

Bringing increasingly large numbers of warships' crew members together for sophisticated computerised exercises is a growing trend, but a recent incident in the Middle East shows that one of the most basic rules of seamanship training is disregarded at your peril. **By Alan Dron**

**O**n 30 January, off the west coast of Yemen, it was a day of good visibility and reasonably calm seas. Despite this, a high-speed launch packed with explosives was able to approach the Royal Saudi Navy frigate *Al-Madinah* and ram its stern.

The resulting explosion killed two sailors. The degree of damage to the frigate is unknown, as upon its return to its home port of Jeddah some days later, a large blue tarpaulin covered much of the area around the helicopter deck and Saudi television's camera angles carefully avoided focusing on the damaged area.

At the time of writing, it was not known if the speedboat was manned by a suicide attacker or was remotely controlled. However, the incident will once again have

brought home to navies globally how a simple small craft can inflict substantial damage on a sophisticated, modern warship.

### Keeping watch

Video taken from the vessel's own cameras around the superstructure and posted on the Internet clearly show the speedboat approaching the stern at high velocity, leaving a prominent bow wave and wake. Personnel on the warship apparently failed to see it, or react quickly enough, bringing into question watchkeeping standards. That is something on which the inevitable inquiry into the incident will doubtless focus and it remains to be seen if training on this basic aspect of naval operations receives greater emphasis.

The *Al-Madinah* attack is likely to focus renewed attention on products made by companies such as Qinetiq Target Systems (QTS). QTS is a new name in the naval training scene, but is in fact a reincarnation of Meggitt Target Systems, which was sold to its new owners in December 2016.

QTS staff operate the small Barracuda and Hammerhead remotely controlled speedboats in exercises for navies, simulating swarm attacks. The company can also sell the system outright. The Canadian, German and US navies have employed QTS in its previous incarnation in this role, while the Royal Australian Navy has acquired the system.

Also on the customer list were several customers in the Middle East whose identities were confidential, according to business development manager Vincent Malley. One of the most prominent users of swarm tactics involving small, high-speed craft is Iran, so the presence of regional neighbours in the list of purchasers is perhaps unsurprising.

Barracuda replicates a fast inshore attack craft with its considerable power and space for payload. One significant

development has been the 'refresh' of the Scanning Projectile Impact Evaluation System (SPIES), which is mounted on the vessel's mast and which detects fall of shot from 'defending' vessels, giving bearing and azimuth measurements.

### High quality

'What we're finding is that with all the advances in technology and camera systems... our customers were asking for more high quality in scoring systems,' said QTS sales and marketing manager Ryan Harty. That improvement has been installed for a couple of the company's customers. A further upgrade to Barracuda is on its ground control station and data link capability.

'We have a lot more functionality, like satellite communication,' said Malley. This gives the vessel an over-the-horizon capability. Further enhancements have included the installation of high-speed and multi-spectral cameras to improve real-time feedback.

'A lot of navies recognise that the small boat threat is a serious one,' he continued. 'The small boat that drove into that Saudi frigate brought it right back to the forefront.'

He added that the US believes the attack was either regarded by Yemen's Houthi rebels as a dress rehearsal for an assault on a US vessel, or that the insurgents believed that the frigate actually was a US Navy ship.

The relatively low cost of the Hammerhead and Barracuda make it attractive as a training target, said Harty, and the latter model could also be used to tow a secondary target.

### Something different

At-sea training of a different sort is provided by the French Sea Owl Group. The organisation operates two vessels, the 2,700t *NV Partisan* based at Brest on the Atlantic coast and the smaller *NV Rebel* at Toulon, in the Mediterranean.

These can be used in a multiplicity of training roles, notably by the French Navy, said Sea Owl Group managing director, Xavier Genin.

*Partisan* originally worked for oil giant BP in the North Sea as a platform supply vessel. It was refurbished for Sea Owl, to



The Sea Owl Group's *NV Partisan* showing a French Navy NH90 about to land. Also visible are the ISO containers used to train boarding parties. (Photo: Sea Owl Group)

comply with technical requests from the French Navy.

'We built a helideck able to receive all kinds of helicopters from the French Army up to the NH90,' said Genin. 'We also built a combat module for special forces to simulate a merchant vessel that had been hijacked by pirates or terrorists and fitted a large crane to starboard with a smaller one aft.'

The larger crane is used for launching RIBs, such as a large Zodiac that is used to simulate an asymmetric threat. The ship is also used for mine warfare training and for the catapult launching of several types of aerial target, including the Meggitt - now QTS - Banshee, Snipe and Sprite.

Sea Owl says the vessel is unique in Europe due to its helicopter deck and combat module. If not being used by the French Navy, other NATO nations can operate from her. During the last DSEI exhibition in London, the UK's 43 Royal Marine Commando gave twice-daily boarding demonstrations of the vessel.

### Wide applications

One of the benefits of *Partisan* and *Rebel* is that they can undertake a range of training tasks that would otherwise oblige the French or other navies to go to multiple suppliers.

*Partisan* has such a wide range of capabilities that one French newspaper called it 'the Swiss Army knife vessel'. 'It spent 120 days at sea last year, and

Rebel, 90 days,' said Genin. 'The French Navy schedules the training programmes. We're not in charge of those, we just provide the tool for the training department of the navy.'

Typically, an exercise takes three to four days at sea. Special forces can come on board by helicopter or RIB by day or night.

'The ship can handle training in gunnery, helicopter pilots and anti-submarine warfare [ASW]. That's its main competitive advantage. Every time a frigate or helicopter carrier needs to be re-qualified, we get called up,' he added.

Coming ashore, another French company with a strong interest in the naval training sector is ECA Group, whose Genoa, Italy-based specialist division ECA-Sindel produces simulators handling areas ranging from bridge navigation training and combat information centre (CIC) teams to its ASW series that can bring together simulators for submarines, ships, helicopters and fixed-wing aircraft.

ECA-Sindel's systems can have up to 200 PCs connected together for advanced team training. It also produces tailored simulators for specific classes of warship, notably the Franco-Italian FREMM frigate.

'One of the areas that we're most strong in is sonar simulators,' said Riccardo Caponi, ECA Group's export sales manager - Western Europe. 'It's something that's not very popular because sonar propagation is very complicated. Very few companies in the world, just two or three, have invested in

# Fluid design

One area of naval training that continues to grow is countering fast attack craft. QTS provides a number of targets to simulate swarm attacks. (Photo: QTS)



that. We use two propagation modules, one for deep water and one for shallow.'

### Back in the spotlight

Understandably popular during the Cold War, emphasis on sonar expertise dropped away in the 1990s, but seems likely to have a revival in popularity with today's changing geopolitical situation.

Several navies have bought the company's ASW training simulators. Most cannot be identified, but one of ECA's oldest and best-known customers is the Republic of Korea Navy. The ASW Team Trainer (ASWTT) is effectively renewed every year with a combination of refreshed software with new functions and renewed hardware. 'Every year we modify what they want and we

sometimes undertake refresher training,' said Caponi.

Also undergoing modernisation under a February 2016 contract is the German Navy's main training centre for operations at Bremerhaven, a task being undertaken by Thales.

After more than ten years of almost unmodified operation, the centre's IT

methods, handheld devices and multiplayer gaming.

These methods offer some distinct advantages from other forms in that assessment or feedback can be nearly instantaneous, and assessing the readiness – in terms of basic knowledge, procedures or some tasks – for individuals, small groups or watch teams can be completed for qualification or proficiency very easily.

Furthermore, the ability to transfer knowledge from experienced personnel can be done in a scenario-based format, which reduces the potential for personnel to experience a situation which is either rare or infrequent. Finally, VE training permits conducting evolutions which are either too dangerous or too risky to equipment to be done 'live'.

An excellent example of an integrated event, which could be utilised in either a team or individual fashion, and would be conducive to both VR and AR would be naval gunfire support (NGFS). Using a combination of geographic representations for 'targeting and spotting' it is now possible for an individual on a NGFS team, or the entire team, to conduct a rehearsal, complete with safety assessment items, and assess individual or team performance. Range time is extremely valuable, and the use of a VR and/or AR capability could have a dramatic impact on this very critical, but also highly perishable skill set.

Advances in game-based technology are occurring at an increasing rate, and what was not possible two years ago, is now commonplace. The trend for using VE – both AR and VR – will inevitably spread across every community and warfare specialty.

## Virtual reality

It would be surprising if VR systems were not finding their way into naval training, and this is one area into which General Dynamics Information Technology has been putting efforts.

**Mark Nesselrode**, a former US Navy captain and now solution architect for training at the company, shares his thoughts.

Over the last 24 months, General Dynamics IT has been working on prototype development in the virtual reality technology area. The development involves using the Unreal and Unity game engines, and focuses on converting light detection and ranging scanned data (point cloud data) into 3D models that permit interaction for training, both in a classroom setting or aboard a ship, maintenance, operations, overhaul planning or shipboard fire-fighting.

Several prototypes have been developed and delivered to the USN, which are being used to evaluate potential uses for shipboard personnel, as well as for shore-based 'point of need' training throughout the sailor's career.

General Dynamics IT has expanded its experience of the virtual environment (VE) and introduced audio and haptic (tactile) cueing, which significantly enhances the virtual experience. We have also done work that will demonstrate the ability to use game engines on mobile devices so that the level of interactivity can be tailored to the sailors' location and need.

General Dynamics IT recently won three naval training contracts to deliver education and training support services

to Naval Education and Training Command and the Naval Education and Training Professional Development Center. As part of each contract, deliverables will include analysis and design documents, self-paced, group-paced, and blended training, learner assessments and performance support systems.

Additionally, the navy has an interest in using computer-based training in the form of discs or as an adjunct to instructor-led classroom training. The more attractive price point for visual devices, such as the Oculus or HTC Vive, as well as the increased capability in tablets, such as the Surface Pro, has allowed the navy to look into how it can leverage game-based solutions.

There have been some awards, in prototype development, and there have been some follow-on projects, but large VR training contracts for this sort of capability are just beginning to take place.

The military and the navy understand that maintaining training capabilities for personnel, especially in highly perishable skills such as system training, damage control or casualty control, requires much more interactive methods. As such, the trend appears to be moving towards VR and augmented reality (AR)

infrastructure had become outdated and was no longer sustainable.

The first phase of the project involves upgrading obsolescent hardware and improving IT security. The navy's existing software will be replaced by the new standard Action Speed Tactical Trainer (ASTT) baseline. The second phase will extend that baseline with a new development for a tactical data link.

This, said a Thales spokesman, would transform the existing Link 11 simulation into one that would mimic Link 16 and Link 22 tactical data exchange networks and connect simulated units with real ships.

Among the equipment to be regenerated under the contract are several procedural trainers and TacFloor, in which, during operational map games, situations can be projected in a large format on the floor or walls. This is particularly suited to larger course groups that need to jointly evaluate a tactical situation. Regeneration of the simulators is due to be completed by August 2018.

### Infrastructure investments

Also the subject of a recent upgrade is the Royal Norwegian Navy's (RNoN) Proteus simulator infrastructure. Proteus is a range of simulators manufactured by Kongsberg, covering such aspects as gunnery and missile trainers, surface warship command team trainers and swarm trainers.

The contract scope included: infrastructure upgrades and migration to a common Proteus simulation core for all the RNoN's Kongsberg-delivered simulators; new visual image generation; a generic High Level Architecture Evolved interface, enabling further simulator participation in joint collaborative exercises; and a new Proteus map-centric instructor station.

The contract was delivered to the RNoN training establishment KNM *Tordenskjold* at Haakonsværn naval base in 2016.

As well as updating its naval simulators at home, Kongsberg has also delivered Proteus systems to the Royal Australian

Navy to facilitate training of its air defence destroyers. 'That has the ability to operate with the US Navy or the Royal Navy [RN], to do fleet cooperative training,' said Morten Kolve, marketing and business development manager in naval training.

'We're doing some work in the area of artificial intelligence [AI], in which the RNoN has taken an interest and we're developing capabilities for them to reduce instructor workload.

'Kongsberg has undertaken AI work with armies with VBS, with entities that have pre-planned reactive behaviours to free the instructors to pre-plan events. With AI, there's much more room to capture real-world behaviour and doctrines to make units autonomous beyond what we had before.

'The first task is to reduce the workload of the instructors, or to reduce the number of instructors. You need a substantial number of real players to keep the trainees busy. With AI, you're able to automate this. A trainee can interact with automated entities. The RAN is very keen on this.' ▶

The BAE Systems Maritime Composite Training System is used extensively by the Royal Navy at HMS *Collingwood* and HMNB Devonport. (Photo: BAE Systems)



One trend Kolve detects is increased emphasis on collaborative training, bringing together several units that are not physically co-located.

**Six ship replications**

Modernisation in the past few years has also been the name of the game in the RN, where BAE Systems has implemented several upgrades to its Maritime Composite Training System (MCTS), whose computerised simulations can be configured to replicate six different ship classes.

These have included changes to the supported platforms, command systems, sensor suite (including radars and electronic surveillance), close-in weapon and missile systems, with the aim of keeping MCTS in line with the latest fleet fit.

'Training on board always remains an exciting opportunity for the future, where perhaps ships' crews could hook up to MCTS from their asset, either alongside or deployed,' said MCTS project manager, Trevor Jones. 'And certainly, striking the



CAE has supplied a maritime naval training system to the Royal Swedish Navy and is in the process of installing a training centre in the UAE. (Photo: CAE)

right balance between synthetic and live training continues to be essential to our UK defence capability.'

In recent months, RN warships have been learning to work as part of a battlegroup with the nation's new aircraft carriers.

The Commander UK Carrier Strike Group (COMUKCSG) battle staff has been

conducting transatlantic exercises ahead of the arrival in Portsmouth later this year of HMS *Queen Elizabeth*.

RN personnel have been taking part in fleet synthetic training exercises used to put USN carrier strike groups through their paces. The latest exercise saw COMUKCSG tested in warfighting techniques involving HMS *Queen*

*Elizabeth* and 36 F-35B Joint Strike Fighter jets (see next issue for a report on this exercise).

**Ship escorts**

Previous exercises have seen command and warfare teams from Type 23 frigates HMS *St Albans* and *Richmond*, as well as the Type 45 destroyer HMS *Diamond* take on the role of principal anti-submarine, anti-surface and air missile defence commanders. Type 45s and Type 23s will be escorts for both HMS *Queen Elizabeth* and HMS *Prince of Wales* when they deploy.

'Training in this way offers enormous benefits, not only in being more efficient and less expensive than live training, but also in allowing a highly tailored training package, delivered in a short space of time, focused on the specific training needs of the team,' said Cdre Andrew Betton, commander of the Carrier Strike Group.

Upgrades to existing systems using the ubiquitous VBS product have been undertaken by US training simulator and

firing range specialist Laser Shot. The company provides a range of S&T systems, including several gunnery training platforms that can include motion systems to replicate vessel movements.

The RN, for example, identified a need to improve its close-range weapons training, and Qinetiq installed its Close Range Weapons Trainer at shore establishment HMS *Collingwood*.

Laser Shot provided the entire simulator system as a subcontractor, which included 20 screens, four motion platforms and eight simulated weapons including 30mm and 20mm cannon, miniguns, M2 .50cal machine guns and general-purpose machine guns. The system has been extremely successful, said the company.

Among its range of simulators, Laser Shot produces a 360° display system, which has been upgraded to a fully curved, cylindrical screen that measures 2.9x4.8m.

The company is also working on a new software system, Titan. This has the entire world as a geo-specific map, 'which is very

handy when you're doing coastlines', explained CEO Paige Manard. 'We're moving towards a more geo-specific training site that has the whole world in it and Titan has ability to take tides into account.'

Meanwhile, Northrop Grumman Technology Services (NGTS) has recently shown a new development of its PC-based Open-architecture for Reconfigurable Training Systems (PORTS), which is used by the USN to train its surface warfare officers on combat systems for the Littoral Combat Ship.

PORTS has been around for some years, but at AFCEA West in San Diego in February, NGTS integrated a PORTS scenario into a VR training experience, to show how simulation training could be expanded with the use of VR/AR.

At the time of writing, Rheinmetall Defence Electronics is expected to deliver some imminent news in the naval training field. For the moment, however, it continues to produce a range of training simulators, covering areas such as damage control, ASW, submarine control and engine control. ■



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