Simulators prepare forces for effective deployment with the latest equipment

BY DAVID OLIVER

However much military budgets are overstretched, squeezed and re-allocated throughout the financial year, more diverse and complex weapons systems are acquired and deployed. And for every piece of new equipment destined for the armed forces, from snipers' rifles to main battle tanks (MBTs), a training package has to be designed and delivered. With many nations, including Australia, Canada, the UK, the US and recently Israel, at war on more than one front, the importance of effective simulation and training programmes and systems cannot be overestimated.

The US Office of the Under Secretary of Defense for Personnel and Readiness (OUSD P&R) has been tasked with leading a collaborative effort to harness the power of information technologies to modernise structured learning. Through the sponsorship of the OUSD P&R, the creation of the Advanced Distributed Learning (ADL) Initiative was formed as a developer and implementer of learning technologies across the US Department of Defense (DoD).

ADL employs a structured, adaptive, collaborative effort between the public and private sectors to develop the standards, tools and content for the learning environment of the future. The vision of the ADL Initiative is to provide access to the highest-quality learning and performance aids that can be tailored to individual needs and delivered cost-effectively, anytime and anywhere.

US Army: 1185211

Operational experience has led US forces to introduce region-specific 'hearts and minds' training tools.

Dan Garner, the Director of Readiness and Training, is responsible for the Training and Transformation (T2) programme, and developing DoD polices that will involve NATO and Partnership for Peace (PfP) training. "This will involve a change in vision and will rely on in-theatre information and feedback from multinational forces, and will also include non-government organisations," he says. "Australia will be the first to be integrated into the DoD T2 programme."

Engenuity: 1191219

Engenuity's AI.implant software is used by US forces for urban warfare and peace support operations training.

Virtual battlefield

By mid-2007, Australia plans to tap into the US Joint National Training Center (JNTC) in Virginia via a newly created Joint Combined Training Centre (JCTC) to be established near Sydney. This will provide the Australian Defence Force (ADF) with a network of state-of-the-art facilities that will enable Australian and US forces to undertake joint training supported by simulation that can be updated 24 hours a day, seven days a week.

The Australian JCTC effort is intended to increase operational capability, combat readiness and interoperability between the US and Australia, and encourages integration of live, virtual and constructive (LVC) training technologies. It will enable the ADF to integrate its laser-based instrumented training system for infantry and armour forces, LAND-134, being supplied by Cubic New Zealand, with other simulation systems, including the Cubic Air Combat Maneuvering Instrumentation (ACMI) system. The success of the JCTC is seen as a vital tool that will better prepare

Australian forces should they be called upon to take part in any future exercises with the US. It will include a concept validation event at Exercise 'Talisman Sabre' scheduled for June 2007 or be part of a multinational force deployment.

Social dynamics

Many armed forces' military training programmes are dominated by operations in Iraq and Afghanistan, and more recently by a renewed Middle East crisis prompted by Israel's operations in response to raids on its territory from Lebanon and Gaza.

For the troops on the ground, the subject of winning 'hearts and minds' is belatedly being addressed by the training sector. The US Strategic Command's Joint Information Operations Center (JIOC) not only trains combat commanders in military deception and psychological operations, but also in Middle Eastern culture.

The LINE Communications Group, a UK provider of e-learning and communications solutions, has been commissioned by the UK Ministry of Defence (MoD) Directorate of Individual Training (Army) Training Advisory Group to develop courseware on raising cultural awareness for UK personnel serving in Iraq and Afghanistan. Through a series of highly interactive, visually realistic scenarios, the courseware will provide an understanding of how the actions of service personnel will be interpreted by ordinary citizens in the host nations.

It is recognised that crowd behaviour is a part of modern warfare that has been largely neglected, but with future troop engagements expected to involve smaller forces in urban settings, military officials are realising the need to train soldiers in handling hostile crowds. Several products are addressing this sector of the artificial training market. Engenuity Technologies Inc, a Canadian provider of solutions for the development of visualisation and simulation applications recently acquired by CAE, announced that Science Applications International Corporation (SAIC) in conjunction with the US Army's Program Executive Office for Simulation, Training and Instrumentation (PEO STRI), and US Joint Forces Command (USJFCOM), has combined Engenuity's AI.implant with OneSAF (One Semi-Automated Forces) to bring enhanced realism and efficiency to military simulations.

Originally developed as a powerful gaming technology, AI.implant makes it easy for users to create and control all entities in any complex simulation. Through its ability to accurately simulate crowd and vehicle behaviour, it is especially suited for urban training and simulation projects requiring realistic and dynamic environments for urban warfare training.

CAE is providing the British Army with Warrior IFV Gunnery Turret Trainers.

David Oliver: 1191220

AI.implant offers 3-D entities capable of non-doctrinal, complex and unpredictable behaviour. The ability to produce scalable, behaviourally realistic crowds is an essential enhancement when creating simulations for Joint Urban Operations (JUO) scenarios. SAIC's integration of the AI.implant technology brings real-world crowds, riots and panicking to the simulated environment as a means of better preparing troops for engagements in conflict zones.

The emphasis for coalition forces operating in Iraq and Afghanistan has remained on convoy training. Much use has been made of synthetic training ranging from the PC action game 'American Army' to Lockheed Martin's top-of-the-range Virtual Combat Convoy Trainer (VCCT).

MPRI, an L-3 Communications company, has launched a driver training simulator for the heavily armoured M1114 High-Mobility Multipurpose Wheeled Vehicle (HMMWV). The simulator would allow soldiers to practise rollover avoidance techniques and incline-decline driving skills. It has a three-channel plasma screen with visuals, force-loaded steering and a SimCommander feature that allows instructors to control training via a dash-mounted touchscreen display.

The company has also launched a trainer it calls the Virtual Warrior Interactive (VWI) that allows dismounted soldiers to learn how to interact with convoys, tanks, armoured vehicles and helicopters on a virtual battlefield. The VWI provides a 360° view of terrain in cities such as Baghdad, Tikrit, Samarra and Kabul. It includes weapons effects and real-world scenarios.

Raydon has also started a programme that opens up its range of trainers, including the VWI, its three configurations of the mobile Virtual Combat Convoy Trainer, and the helicopter Virtual Door Gunner Trainer. The company's Convoy Training Services/Rental programme includes delivery and removal of trainers to chosen sites, an on-site training specialist, maintenance and spare parts, and upgrades.

Tailored training

The combat vehicle platforms simulator answers the need for enhanced training tailored to a specific platform. Based on datalink technologies, Elbit Systems Appended Tank and ACV Crew Trainer (ATCT) is a field-deployable compact mobile tank combat training system. Linked to an actual combat-ready tank, it provides the ultimate real-life training and simulation setting. The combat vehicle platforms simulator generates a comprehensive virtual environment for training to get as close to reality as possible. Tailored to individual needs, the system provides the flexibility to generate realistic performance of various types of sensors, weapons and systems. The simulator allows for both fighting equipment and tactical options to be trained separately or in a combined fashion. It is available in three possible forms: by a stationary unit; a mock-up or a mobile unit; or appended to the combat vehicle transforming it into a simulator.

Rheinmetall Defence Electronics (RDE) has received two orders from Switzerland for its electronic gunnery training system (ELSA) as well as system extensions for its artillery simulation technology. ELSA will be employed for training infantry fighting vehicle (IFV) and armoured artillery command vehicle crews, as well as for teaching troops to operate target acquisition and observation equipment used by the Swiss Army's Artillery Corps. The series scope of delivery

includes a system with eight vehicle mock-ups of the CV9030 IFV as well as another with four mock-ups of the armoured artillery command vehicle, plus target acquisition and observation equipment.

Switzerland's own leading training systems manufacturer RUAG has supplied its Advanced Driver Training Simulator (A-DTS) to the Swiss Army, designed as an economical solution for basic and efficient operation and procedure training. Realistic simulation of all vehicle operations, along with the appropriate audio cues, facilitate familiarisation with the interior environment, the correct operation of the driver's controls and indication displays, and malfunction management in various simulated situations.

Instructor input

The A-DTS, which comes with a six-axis electro-mechanical motion system that works in conjunction with the 3-D visual system and professional sound equipment, enables drivers of tracked and wheeled vehicles to perform complete training tasks in a realistic environment. Its instructor operating station (IOS) enables the instructor to create, control and assess exercises and carry out after-action reviews (AAR). A 2-D map showing the actual traffic situation, the vehicle status display plus a slave view showing the student's 3-D view and the vehicle's rear-view mirrors can be acquired on the IOS' five screens.

Proper use of the radio equipment through to tactical training in a networked communication system are the training objectives of the PC-based voice communication system, which can be used for radio and intercom simulation. The simulation also includes battlefield noise and transmission characteristics. Among the 20 wheeled and tracked vehicles that can be simulated on the A-DTS system are the BMP-3, G6, M-109, TATRA truck and HMMWV.

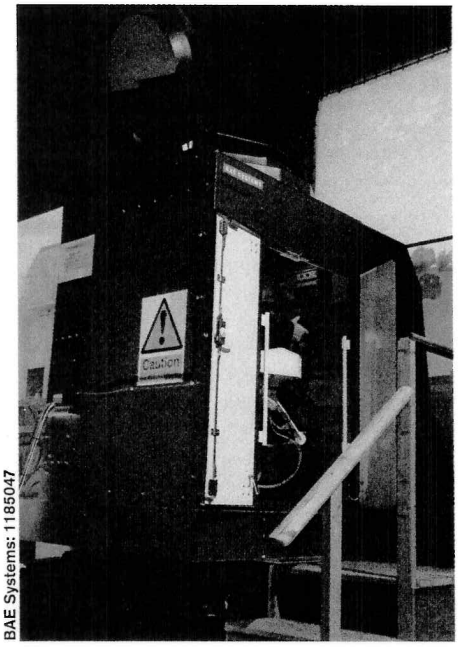
In the UK, CAE has been awarded a GBP6 million (USD11.8 million) contract to provide the British Army with 36 Warrior Infantry Fighting Vehicle Gunnery Turret Trainers. Four trainers will be delivered to the Armoured Fighting Vehicle Gunnery School in Lulworth in southern England early in 2007, while the other 32 will be delivered later in the year to British Army armoured infantry units deployed across the UK and Germany. The devices will be network-enabled for platoon training.

CAE has previously delivered a range of Armoured Reconnaissance, Armoured Infantry Fighting Vehicle (AIFV) and MBT trainers, including Scorpion 76/90, M57, Warrior and Leopard 2. These trainers feature high fidelity sighting systems including magnification, thermal and image intensified sights and vision blocks, and full spatial representation of all crew positions.

Stabilised turret firing on the move is an important feature included on many of the trainers. Also, where multiple trainers have been procured, students may train individually as a commander or gunner, as a full crew or multiple crews for collective troop/platoon training.

The UK MoD has also adopted an integrated training programme that Royal Electrical and Mechanical Engineers (REME) electrical and vehicle mechanic technicians can use to practise electrical diagnostic skills in a safe and supportive training environment.

The new TITAN armoured bridge-layer and TROJAN armoured vehicles are based on the Challenger 2 MBT chassis and will be used by the Royal Engineers to provide added mobility to the MBT fleet.



BAE Systems: 1185047

The British Army's Royal Engineers will be using BAE Systems' TERRIER vehicle training system for its new fleet of general support engineering vehicle.

For both TITAN and TROJAN, VEGA is developing an Electronic Diagnostic Trainer (EDT) based on its well-established emulation infrastructure technology. These emulations will be used to drive a conventional desktop EDT covering both variants and will also interface to full-size physical models of the interior of each vehicle that consist of the relevant equipment situated in representative locations within a wire-mesh framework.

VEGA has again collaborated with specialist model makers EDM to construct the physical models. The interface will be based on an industrial Programmable Logic Controller (PLC) fed by a series of scanning units that will monitor about 2,000 active pins within the various connectors that are modelled. Test-sets include a digital multimeter for probing connector pins, a megohmeter for testing the quality of insulation on cables and a laptop PC for interfacing with systems such as engine management.

The solution to be delivered includes a tablet PC with a wireless network connection, which enables instructors to move around the training area freely while still being able to monitor and interact with student activities. A 3-D representation of the vehicles will be displayed on a Student Viewing Panel to enable the students to visualise events that are relevant to their diagnostic procedures, for example the correct response of the excavator arm on TROJAN. In addition to the built-in synthetic faults, which the instructor can activate during diagnostic training sessions, there is a facility whereby the instructors can create their own synthetic faults. This is performed using the system's Fault Definition Editor (FDE) that allows instructors to create certain types of faults, for example broken switches, blown lamps and broken pins. This greatly enhances the flexibility of the system and provides a rigorous testing mechanism for the students.

BAE Systems launched a new high-technology training system earlier in 2007 to deliver enhanced armoured vehicle crew training in support of British Army engineering operations. The TERRIER programme for a minimum of 60 vehicles, valued at GBP300 million, will provide the Royal Engineers with an agile, capable and air-transportable general support engineer vehicle with a wide variety of early entry, combat support, post conflict and disaster relief roles.

The TERRIER vehicle training system will be the first simulator to provide training using synthetic digging with motion feedback, delivering a comprehensive, cost-effective and environmentally friendly approach to training. BAE Systems was awarded a contract at the beginning of 2006 to provide two TERRIER training systems worth about GBP10 million.

This will comprise four mission crew trainers with motion platform featuring an embedded remote control trainer and a classroom set of PC-based maintainer trainers. The operational benefits for the Royal Engineers include the ability to train for driving, digging and maintenance in different environments, which was previously only available through overseas deployment.

Urban warfare

The system, due to enter service in 2008, provides increased flexibility through the simulation of operations on sand, gravel, mud and at any time of the day or night, at the click of a mouse. The training system will be developed by BAE Systems at its facilities in Edinburgh, Scotland and will eventually be located for operational training at the Royal Armoured Corps Centre in Bovington, Dorset.

It has been predicted that 75 per cent of the world's population will live in large urban areas by 2010. It has also become obvi-

ous that cities are the most likely battlefields in the 21st century and several large state-of-the-art combat training centres specialising in mobile operations in urban terrain (MOUT) are coming on stream in Europe.

The Dutch village of Marnehuizen, which opened in 2002, is the largest purpose-built MOUT training facility in Europe. Located in the northern Netherlands, the village is within a 1,500-hectare training area and has 120 permanent buildings ranging from shops and houses to apartment blocks and civic buildings. Extensively used by NATO forces, the village is currently equipped with the Multiple Integrated Laser Engagement Systems (MILES) outfit for simulation training. Saab Training Systems has also provided equipment for an urban company of opposing forces (OPFOR), which includes some 200 personnel detection devices (PDD), a lightweight instrumented man-worn system with sensors attached to the helmet and vest that react to direct fire, laser weapon systems from instrumented armoured vehicles/tanks, ATWs and instrumented buildings.

Located 140 km north of Oslo, the Norwegian Army Combat Manoeuvre Training Centre (NACMTC) was opened at Camp Rena in 2004. The centre has fully instrumented live firing and training areas with its own MOUT village, airfield and cross-river operations. These facilities offer realistic training with live firing from all types of weapons systems, advanced manoeuvre training and joint training, with small-arms, artillery and fixed-wing and helicopter support.

David Oliver: 1191221

Finnish soldiers training at the Pori Brigade's Combat Training Centre using Saab personnel detection devices for hit scoring.

Classroom combat

The NACMTC's mission is to train Norwegian Army units according to doctrine tactics/combat drills, including mission oriented training; conduct staff training up to brigade level; train handling of the major weapons systems, including the formal certification of armoured vehicle drivers and commanders.

The centre's advanced training systems include computer-based simulators for drivers, video-based turret trainers and an indoor laser-range for gunners – all located in one central building – while an advanced outdoor laser-range, a combined combat simulator (CCS), and a staff and command trainer (SCT) for unit training are located at the nearby Combat Training Centre (CTC). All the systems' technical support is outsourced to industry: the CCS to Kongsberg and the SCT to CAE.

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RUAG Electronics
Simulation & Training · P.O. Box · CH-3000 Bern 22 · Switzerland
Tel. +41 313 766 600 · marketing.electronics@ruag.com · www.ruag.com

RUAG COEL GmbH
P.O. Box 1447 · DE-22880 Wedel · Germany
Tel. +49 4103 9395-0 · contact@coel.de · www.coel.de

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