

ROBOTS FOR PORT AND MARITIME SECURITY

Timothy Compston goes underwater to find out more about the autonomous and remotely operated vehicles being deployed to secure our ports and the wider maritime environment



The realisation that there is an ongoing threat from terrorists to ports and shipping is nothing new. In his book *Cruising For Trouble* commander Mark Gaouette, now a maritime security consultant and formerly a director of security for Princess Cruises and Cunard Cruise Lines, points out that as far back as 2003 George Tenet, the then director of the CIA, told the US Senate Committee on Intelligence that al-Qaeda was developing the use of "underwater methods to attack maritime targets".

Focusing on some of the maritime security issues where highly mobile unmanned platform like ROVs (Remotely Operated Vehicles) and AUVs (Autonomous Underwater Vehicles) can come into their own underwater, these range from: IEDs (Improvised Explosive Devices) and limpet mines being placed on port infrastructure like piers and jetties, ship hulls and on the dockside and passenger terminals; unexploded ordnance (UXO) being accidentally dredged up – as we saw with the recent work in Portsmouth for the new aircraft carriers – to mines being laid deliberately near ports and the associated shipping lanes in times of war.

TETHERED ROVS

Speaking to end users and equipment vendors from across the globe, it soon becomes clear that there isn't a one-size-fits-all solution to dealing with potentially explosive issues under the waves. On the other side of the Atlantic, lieutenant Seth Clarke from the Navy Office of Information is keen to discuss the state of play for the US Navy. Interestingly, he says that advanced autonomous solutions have proven to be only a partial solution to the US Navy's EOD (Explosive Ordnance Disposal) requirements since 1995 to provide relief for some 'diver only', 'dull', 'dirty', and 'dangerous' tasks: "Tethered ROVs will be in the Navy toolkit for the foreseeable future," he explains. Expanding on this point, Clarke feels that communications bandwidth, latency and reliability in what is after all a highly diverse and complex undersea environment are continuing to limit AUVs or UUVs. In addition, Clarke says that many underwater tasks still require Navy EOD supervision and oversight to ensure safe and effective countermeasures to

neutralise, render safe, dispose, recover and/or exploit sea mines and other underwater explosive threats.

Drilling down further into lieutenant Clarke's take on the advantages and disadvantages of AUVs or UUVs versus ROVs, he points out on the positive side that search-based – 'mow-the-lawn' – untethered UUVs, with a moderate amount of autonomy, allow the localisation of targets of interest. On the other hand, Clarke notes that: "Tethered underwater vehicles [ROVs] enable response teams to maintain oversight of moderately autonomous ROVs for a range of potential underwater tasks". When it comes to working with a tether in tow he acknowledges that it is not always plain sailing: "Tether management around clutter, tether drag in terms of standoff range and platform manoeuvre and stability are all challenges that impede operations". Despite such issues, lieutenant Clarke reiterates the point that tethered systems offer the benefit

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of real-time, no-to-low latency communications and potentially unlimited power via topside/surface sources.

Moving ahead, the ability to offer joined-up situational awareness from – and tasking of – unmanned vehicles, not just underwater but on and above the surface, in the context of coastal and port infrastructure is also exercising the thoughts of more and more vendors, port operators and government agencies. One company pushing the boundaries of what is possible here is ECA Group – which specialises in robotics for hostile environments – with the recent unveiling of a new software suite, UMIS for Security, which is currently being evaluated by different ports and critical infrastructure owners.

Setting the scene for this move, Vincent Clavier, homeland security business manager at ECA Group, reiterates the security challenges out there today. These are challenges that necessitate the need for a platform like UMIS for Security that brings mobile sensors on unmanned vehicles into the picture above and beyond traditional

Saab's Sea Wasp is specially designed to deal with the threat of waterborne IEDs in harbour areas

static surveillance methods: "The situational awareness for harbour, coastal infrastructure or ship protection has to focus on attacks, which can come from the coast with individual or collective weapons, suicide boat, as well as simple walkers and swimmers," explains Clavier.

According to Clavier the beauty of UMIS for Security is the potential for an entire fleet of different robots to be regrouped, managed and coordinated – and their sensors supervised – from one single command post. "The real novelty of this software suite is its ability to integrate seamlessly into existing systems, its primary purpose being supplementing already installed devices," reckons Clavier. More broadly, he explains the advantages that come with the deployment of mobile sensors on a fleet of robots over fixed solutions including providing earlier, more precise and better information and a wider viewing range: "They [the robots] enable better detection of dangers and the generation of alerts well in advance so that action can be taken at sea and infrastructures can be protected," he says.

Clavier adds that the ability to move unmanned vehicles around means that the distance of sensors from any potential threat can be adjusted according to factors like the sea state: "This tactical process greatly improves the classification functionality, whether by a human or the software". Another decisive factor that Clavier underlines in the case for the 'robotising of coastal protection' is the changing nature of detected objects and the failings of existing harbour protection solutions: "Detailed analysis of traffic flow management and illegal intrusion methods at sea reveal a weakness in the system [data fusion software based on automatic alarms using echo types and sizes and in some cases, target trajectory]. Essentially an intruder will follow a normal track to the last moment. More precisely, a very serious intruder with firearms or wanting

to deploy an illegal means will change his appearance at the last moment."

Touching on specific port security scenarios where a fleet of unmanned vehicles could make a difference, Clavier flags up a hypothetical 'security mission' during a major event in a port or coastal location such as the Olympics or a G8 summit. He says that for added protection navies may be called in to mount patrols but that this is very demanding in terms of logistics and human resources. By contrast Clavier reckons that by employing something like UMIS – and the associated unmanned systems (USV, UAV and AUV) to survey the surface, aerial and underwater environments – this cost could, potentially, be reduced: "They [the unmanned systems] can all be supervised from a containerised command and control station on a truck. This solution is particularly suited for events because it is easy to deploy and modular," he concludes.

UNMANNED SOLUTIONS

In terms of the robots from ECA Group that can deliver mobile sensors on the ground, in the air and underwater, the vendor spotlights several, which are compatible with the UMIS for Security software. These are, primarily, USV INSPECTOR MK2, an unmanned boat that can function by remote control or by navigating in autonomous mode. Should the need arise, ECA Group says that USV INSPECTOR MK2 can escort suspicious boats to the entrance of a port to collect as much information as possible – from radars, visual or thermal cameras – and transmit images in real time and to generate a warning to enable a timely response or can, where fitted, engage immediately non-lethal or lethal payloads fitted for area protection.

As well as an unmanned surface vehicle, other robots from ECA Group that come under the UMIS for Security umbrella include underwater robots like the A9-E AUV and SEASCAN, a remotely operated vehicle (ROV), to check for explosives and mines. When it comes to surveillance from the air, according to ECA Group, a third family of robots the aerial drone UAV IT180 can come into the mix here.

REMOTE CONTROL

Diving back under the surface for port security, Chris Gibson, vice president of sales and marketing at Pennsylvania-based VideoRay is a strong advocate of the value of ROVs (Remotely Operated Vehicles) to tackle explosive situations. According to Gibson, VideoRay's systems like the Pro 4 are operated by numerous users in this environment with, for example, the New York Police Department employing them to sweep the city's waterways and bridges for explosives. Beyond this he explains that a new solution – the Mission Specialist – has now come on stream and features a sensor suite for control and waypoint following plus six to seven thrusters – compared with the Pro 4's three – making it even more manoeuvrable.

Gibson adds that the autonomous capabilities built into the latest ROVs – like the Mission Specialist – make it easier for an operator working in a port to concentrate in an EOD [Explosive Ordnance Disposal] scenario on identifying what type of mine or bomb they are looking at: "These [autonomous features] are as basic as hold this depth and the robot will hold the depth or hold the heading. Some of the more sophisticated things are having it go through and run a search pattern to known waypoints," says Gibson.

In the context of harbour and port security Gibson says that an advantage here is that there are known areas where ships are going through and positions on that queue route: "As you are flying in you have telemetry that you are looking at, including video and forward looking sonar, and if you see an object maybe on your sonar but not your video – because the water clarity isn't the best typically in harbours – you can simply

pause the mission for a second go look at the target and determine if it's okay, mark it and then continue on with your original mission."

Gibson is quick to contrast the real-time immediacy of ROVs thanks to their umbilical with the situation with AUVs where communication capabilities are more limited: "If you are doing a survey with a side scan sonar or an AUV you would go through and perform the task, reviewing all of the data typically after the fact, and then you have to go back and essentially re-acquire those targets and work out if they are good or bad."

For his part, Carl-Marcus Remén, sales director at Saab's Underwater Systems business unit contrasts the requirements of in-shore EOD [Explosive Ordnance Disposal] operations – and the associated systems – with MCM (Mine Counter Measures) off-shore. He says that the scale is certainly very different: "As soon as you get close to harbours and ports it becomes an EOD task for smaller units. Small systems and manoeuvrable systems are some of the key requirements that we see for the EOD teams as they commonly operate from smaller vessels like RIBs [Rigid Inflatable Boats] or from the shore."

THERE ISN'T A ONE SIZE FITS ALL SOLUTION TO DEALING WITH EXPLOSIVE ISSUES UNDER THE WAVES

Underlining the dynamics at play here Saab now offers Sea Wasp, a waterborne security platform, specially designed to deal with the modern threat of waterborne IEDs in harbour areas. A key operational benefit with Sea Wasp is, according to Saab, the safe distance that can now be maintained between Sea Wasp's operators and the threat – keeping EOD divers out of harm's way who would, otherwise, need to dispose of the item manually.

In the end, it is clear as the threats to ports and the wider maritime environment evolve so too, thankfully, are the technological solutions available to detect and deal with them at the earliest possible stage ●

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