility Artillery Rocket System (HIMARS), the M1 Abrams Tank, and the M2A3 Bradley Fighting Vehicle are complex systems that employ multiple computers, sensors, and displays linked by networks of digital buses. They use these arrays of digital equipment to provide extensive onboard diagnostics. Maintainers also use interactive electronic technical manuals and advanced test, maintenance, and diagnostic equipment to troubleshoot these systems. But at certain points in the diagnostic process, there is still a need to find and disconnect cables and check for damaged connectors using basic diagnostic tools like multi-meters and breakout boxes. CAE offers computer-based training to prepare maintainers to handle the entire gamut of maintenance functions.



## Training solutions for a range of ground combat systems

Maintenance training is one of CAE core competencies. To date, CAE has delivered, or is in the process of delivering, maintenance trainers for the following ground combat systems:

- M1-series Abrams Tank (desktop simulations and hands-on trainers)
- M2-series Bradley Fighting Vehicle (desktop simulation and courseware)
- M270-series Multiple Launch Rocket System (desktop simulators and launcher mockup)
- High Mobility Artillery Rocket System (desktop simulators and full scale mockup)
- Mobile Subscriber Equipment shelter (desktop simulation, web deliverable)
- Strategic Satellite Ground Terminal (desktop simulation, web deliverable)
- Brigade Switch Node Shelter (desktop simulation, web deliverable)
- FBCB2 equipment suite in tactical vehicles (desktop simulation, web deliverable)
- Tactical Satellite Ground Terminal (desktop simulation, web deliverable)
- High Capacity Line of Sight Radio (desktop simulation, web deliverable)



## Program Example: U.S. Army Advanced Individual Training (AIT)

U.S. Army Advanced Individual Training (AIT) is where soldiers typically get their first Military Occupational Specialty (MOS) training. For maintainers, the training program for a specific vehicle includes at least five topics:

- Familiarization with the vehicle and its subsystems;
- Training on basic vehicle operations, such as starting the engine and accessing the vehicle diagnostic software through the soldier/machine interface;
- Understanding general diagnostic functions, such as executing the Built-In Test (BIT) and Fault Isolation and Test (FIT);
- Understanding special diagnostic functions for subsystems such as power management, hydraulics, fire control, and communications;
- Use of technical and/or training manuals.

CAE's computer-based training has saved the U.S. Army millions of dollars both in initial acquisition costs and in continuing lifecycle costs. CAE's maintenance training systems raise the student-to-teacher ratio from 2:1 (when using actual tactical vehicles) to 8:1 or greater. The only limit to the student-to-teacher ratio is the number of available desktop stations.

Additionally, desktop-based training modules can be developed in parallel with the combat vehicles, making them available earlier in the fielding schedule. By allocating fewer combat vehicles to train soldiers, more vehicles are available for use by active units, thereby lowering training support costs.

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