The Underwater Battlespace

Scott Jamieson, Managing Director, BAE Systems Maritime and Land Defence Solutions: [00:00:00] I think it is fair to say that since we all gathered here together at DSEI, our work in this area hasn't just progressed, it has accelerated. And today, I'm excited to not only share what we've achieved with Hearn, but also to announce the next major milestone in its history. But let's step back for a moment, because to understand why this matters, we need to look at the environment that we face. The underwater battle space is no longer a quiet domain. It's contested, it's congested, and it's complex. Adversaries are moving fast, and they're investing in capability at great speeds. And threats are multiplying not just in number, but in nature. Some are highly sophisticated, others simple but cheap and increasingly available to almost anyone. And that combination creates a dual challenge. On the one hand, advanced systems that are hard to counter and on the other, mass, low cost threats that stretch our ability to detect and respond. And we see this everywhere. We see it in the headlines that we read in the growing number of international agreements focused specifically on subsea security and in the rapid spread of technology. Some of it advanced, some of it basic, but all of it disruptive. And remember where this plays out in a domain that is vast and inherently difficult to navigate. So if we are to maintain advantage in this environment, we cannot simply just do more of the same.

Scott Jamieson, Managing Director, BAE Systems Maritime and Land Defence Solutions: [00:01:56] We must think differently, and we must act decisively, responding to the challenge. Meeting this challenge isn't about small, incremental steps. It's about a transformation in how we think about delivering capability. And for us, that means four things. First of all, affordable mass. We need more autonomous assets in the water because only mass gives us the presence, the persistence and the resilience needed to cover the world's oceans. Secondly, we need highly capable nodes. Numbers alone aren't enough. Each system must balance affordability with performance. Able to find and track the most difficult of targets. Third, we need hybrid architectures. We need breadth and depth. This means combining simple, commercially derived systems with complex military grade assets. Only this type of mix can deliver both deterrence and, when required, credible strike Capability and the fourth decision superiority. The volume of data in the underwater domain is staggering. We must be able to fuse it, interpret it, and act on it in real time, because only then can navies get actionable insight fast

enough to make a real difference. And here's the truth the challenge cannot be solved by any one single nation, navy or company on their own. It demands integration and it demands collaboration partnership across navies, across industries, across the whole spectrum of providers, from the large primes to the SMEs. So what is the role of BAE Systems in all of this? We believe enduring capability in the underwater battle space requires a prime systems integrator, one organisation able to harness innovation from right across the whole ecosystem. One that can bring coherence to a system of systems and deliver trusted solutions Navy can rely on when it matters the most.

Scott Jamieson, Managing Director, BAE Systems Maritime and Land Defence Solutions: [00:04:08] This is the role that we see for ourselves, not simply delivering platforms or sensors in isolation, but ensuring they work together seamlessly as part of a wider, resilient architecture. That's why we put so much emphasis on building enduring partnerships across industry, across governments and across allied nations, because only together can we bring the best technologies to the fight at speed whilst maintaining maintaining military assurance and reliability. Persistent sensing and credible strikes are vital, but I would argue the decide function is just as important. The ability to interpret, to assess, to decide at speed. That is the essence of the integrator's role, to give clarity to decision makers in an increasingly complex and congested domain, and to make sure they have the right information at the right moment to act. And that is why BAE systems is committed to leading in this space, to integrate across domains, to bring together the best from right across industry, and to deliver a systems of systems that's agile, credible and enduring. Because only by doing this, by working collaboratively and moving decisively, can we build the underwater capability needed to protect our national interests, secure our seas, and maintain strategic advantage for decades to come. So I'm going to hand over to Sarah now, who's going to talk you through our integrated operating concept.

Sara Thurman, Head of Future Products, BAE Systems Maritime and Land Defence Solutions: [00:05:58] From seabed to space. We need to integrate our sense, decide and effect capabilities in order to provide underwater protection. This is in anti-submarine warfare, protection of our undersea infrastructure and in our seabed warfare. At the heart of which sits ISR in ISR, the appetite to deploy a crewed submarine is low and not always possible. Yet there is still a need to gather intelligence from a number of strategically placed nodes across the battle space. Similarly, the design demand for

information to identify and locate threats Marines is high and ever increasing, and we need to get that information to the people that need to make decisions quickly and effectively in order to take appropriate action. But we need to be prepared for simultaneous and persistent mass in our vast and deep oceans. Our analysis shows that the need for conventional kinetic strike capabilities, such as our nuclear submarine can to conduct the deter and defend aspects are going to endure, but at relatively high cost and low numbers compared to the vast amount of ocean that needs to be covered. We need other solutions that can also provide mass and persistence in the fight and fix capabilities. This is to create a web of information which ensures our defensive integrity. We can learn a lot from our many years of submarine operations. Taking the these learnings and incorporating them into our new capabilities such as XLAUV, autonomous boats and drones is key. And we see a world where these elements are integrated as a system of systems approach with integrated and secure information sharing at the speed of relevance through an open data architecture. Tim's now going to talk a bit more about what this means in practice.

Tim O'Neill, Campaigns Lead, BAE Systems Digital Intelligence: [00:07:49] Thank you Sarah. At the heart of the battlespace has to be a secure, assured and integrated environment, particularly as we now need to connect a variety of platforms and systems across domains to share information. This requires sensors and platforms to be ubiquitous, connected, covert where necessary, and able to communicate data securely in the theatre of operations in order to accelerate, decide, and affects functions. Fusing intelligence with common integrated operating pictures available across surface air, land, and space domains. However, the underwater communications is missing a vital piece of the puzzle. We must provide seamless connectivity between data and communication interfaces. It must support a range of connections, including acoustic for subsurface optical through air and subsurface RF for through air and cabled. And it must also offer a flexible solution that can meet the requirements of the network regarding availability, covertness, Bandwidth and reach, to name a few. Traditionally, data gathered underwater is mostly available for analysis after the mission is completed. In this new environment, the integration of next generation underwater networking capability into platforms brings the dynamic mobile network routing into the equation. Autonomous platforms such as Herne XLAUV need to be capable of edge processing of critical data points. It is the integration of this capability that moves us a step towards the provision of in-mission time sensitive intelligence. This is what opens up that

capability, giving the freedom and advantage of timely decision making. Additionally, the ability to harvest data across multiple assets to create aggregated combined area surveillance will be game changing. We must get better at giving decision makers simple, clear, actionable information. Here the combat management system is integral, and we are developing our capability every day to help untangle the complex data of the modern battlefield.

Tim O'Neill, Campaigns Lead, BAE Systems Digital Intelligence: [00:10:11] Bringing the available data from every domain and presenting this to the commanders as information in a single interface, whilst also ensuring that we maintain a complete picture of force assets. In order to provide that environment, we need to get better across industry and navies at providing maintaining a secure but open architecture with common flexible data and configuration standards matched to the outcomes and user cases. We also need to be careful that in integrating the battlespace, we don't heighten the security of information overall and create barriers. Instead, we need to be aware of the individual platform situational awareness. Consequently, the complexity of the platform can be low and the data exchange be simplified to the bare minimum. This then allows simpler, lower value platforms to be deployed in mass at lower risk. The utopia would be to do this to enable interoperability across nations, so combined task groups can access combined assets available at the time and place of their choosing. Assured, reliable data handling of high volume sensitive data is is being done today, and progress within this data domain is continually being made. BAE Systems provides a range of services across government and national security, handling, processing, analyzing, and exploiting data in high trust environments in order to enable informed decision making. Let's spend a few minutes just talking about how we're turning that into reality. An example of the large scale data management in Operations is Cerberus, which is a program delivered with UK Border Force. This program saw be partnered with the Home Office to develop data analytic technology that helps protect the UK borders and simplify processes for traders and travellers.

Tim O'Neill, Campaigns Lead, BAE Systems Digital Intelligence: [00:12:11] The three year contract enabled the Border Force and related agencies to manage, in real time the vast amounts of data relating to 300 million passenger journeys and 385 million tonnes of freight that enter the UK every year. The amount of information held across the Home Office, wider government and industry is increasing rapidly, and

understanding these large data sets quickly is critical for identifying risks to national security through the development of advanced risk analytics services with the Home Office, BAE Systems is enabling the Border Force and related agencies to streamline and augment the process of real time threat detection and intervention. The capabilities will also enable the government to secure, connect and analyze data over a longer period of time to gain better understanding of the bigger picture and macro trends. They emphasize the need to handle multiple data types structured such as AIS, unstructured, such as acoustic streaming data captures and demonstrates modern data processing pipelines, taking advantage of our own and third party AI and ML techniques. Applying these data architectures to the subsea domain, we have demonstrated automatically managed data routing across multi-node networks comprising a mixture of all through water, air, water interface cabled and through air RF links. Testing scenarios that simulate the needs of warfare domains such as mine countermeasures, ISR and ASW operations. Through demonstration work we conducted in December 2024, we set up a multi-domain mesh network using acoustic, optical and RF links to transfer data from one point to another in a flexible, agile way. Sara.

Sara Thurman, Head of Future Products, BAE Systems Maritime and Land Defence Solutions: [00:14:02] The key to how we deliver capability in the underwater battle space is to integrate our assured autonomy flexible payloads, including weapons and our militarized platforms, which provide us the ability for endurance and covert operations in adherence to military standards. We have continued to develop these capabilities, and we have proven them beyond theory. Nautomate, our common autonomous control system for both surface and subsurface autonomy has been integrated on both ours and on third party platforms. We have recently conducted live firings and we've conducted testings with a range of non-lethal effectors. Nautomate is at the core of our Herne XLAUV. This was also tested last year, and I'll come on to that a bit more later. We've also undertaken launch and recovery testing of an autonomous platform and across our wider underwater portfolio. Trials continue to integrate the lightweight Stingray torpedo onto P-8 maritime aircraft. This demonstrates the flexibility to deliver that effect across not just the aircraft, but also helicopters, UAVs and from ships. By far our biggest success last year, bringing together our proven effectiveness in the underwater maritime domain. Our experience in autonomy and our underwater effects was our Herne XLAUV demonstration that we did in Portland. Herne is a truly flexible, militarized XLAUV. It's easy to operate, easy to integrate. It has enduring range.

And it has high endurance and enduring range. It's flexible payload capability, provides future proofing. We can interact between ASW critical national infrastructure and ISR missions quickly. As Scott mentioned earlier. Last year's demonstration took place off the coast of Portland together with Cellula Robotics. Our partners, we managed to deliver with pace and innovation. The demo was not a one off.

Sara Thurman, Head of Future Products, BAE Systems Maritime and Land Defence Solutions: [00:16:06] Over the course of a two week period, we delivered six Isrt demonstrations to a range of external customers and delivered every time. So in terms of the demonstration, what did we learn? Firstly, we learned that trust is key. Nautomate had been proven. So we trusted that when it went out of comms, both because we were intentionally submerging it. And as part of the ISR mission, we trusted it to perform. And it did so every time we reconfirmed our view. This is not just about putting a platform in water. Secure data is the key. As Tim discussed earlier, this is complex, but we absolutely need to be able to get data to and from our platforms and integrate that with those who need to make decisions in a timely manner. Key design features matter. We need to understand how people want to be using Herne, and have the flexibility to be able to adapt and ensure that we are future proofing the design, which is absolutely what we, the design team, are doing. New technology is important. For example, Herne can deploy payloads from the bottom which allows it to launch torpedoes. Other design features such as hydrodynamics and maximising payload space for power sources are also key, and this contributes towards the flexible platform we are offering into the market. So where next? Firstly, there is a next. We absolutely believe we can provide a militarised platform into the battle space, either for use on its own or as part of an integrated battle space. Before I talk too much about this, Scott is going to continue that thread.

Scott Jamieson, Managing Director, BAE Systems Maritime and Land Defence Solutions: [00:17:46] Thanks, Sarah. So as I said earlier, we were so proud to launch our Herne demonstrator in 2024. And that was very much thanks to a successful collaboration with Cellula Robotics. So following that, and in order to maintain the momentum and driving this product into the market, I am extremely pleased to announce that we have now signed a new ten year strategic partnership agreement with Cellula Robotics. And through this partnership, we will continue our collaboration on Herne, our militarized XLAUV, and together offer that into the global market. The first

significant milestone we intend to hit will be to deliver a market ready Herne available for the military market from the end of next year. We believe we not only have the ability to put an XLAUV in the water, but to unlock that capability for navies to use in the military scenario. And to do this through its modular design, its integration and flexible payloads its trusted Nautomate autonomy. Its secure network and communications, and its military assurance that militarized capability optimized to meet specific missions by design, is what sets us apart from others. And I continue to genuinely believe that Herne is a game changer in the underwater battle space, and it will give our customers a cost effective autonomous capability, providing them with more endurance, efficiency and scale while keeping people out of harm's way. So I'd now like to hand over to Neil Manning, CEO of Cellula Robotics, to share his thoughts with you.

Neil Manning, Chief Executive Officer, Cellula Robotics: [00:19:39] Thank you Scott. Firstly, before we we do anything, I want to thank Scott, Tim, and importantly, Sara. Those guys have done all the hard work this afternoon. I have no notes. My my talk is very short, which is the good news. Because we want you all to go and look at the vehicle afterwards. So why Herne and why Cellula? Cellula has unique technology, which is a hydrogen fuel cell that lives inside the vehicle. We can move between lithium ion batteries and a fuel cell to meet these needs and mission requirements. That capability and flexibility is why we believe Cellula is an important partner. But none of this would be possible without the foresight of BAE. I can't commend them enough as a team over the last two years. We have Nick in the back there, so thanks, Nick. And for those that don't follow Nick on LinkedIn, he was celebrating his 12 years with BAE recently. So you definitely can't go anywhere for another ten, Nick. Otherwise I'll find you. So I appreciate that foresight. And we're going to jump back to some questions soon. The most common question I'm expecting to get is why a ten year deal for a militarized platform. I think if you walk around this booth that will answer the question on the exterior facade. You'll see some branding that says innovation beyond belief. That that branding is really why we're here is to continue to push that boundary and, and continue to invent and create. So I just want to thank the team for their foresight and trust in Cellula. And we look forward to the next ten years. So thank you very much.