

# Virtual battlefield, real benefits



*Advanced technology has made simulation systems almost identical to the real world – but a lot less dangerous and expensive*

**I**magine for a moment that you're the commander of a Scimitar armoured reconnaissance vehicle. You're moving slowly forward across what you know to be enemy territory. There are hostile forces in the area, perhaps hidden in that building or that hedgerow. Your heart is pumping hard, your palms are sweating and your mouth is dry.

Suddenly, out of the corner of your eye you sense movement. In a flash, you recognise an enemy infantry unit – but it's too late. Already, an anti-armour missile is streaking towards your vehicle.

An hour later, you're comfortably seated, cracking jokes, drinking coffee and watching again as the missile hits your vehicle. You replay the moment over and over, to see where you made

your mistake. No, this isn't some kind of *Twilight Zone* – it's the Combined Arms Tactical Trainer (CATT) in Warminster, England, a synthetic environment capable of providing brigade-level training. And the reason for the earlier sweating palms and dry throat is that the simulated combat you've just experienced is *that* real.

The infantry unit that brought about your demise is sitting, drinking coffee and watching the same replay of events. If they could, they'd probably punch you on the arm and crack jokes at your expense – except that they are hundreds of miles away, at CATT's networked facility in Sennelager, Germany.

CATT is the clearest demonstration you could have of both the advantages of

synthetic training and the astonishingly advanced state of the technology that delivers these benefits.

It was developed initially for the US Army, which needed realistic combined arms training at all levels from individual crews through to an entire battlegroup. It required the use of extremely advanced technology to create a training tool that exactly replicates the Army's armoured vehicles, and where friendly and enemy forces 'viewed' out of the window behave exactly the way they do in a real-world combat situation. CATT became the first tactical simulation system for the US Army's entire combined arms team.

The implementation of CATT for the British Army, delivered by Lockheed Martin last year, is even more

impressive, as UK CATT is the world's largest and most sophisticated simulation system. The £250m contract was awarded to Lockheed Martin UK Information Systems, supported by partners AMS and SAIC, in 1996. Its virtual-reality computer system links 170 combat vehicle simulators at the two facilities in Warminster and Sennelager. As a result, 700 or more troops and commanders can train at the same time.

The terrain database itself accurately replicates an area of 35,000 square kilometres, with areas such as Salisbury Plain, Northern Europe and a generic desert location being reproduced. The system generates a level of fidelity that enables trainees and commanders to use real world topographical maps and intelligence data in mission rehearsal for 'what if?' training.

It is an ultimate virtual reality experience, says Rick Perez, CATT project director at LMUK Information Systems. "When soldiers get into the simulator, it's identical to being in a real tank. The gunner, the commander, the driver, they all look out the periscopes and see the world exactly as they would see it from a combat vehicle."

By achieving high levels of fidelity, both in terms of the computer-generated world and the equipment used, synthetic training facilities like CATT keep soldiers' skills honed while reducing costs, and avoiding wear and tear on assets and the environment. These are benefits the Army is seeking from its Armoured Vehicle Training Service (AVTS), which will include synthetic training on a similarly large scale to CATT and will involve many of the vehicles and systems that CATT already incorporates. Lockheed Martin UK is a key member, with AMS and Vosper Thornycroft, in the Military Training Systems (MTSsys) joint venture currently bidding for this programme.

### High proficiency

These advantages have long been understood in the aviation world. But even there, financial constraints, environmental issues, the concern with proficiency and the rapid development of technology have combined to make simulator training ever more valuable.

For example, simulation will play a key role in the UK's forthcoming

Military Flying Training System (MFTS), a tri-service programme to provide flight training for all aircrews on all platforms. It will need simulators capable of great fidelity and flexibility, something Lockheed Martin is already demonstrating with its F-16 Mission Training Center (MTC), which immerses the warfighter in a realistic, integrated tactical environment (see box). It delivers all levels of training, from Initial Qualification through to multi-combatant, campaign-level pilot training.

The simulated aircraft faithfully recreates the F-16 cockpit and flies exactly like the real thing. The pilot has a realistic and detailed database of high-resolution, high-fidelity and geospecific topographic and man-made features, targets, and environment.

One-, two-, and four-ship training system configurations are available, each fully capable of long-haul networking to other F-16 system simulations. Through Distributive Interactive Simulation, three-dimensional landscapes are created where people can project themselves and interact with one another. Lockheed Martin's visual database generation techniques allow the integration of photographic imagery at half-metre resolution and the use of scenes that transition from daylight to night-time.

"The realism of the visual database, which uses photo-specific terrain, vegetation and man-made infrastructure, is a big step forward in flight simulation. Pilots can now train with real visual cues," said Chris Cross, an F-16 mission operations expert and qualified pilot with Best Group.

### Major market

As a systems integrator and information technology innovator, Lockheed Martin is at the forefront of simulation technology for both aircraft and ground vehicles. Indeed, the company has recently picked up US Department of Defense awards for the US Air Force's Theater Aerospace Command and Control Simulation Facility.

With this kind of technology, armed forces throughout the world can now train safely, inexpensively and efficiently, knowing that when they are called on to do their jobs in the real world, they will be ready. **S**



### Extra capabilities for F-16

The US Air Force is doubling the number of F-16 Mission Training Centres (MTCs) it has deployed worldwide, reflecting the value it places on synthetic training. The five additional systems ordered recently will be installed at air bases in Spangdahlem, Germany and Mountain Home, Idaho.

"The single-pilot training systems currently in use at Mountain Home Shaw Air Force Base, South Carolina, and Mountain Home provide immersive flight training that stimulates the senses with visual, audio and tactile cues," says Charles McCoy, Lockheed Martin F-16 programme director. "The Air Force has elected to install a four-pilot training system at Spangdahlem and upgrade Mountain Home with a second system."

The additional system at Mountain Home demonstrates the built-in scalability and modularity of the systems. It will provide more advanced features and training, extending the capabilities of the MTC.

The MTC features new dimensions of realism including a 360-degree visual system and a variety of three-dimensional, high-intensity tactical situation 'entities' with which the pilot can interact. These include up to several hundred aircraft, surface threats and electronic emissions. MTCs support high-level architecture network protocols and will be fully capable of long-haul network operations with other systems and players within a distributed mission training network.