



AGAINST THE ODDS

Over the past three decades, the UK's T&S industry has slowly shrunk. While this consolidation continues, innovative technology solutions keep emerging in the face of reducing resources. **By Giles Ebbutt**

The International Training Technology Exhibition & Conference (IT²EC) will be back at the Excel Centre in London in April, following a two-year hiatus caused by the COVID pandemic.

IT²EC is described by its organisers as 'Europe's primary forum where stakeholders from military, government, industry and academia connect and share knowledge about training, simulation and education technologies'. With the show taking place in London, it is a suitable time to review the current state of the UK's military T&S industry.

It is a broad church, ranging from the specialist arms of UK divisions of major global enterprises through to a host of SMEs offering niche expertise or technology, with solutions spread across the air, land and maritime domains. Shephard spoke to representatives of both large and small companies to get an overall view, and several themes emerged.

These include consolidation in the industry and an emphasis on large-scale teaming for major projects; frustration with the UK MoD's procurement processes; the importance of simulation in reducing emissions; continuing innovation, particularly in SMEs; changes in learning processes and their impact on training structures; the provision of training as a service; the growing importance of AI and machine learning (ML); and finally, the use of simulation for purposes other than training.

Climate concerns

Ian McCrudden, COO of the European Training and Simulation Association (ETSA), told Shephard that there had been some reshaping of the market in recent years as new technology was introduced, noting particularly the increasing use of cloud-based simulation and service on demand.

He said the COVID pandemic has had a significant impact on the development of new ways of training and the use of remote

One of the major trends to have emerged over recent years has been the provision of training services by industry – in this case, the Military Flying Training System. (Photo: Airbus UK)

learning, particularly in the increased use of simulation and gaming.

The drive for net-zero and the requirement to reduce emissions emanating from COP26 will lead to an increased use of simulators. On average, an estimated seven tons of carbon is saved by every simulated flight, McCrudden opined.

The UK has an eventual target of 80% synthetic and 20% live flying training, and the net-zero approach is also true for ground vehicle simulators, particularly heavy armour.

McCrudden said that there was a global trend of consolidation in the market and a continuing drive by major companies to grow through acquisition, citing the examples of the pending acquisitions by BAE Systems of Bohemia Interactive Simulations and by Thales of RUAG Simulation & Training. Within the UK, an example of this is the acquisition of Inzpire and NSC by QinetiQ in 2018 and 2020 respectively.

Darryn Rawlins, MD of Thales T&S UK, noted that as well as consolidation, cooperation and partnerships were increasingly important, but one of the obstacles to this was the issue of corporate intellectual property (IP). 'It is important that IP constraints on collaboration are addressed head on,' he said.

Steve Wilkinson, ETSA CEO, added that the increased introduction of more cost-effective XR technology, which encompasses AR, VR and MR, was likely to lead to more rapid consolidation as smaller businesses with niche XR capabilities were absorbed by larger firms.

Forced to export

QinetiQ's Frazer Ross, head of joint and land domains business development for global training, expanded on this theme. He said that the UK MoD, the industry's main customer, wanted consolidation or partnership to deliver current or impending major programmes.

As an example, the RN's Project Selborne to deliver much of the navy's training is being run by a consortium; the RAF's Gladiator distributed synthetic training system is the responsibility of Boeing Defence UK; and the army is seeking a strategic partner for its Collective Training Transformation Programme.

Ross suggested that SMEs find it difficult to compete for long-term programmes such

as these that take time to come to fruition because while they are in preparation, which may take years, they do not produce income, but SMEs need to maintain cashflow.

'The bigger the programme, the better the opportunity for the big primes, as they can carry the cost and risk of a drawn-out procurement process.' However, Ross noted that although aggregation into large projects creates coherence, it also means that the procurement process can become slower, more unwieldy and less agile.

He was critical of the UK's procurement process and focus on long-term requirements at the expense of benefitting from fast-moving technology. 'By the time the requirement is set, technology has moved on. We need to be more prepared to take risk with COTS and MOTS equipment.'

This view was echoed by Don Hawes, director of AFV Sim, which supplies replica AFV hardware and computer games for low-cost desktop gunnery and tactical trainers, but the UK only accounts for approximately 3% of the company's total sales.

'The UK seems to be about 15 years behind most of our customers in utilising combined COTS hardware/software products for part-task desktop trainers. For us, the UK procurement process for desktop trainers for armoured vehicles is too long-winded and rarely, if ever, results in us receiving a purchase order,' Hawes said.

Ross also noted the shifting nature of consortia and teaming arrangements, where firms may be partnering on some programmes but competing on others, with consequent implications for IP rights. He added that an associated issue with IP was where a phased programme required the abdication of those rights, quoting the example of the Collective Training Transformation Programme where there will be a separate design phase on completion of which the IP will be given up to the MoD.

Ross highlighted the increased importance of I-LVC simulation and particularly the technological impact and leading role of the gaming industry, the speed of development and its impact on the procurement process.

'We need to recognise and embrace the gaming industry, and we need to procure kit more quickly and throw it away more

UK T&S industry

quickly. We're buying now head-mounted displays that will be obsolete in two years – such is the pace of advance,' he pointed out.

There are numerous large and small examples of gaming technology being leveraged for military simulation. Epic Games' Unreal Engine is a popular system in use with CAE in its latest Prodigy image generator at one end of the scale, with SimCentric's SAF-TAC VR infantry training system at the other.

Ross suggested that the UK customer ambition was now limited by resources and knowledge, not by technology, which 'will take the military far beyond what it understands and thinks is available'.

He cited the UK's Serapis framework which 'focuses on developing and bringing into

'Whilst budgets are squeezed, we have not seen a decline in our target sectors but rather an expansion of opportunities to deliver cost-effective interactive hardware and software to support end-users' training needs.'

He said 'the UK's biggest strength is a strong innovative outlook to the sector' but added that 'accessing... funding can be a tedious and frustrating process. Schemes always have the best intent but tend to favour a more academic led form of funding, often awarding 100% grants to educational partners and 50-70% support for commercial entities.

'This can often be prohibitive as generally projects must be funded up front. In an extremely strained economy with rising

workshare and are likely to look to their own specialist business units to provide innovative technologies if possible.

This view was echoed by Simon Skinner, Thales T&S UK product line manager simulation capabilities, who said that the UK, particularly its SMEs, was very innovative in developing training technologies and their applications, and the pace was increasing.

'I've seen more innovation over the last five years than the previous ten,' he said. However, there was a lack of investment. 'The UK is good at inventing things with not very much money,' he explained, adding that 'we [Thales] are always on the lookout for interesting small businesses to partner with, and with universities'.



operation new and battle-winning capabilities' as one way of overcoming this knowledge gap. Serapis Lot 5, for which QinetiQ is the prime contractor, covers the development of simulation and synthetic environments.

Domestic talent

Alexander Bradley of Cobra Simulation, a specialist immersive interaction company with a strong export footprint, told Shephard that 'the T&S industry continues to grow exponentially due very much to the continuing adoption of immersive technologies, as new devices in the virtual, augmented and mixed reality arena find their feet with more sector-appropriate content.

4GD, a UK veteran-owned SME, recently won a contract to supply its SmartFacility urban training system as part of the UK's Urban Fighting Skills House framework. (Photo: 4GD)

materials costs and services, it's the SMEs that get hit the hardest. I see a wealth of innovation at grassroots level in the UK, [but] more investment is needed.'

Ross reinforced this view with a comment from a QinetiQ colleague: 'It's very, very hard for a non-military SME to get a niche product accepted. For a military SME, it's just very hard.' He added that the major primes are often concerned about

To illustrate this, he cited the example of XPI Simulation, of which he was then part, which was a non-military driving simulator SME that undertook a driver simulator effectiveness evaluation study for the MoD. It then won a £20 million (\$26 million) contract for Ajax driver simulators and is now a wholly owned subsidiary of Thales.

Another example of an SME success in winning contracts is 4GD, a veteran-owned business. 4GD has developed the SmartFacility urban warfare training system with reconfigurable walls, a comprehensive video monitoring and AAR system, integration with a synthetic environment and a simple user interface. ▶

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This is in use with the Royal Marines, UK's 16 Air Assault Brigade and a US SOF unit. In 2021, the company was selected by the UK national training estate prime contractor to provide a number of SmartFacilities as part of the Urban Fighting Skills House framework.

Training on the go

Focusing on flight simulation and training, McCrudden said that based on feedback from ETSA members there had been some decrease in demand for high-fidelity full motion simulators in the military market, although demand remained 'robust' due to the continuing requirement to support certification.

He suggested that the adoption of the single-seat F-35 (with no two-seat trainer variant) was driving an emphasis on synthetic training, but a possible reason

Leonardo Helicopters UK continues to develop in-house training systems such as this desktop trainer. (Photo: Trevor Nash)

for the decrease in high-fidelity demand is the increase in smaller, more capable deployable simulators.

An example of this is the F-35B Deployable Mission Rehearsal Trainer developed by BAE Systems. This consists of a standard 40ft ISO container housing two fixed-base simulated cockpits, which almost completely replicates the training experience pilots have had in a full mission simulator (FMS). These container-based simulators can be embarked on the Queen Elizabeth-class aircraft carriers, and two were used for the 2021 global deployment.

These simulators are one element of an overall training system developed for the Queen Elizabeth class, which has combined the efforts of both industry and academia. It includes FMS from Lockheed Martin for pilot training and a digital twin of the ship developed by BAE Systems that includes hydrodynamics, 3D geometry, ship motion and dynamic air wake.

The dynamic air wake (wind) model was developed in partnership with Liverpool University. Integrating the ship model with

a motion-based FMS allows a pilot to experience the challenges of taking off from and landing onto the deck while simultaneously training and exercising the flying control personnel.

Staying in the maritime domain, BAE Systems also provides the Common Synthetic Environment Control, a constructive simulation used at the RN's Maritime Composite Training Facility at HMS Collingwood, which is responsible for much of the navy's warfare training.

The system is also used by QinetiQ at the naval combat system integration support centre at Portsmouth as a synthetic environment to test RN mission systems and infrastructure, as well as for other distributed maritime training events.

Science of learning

Another common theme which is emerging is the need to adapt military training to changes in learning technology and structures. 'Training needs to be in the same design architecture as in mainstream education,' Rawlins said. 'Learning



QinetiQ provides a range of aerial targets to customers around the world. This photograph shows the company's Banshee and Rattler models. (Photo: QinetiQ)

psychology has developed, but the training design architecture has not. It needs to be based on individual competency progression, using technology and particularly artificial intelligence.'

This approach is a key element of the RN's Project Selborne, which is also an example of the trend for outsourcing and the provision of training as a service. Selborne, a 12-year programme worth about £1 billion, will modernise and deliver RN training.

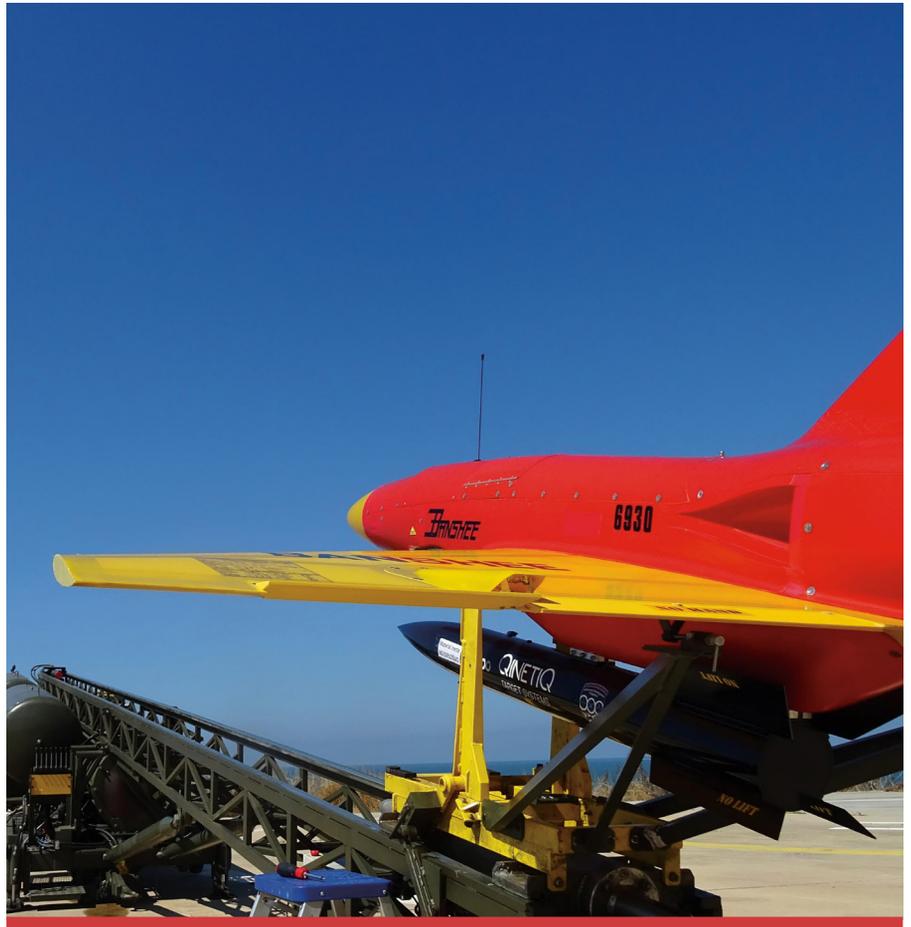
It is the responsibility of a consortium, known as Team Fisher, led by Capita and including Raytheon UK, Elbit Systems UK, Fujitsu and the University of Lincoln as Tier 1 partners, together with 14 Tier 2 UK-based suppliers.

A key element of the project is to transform the way training is delivered, taking into account existing skills and experience and with the emphasis on individualised learning. Online and distributed learning, both as part of pre-course preparation and post-course consolidation and progression, is central to this and is particularly appropriate for a service that will be increasingly forward-deployed. This approach has been reinforced by the move to remote learning as a result of the pandemic.

Team Fisher will also undertake resource scheduling and course modernisation and design; provide equipment management and the IT infrastructure and management; provide and manage simulators and synthetics; and deliver the academic component and education expertise.

Adopting a training-as-a-service model is not new and all three UK services have invested or are investing in it. The UK Military Flying Training System is provided by Ascent Flight Training, a JV between Babcock International and Lockheed Martin UK. Under a separate arrangement, the former supports French Air Force flying training.

Thales T&S UK provides Voyager and A400M training for the RAF at Brize Norton and the high-g centrifuge at RAF



Cranfield for RN and RAF fast jet pilot training and experimentation.

The Voyager effort is as a subcontractor in the overall Airtanker PFI contract with the MoD. The training provided covers pilot, cabin crew, engineer, operational and logistics staff. It includes a 'unique' flight simulator which is a combination of a commercial A330 flight simulator and a military device that can provide CAA-approved training for both civilian and military pilots. The engineering training also includes civil qualification.

Victoria Tolley, Thales services business manager, echoed the need to remain alert to changing learning methods and continue to modernise, but she noted that the methods had to match the demographic of the training audience.

The A400M project, which is a PPP contract with the MoD, is a JV between Thales and Airbus. Thales provides instructors, course designers, simulator technicians and a management team.

It provides two flight simulators, a cargo hold trainer for loadmaster training, and classroom-based virtual engineer facilities.

All those Shephard spoke to agreed that AI/ML will be increasingly important in a number of areas, not only for training but also in the use of digital twins for test and evaluation, experimentation, planning, course of action analysis and mission rehearsal. Skinner said that Thales was making significant investment in the UK to develop the connection of digital twins. He also pointed out that the more data that is available, the better AI works, and digital twins can help generate that data.

Ross added that all forms of simulation generate data and there is a vast amount already available. 'We need to capture, store, order, secure, compute and present all the data we have,' he said, 'so that we can use it for experimentation and doctrine development. And this needs to be done at the enterprise level.' ■