

Simulated training ●●

As in every workplace the world over, training is a vital part of the job for new and existing recruits. While live fire exercises remain a vital part of the training ecosystem, simulated options are increasingly offering a viable alternative.

Amy Saunders, Editor, Global Military Communications

Military training has of course played an essential role in the global defence market for as long as the market has existed. Training new recruits and upskilling existing personnel is vital for a nation to continue to defend itself effectively as the opposition grows and enhances itself in turn.

Live fire exercises using real ammunition plays an extremely important role in training across all the forces – army, air force, marine, naval – enabling fighters to familiarize themselves and practice with real weaponry ahead of a conflict scenario. However, such exercises are expensive, dangerous, and increasingly seen as overused when alternative, safer solutions exist.

A changing world

Virtual or augmented realities (VR or AR) and simulated environments provide many of the same benefits as live fire exercises, with some significant advantages in costs, safety, and efficiency. Often seen as an excellent first foray before being allowed loose with live rounds or expensive equipment, interest in simulated military training has boomed in the last decade. Indeed, Allied Market Research reports that the global military simulation and training market is expected to grow at a CAGR of 6.2 percent from US\$11.56 billion in 2020 to US\$20.58 billion by 2030. Growing defence expenditure driven by increasing conflicts is giving the segment a major boost right now, with modernization and virtualization of offerings of the utmost focus.

As with so many other areas, the COVID-19 pandemic severely hampered the military simulation and training sphere, however, key market players are now coming back with strategic cost-saving initiatives to improve operations going forwards. Interestingly, the live training segment held the highest market share in 2020, holding more than two-fifths of the total market share, and is expected to continue to lead during the forecast period with a CAGR of 7 percent. From the application point of view, the airborne simulation segment held the largest market share in 2020, holding nearly three-fifths of the total market share, and is expected to continue its leadership status during the forecast period with a CAGR of 6.6 percent. Regionally, North America contributed to the highest share in terms of revenue in 2020, holding more than one-third of the total market share, and is estimated to continue its dominant share by 2030 with a CAGR of 6.0 percent.

While current market reports indicate that live fire exercises remain a key part of soldier training, a good portion of the market growth is currently comprised of simulated/emulated training technologies. This has been well demonstrated over the last two years, when some live fire training exercises have had to be delayed or cancelled due to COVID-19, while demand for new AR and VR options grow.

Simulated environments

In line with the surge of interest in simulated training, increasingly we're seeing new interest and deals being made to further extend virtual training capabilities. Such is the case in the UK, where in



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September 2021, the Ministry of Defence (MoD) awarded BAE Systems contracts valued at more than US\$300 million to deliver advanced synthetic training for pilots training to fly the combat aircraft Typhoon. BAE Systems aims to deliver ten high fidelity, immersive simulators, together with highly secure state of the art training facilities at RAF Coningsby in Lincolnshire and RAF Lossiemouth in Moray. The new training environments will be linked together providing an integrated environment for pilots to train and carry out complex combined training exercises using real world mission software and tactics.

The investment by Defence Equipment and Support, the MoD's procurement arm, reflects the Royal Air Force (RAF)'s ambition to increase its use of synthetic training, delivering cost, time and sustainability benefits over live training. This technology will also provide students with a more complex and secure training experience tailored to the individual which are often difficult to achieve in live training environments.

"We pride ourselves in delivering world-class training capability as we understand how critical it is to deliver the highest quality skills and capabilities to the frontline. This contract builds on existing work to deliver synthetic training to the RAF's Typhoon Force, which will eventually enable pilots from different locations to fly virtual missions together and provide the ability to 'plug into' other assets across air, land, and sea," said Richard Hamilton, Typhoon Programme Director, Europe, BAE Systems' Air Sector. "The investment will deliver a number of valuable operational benefits for the RAF, alongside the positive impact that the increased use of synthetic training will make to reduce carbon emissions. With 9.6 tonnes of carbon saved by every synthetic flight, it will help reduce the current carbon footprint of live training, supporting the net zero ambitions held by our customers and ourselves."

Meanwhile, October saw SEA, DSAT Consultancy Ltd and Peak Pacific UK Ltd deliver an innovative new training system within the simulated training segment. The new system will enable the Royal Navy to conduct its own common submarine External Communications System (cECS) training for the first time.

The training system significantly reduces reliance on hardware; combining high-quality training media with interactive system emulation using real system software in a virtual environment, along with a hardware-based training rig to provide the Royal Navy with a self-sufficient and robust cECS training capability. The cECS training is delivered over two five-day courses for both system operators and maintainers. The operator course covers system infrastructure and the external interface, while the maintainer course focuses on predictive and corrective

maintenance and functional checks and system admin. SEA's virtual environment offers realistic system behaviour while enabling trainers to simulate faults and better track student performance than when using physical equipment.

"In collaboration with our partners we have delivered a flexible and reconfigurable training system. cECS is less reliant on expensive hardware, which reduces demands on space for the Royal Navy and directly responds to its evolving training requirements," said Richard Flitton, Managing Director at SEA. "Our detailed knowledge of cECS enables us to provide state-of-the-art training media delivered more cost-effectively and practically. We prioritize the development of the virtual and simulated training environments to expose trainees to vital operational scenarios that are challenging or costly to replicate in other ways."

Similarly, later in December it was revealed that Rheinmetall is supplying new simulation technology for the German Army's Combat Training Centre. The Federal Office for Bundeswehr Equipment, Information Technology and In-Service Support (BAAINBw) awarded Rheinmetall a procurement contract for 440 state-of-the-art Training Device, Duel Simulator (AGDUS), Passive Vehicle systems earlier in 2021, with delivery scheduled to be complete by December 2023.

The laser-supported AGDUS enables highly realistic combat training by simulating the effects of weapons fire. It consists of sensors on the vehicle that receive laser signals, the central electronics, and a display and control unit. The systems enable highly realistic combat training through precise determination of the simulated hit location and a detailed damage simulation based on vehicle-specific damage models. All data concerning the laser-based engagement are relayed in near-real time to

the exercise control cell, where the results of hits are depicted optically.

The latest iteration of the AGDUS passiv vehicle target system features a wireless connection to the central electronics. The equipment also includes a roof sensor that enables detection of hits from shots fired from above such as from rooftops. The sensor modules can be arrayed and expanded in accordance with specific training requirements. Encompassing the casualty model which calculates the consequences of a hit for crew and vehicle, the connection between the sensors and the central electronics features a short-range radio transmission system based on a proprietary solution involving a multi-frequency process to assure stability of training. The signals are bundled and transmitted simultaneously via two or more radio links (frequency diversity). To assure the required stability, the transmitter and receiver operate in parallel, thus avoiding breaks in transmission. The updated AGDUS passiv features state-of-the-art sensors and detectors with enough sensitivity to guarantee reliable detection under adverse weather conditions like fog, even at extended ranges of engagement.

A digital future?

Simulated training technologies for military applications are expected to continue to grow in popularity and use for the foreseeable future. The many advantages of such systems make them extremely attractive for decision makers, while the technology itself comes on in leaps and bounds thanks to input from other industries such as gaming. However, live fire training exercises will continue to dominate for the next decade at least – nothing can compare to the feel of genuine equipment for soldiers in the field.

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