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GEOFF SLOCOMBE // VICTORIA



Sailors from the clearance diving and mine warfare communities are introduced to the Remote Environmental Monitoring Unit System (REMUS) Autonomous Undersea Vehicles (AUV) used in shallow water mine countermeasures (MCM) and hydrographic reconnaissance by Petty Officer First Class (PO1) Smith from the United States Explosives Ordnance Disposal Mobile Unit Five during a joint USN/RAN exercise held in Cockburn Sound, Western Australia. Credit: CoA / Bradley Darvill

The Royal Australian Navy has become very serious about the contribution newer technologies can make to Navy's future capabilities. On 9 October 2020 Chief of Navy Vice Admiral Michael Noonan launched the Navy's Remote and Autonomous System & Artificial Intelligence Strategy 2040. This 28-page strategy document was downloaded shortly afterwards by APDR and it makes very interesting reading.

The RAS-AI Strategy, as it is now commonly known, is based on force protection as a partnered force under Australian control, with the potential to project force to places where it may be required.

The whole RAS-AI concept is in an Australian context covering geography with great distances and dispersion; an environment with diversity, disaster and responsibility; and an evolving strategic environment where there is regional military modernisation occurring and reduced warning times.

For the strategy to succeed it must be a national enterprise which takes a national approach requiring a warfighting culture, with skilled naval shipbuilding capacity and strong defence industry partnerships.



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The current project for maritime unmanned systems is SEA 129 Phase 5 Tactical Unmanned Aerial Systems (TUAS), now divided into three blocks. Block1 is for ANZACs and Aratura OPVs, to come into service in 2024. Block 2 will be for the Hunter Class frigates from 2028 and Block 3 will be future upgrades of the TUAS in service.

Navy's 822X Squadron, based at Naval Air Station Nowra, is already flying the Schiebel S-100 Camcopter and Insitu's ScanEagle under its non-capitalised Navy Minor Program 1942.

Trials in the delivery phase of Block 1 are planned to occur at Naval Air Station Nowra, at sea from Offshore Patrol Vessels, ANZAC Fast Frigate Helicopters (FFH) and other ship classes. Additional trials may take place in other parts of Australia, depending upon the trial requirements and availability of ranges and Defence assets.

Trials will involve 822X Squadron, Aircraft Maintenance and Flight Trials Unit and Maritime Warfare Centre. Trials are aimed at evaluating systems and informing subsequent Blocks of the SEA129 Phase 5 Continuous Development Program.

The few examples provided in this article show that the RAN is gaining the agility and technological edge to respond to an evolving geostrategic environment.

SEA 129 PHASE 5

A Defence spokesperson told APDR that 'A key focus for SEA129 Phase 5 is to assist in the development of Australian unmanned industrial capabilities. This approach will help ensure Australian industry's ability to support the ADF Unmanned capabilities is enhanced over time.

'The Invitation to register released Australian Industry Capability Information Requirements that focused on the potential responses for Australian industry participation in Block 1 and beyond. The SEA 129 Phase 5 evaluation will consider to the AIC Information Requirements as part of any down-select decision.' 'SEA129 Phase 5 will provide opportunities for the Australian unmanned systems industry for Block 1. Initially these opportunities are anticipated to be for assembly, component manufacture, ship integration systems, sensor development and manufacture, support systems (including deep level maintenance), analysis software and unmanned system research and test and evaluation. There is potential for these opportunities to develop over time to include air vehicle and related system development and manufacture.'

TIMELINE TO THE COMMONWEALTH ACQUISITION DECISION

When APDR asked for a timeline to SEA 129 Phase 5 Block 1 decision, a Defence spokesperson told us 'SEA129 Phase 5 Block 1 will run between mid-2024 and mid-2029. Responses to the Invitation to register for SEA129 Phase 5 Block 1 closed on 25 October 2020. Defence is currently evaluating the responses. Results from the invitation to Register evaluation are planned to be publicly announced on 17 December 2020.

'First Pass consideration by Government will occur by October 2021. A restricted Request for Tender (RFT) is planned in late 2021/early 2022. Second Pass consideration by Government is planned by mid-2023. Block 1 Initial Operating Capability is planned for 2024-25.'

UNMANNED UNDERWATER VEHICLES (UUVs)

Defence Science and Technology Group operates UUVs, including the REMUS 100, REMUS 600 and Gavia, for testing autonomous vehicle concepts for tasks such as underwater survey and maritime mine detection.

The RAN operates UUV REMUS 100 for hydrographic survey and seabed search and survey. This capability provides high definition seabed search, depth rated up to 100m of water in addition to collecting soundings to meet charting standards in accordance with the International Hydrographic Organisation. The REMUS 100 can be deployed from a wharf, beach, zodiac or the Deployable Geospatial Support Teams recently introduced Survey Craft.

Three SLOCUM gliders were trialled by the RAN, with a Huon Class MHC HMAS Melville as mother ship, in the Coral Sea and in the Indian Ocean near Perth during 2020 to test Military Survey options.

The gliders evaluated the piloting effort and training necessary to support larger fleets of these types of long endurance remotely operated systems. The gliders were put through configuration, launch and shallow dive tests before beginning their programmed deep dive, supported by the Marine Tech Systems remote control headquarters in Western Australia.

The Bluebottle Unmanned Surface Vessel operates in Jervis Bay during Autonomous Warrior 2018. Credit: CoA / Steven Thomson

The gliders are capable of a range of oceanographic observations including tracking ocean currents within specific depth ranges.

Melville's Commanding Officer, Commander Michael Kumpis, said launch day was an exciting morning for all of the ship's company. 'Particularly for our geospatial officers and sailors, as they engaged with the new technology and procedures. The SLOCUM Glider is an innovative and efficient solution to the challenge of oceanographic data collection. Acquisition of capability improve these gliders represents a significant for the Hydrographic Force and the Royal Australian Navy.'

The RAN's Huon Class minehunter coastal vessels are fitted with a pair of electrically powered Saab Double Eagle Mk. II remotely operated underwater vehicles for mine disposal. The Double Eagle is equipped with a searchlight, closed-circuit low light television camera and an on-board close-range identification sonar. Commands are relayed via a fibre optic link inside the vehicle's 1000 metre tether, which also relays sensor images for display on the ship's multifunction console in the operations room.

Each Double Eagle is fitted with either a disposal charge slung beneath or an explosive or mechanical cutter designed to sever the wire rope or chain holding moored mines.

UNMANNED SURFACE VEHICLES (USVs)

Advantages seen for maritime domain military USVs include continuous and wide coverage, greatly reduced capital costs, no fuel, food or crew, elimination of errors due to human fatigue and no people or expensive assets are in harm's way.

APDR attended Autonomous Warrior 2018 at HMAS Cresswell, Jervis Bay and was particularly impressed with the Insitu Wave Glider and the Ocius Bluebottle USVs. We have kept up-to-date with commercial and military trial activities for both of these platforms.

Defence's spokesperson told us 'In collaboration with industry, Defence Science and Technology Group have conducted trials with Unmanned Surface Vessels such as the Ocius Bluebottle, which are designed for persistent operation at sea and using renewable energy, and the WAM-V twin-hulled Unmanned Surface Vessels for shorter duration tasks.' 'APDR have followed progress of trialling of the original 5.5 metre/18-foot Ocius Bluebottle USVs, Bruce and Bob, studying their characteristics as renewable energy-powered vessels which use solar, wind and wave energy so that they can stay at sea indefinitely, limited only by biofouling.

As versatile USVs they have a five-knot hull speed and can be launched from a boat ramp or ship. They can carry a 300 kg modular payload while consuming 50 watts average payload power. Control is by an intelligent network which can activate team behaviours, while humans remain on the loop, not in the loop.

Back in July this year Ocius received permission for their Bluebottle USVs to operate autonomously in Australia's Exclusive Economic Zone. Their first fully autonomous trip was from Botany Bay to Ulladulla.

Bob used 360-degree cameras, radar, Automatic Identification Systems and collision avoidance software to autonomously navigate safely during the voyage, with engineers at the R&D facility at UNSW Campus Randwick and at Charles Darwin University Darwin taking it in turns being the 'human on the loop' supervisors.

Following this successful trial, Bob headed to Darwin to begin logistics and sea trial tests before the first new next-generation Bluebottle, Beth arrived in September.

On 19 August 2020 this author joined in virtually via Google Meet to Ocius celebrations for the christening of "Beth", the first of their five next generation larger 6.8 metre/22-foot Bluebottle USVs. He was pleased to raise his champagne glass and toast 'God bless this ship and all who don't sail in her'.

On 24 November Ocius christened "Bonnie", the second of their larger Bluebottle USVs.

These will be followed by three more large Bluebottles in 2021, each armed with Thales thin line sonar arrays,

radar, cameras and other sensors. Under Ocius's new Defence Innovation Hub \$5.5million contract, in 2021, they will deploy 5 Bluebottles in an intelligent networked squad to 3 different Areas of Operations doing 3 different types of jobs.

In 2013 Australia's Blue Zone group supplied eight Liquid Robotics SV2 Wave Gliders to the Royal Australian Navy Maritime Signature Management & Target Services SPO and supported them since by establishing maintenance, repair and overhaul capability in Newcastle NSW and Perth WA. BZG has also designed and implemented modifications to this fleet as well as supplying ancillary systems.

The Army Littoral Riverine Survey Squadron operate 2 Z-Boat Unmanned Surface Vessels for hydrographic survey in potentially hazardous areas. The capability provides above and below water georeferenced Geospatial Information in low sea conditions such as harbours and lakes.

Defence also introduced the Hydrographic Industry Partnership Program (HIPPI) to provide the National Hydrographic Survey Program early this year which will provide the opportunity to investigate commercial USVs suitable for future military survey requirements.

Commercially, Fugro (Adelaide based) is the first company to use a USV for hydrographic survey

in South Australian waters for the HIPPI in 2020. iXBlue (Brisbane based) has operated an indigenous designed USV internationally for several years with the first survey to be conducted in Australia expected in 2021. The Drix, operated by iXBlue, based in New Zealand.

Commercial industry uses USVs to augment ship hydrographic work to improve efficiency. Within the HIPPI it is anticipated industry will increase the use of USVs to improve hydrographic survey efficiency, as the low noise, and designed stability has already demonstrated significantly improved results over sensors operated from manned platforms.

Navy will investigate these systems further in 2021 for the future military survey requirement.

RAN TRIALS UNMANNED VEHICLES FOR HADR


In November this year the RAN announced it and the defence Industry started putting robots to the test in a simulated counter-disaster operation in Brisbane. Autonomous Warrior Genesis – the first of Navy's flagship events exercising Robotics, Autonomous Systems and Artificial Intelligence (RAS-AI) saw Unmanned Vehicles (UxVs) deployed by air, land and water to respond to a fictional Humanitarian and Disaster Relief (HADR) scenario on the Brisbane River.

Minister for Defence Linda Reynolds said the is usually exercise demonstrated Defence working with Australian Industry to integrate emerging technologies with Navy platforms to rapidly respond in emergency situations.

'Australia's commitment to maintaining a strong and secure region is predicated on ongoing modernisation of Defence capability as new and disruptive technologies emerge,' Reynolds said. 'As announced in the 2020 Force Structure Plan, the government recognises the exploration of autonomous and un-crewed systems will further safeguard Australia's capability and achieve expanded reach across the region.'

'Using autonomous systems to respond to disaster scenarios is a potential game changer for Defence by providing the agility and technological edge to rapidly support our region in times of crisis.

'Navy's recently launched RAS-AI Strategy emphasises the importance of strengthening Defence's relationship with Australian industry to together we develop innovative new ensure that capabilities to respond to an evolving geostrategic environment.'

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