NAVY

OUTLOOK

2022

NAVY

Navy People and the Future Workforce

CDRE Eric Young
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CDRE Anthony Klenthis
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Future Navy Workforce

CAPT Virginia Hayward
Director Navy Workforce
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Head Maritime Systems
Division, CASG

Future Navy Capability

RADM Pete Quinn
Head Navy Capability

Navy Training

CDRE Charles Huxtable
Commodore Training

CAPT Tony Mullan
Director Navy Training

CAPT Pat O'Brien
Director Training Strategy
and Futures

Interviews

VADM Michael Noonan
Chief of Navy

RADM Mark Hammond
Commander Australian Fleet

WO-N Deb Butterworth
Warrant Officer of the Navy

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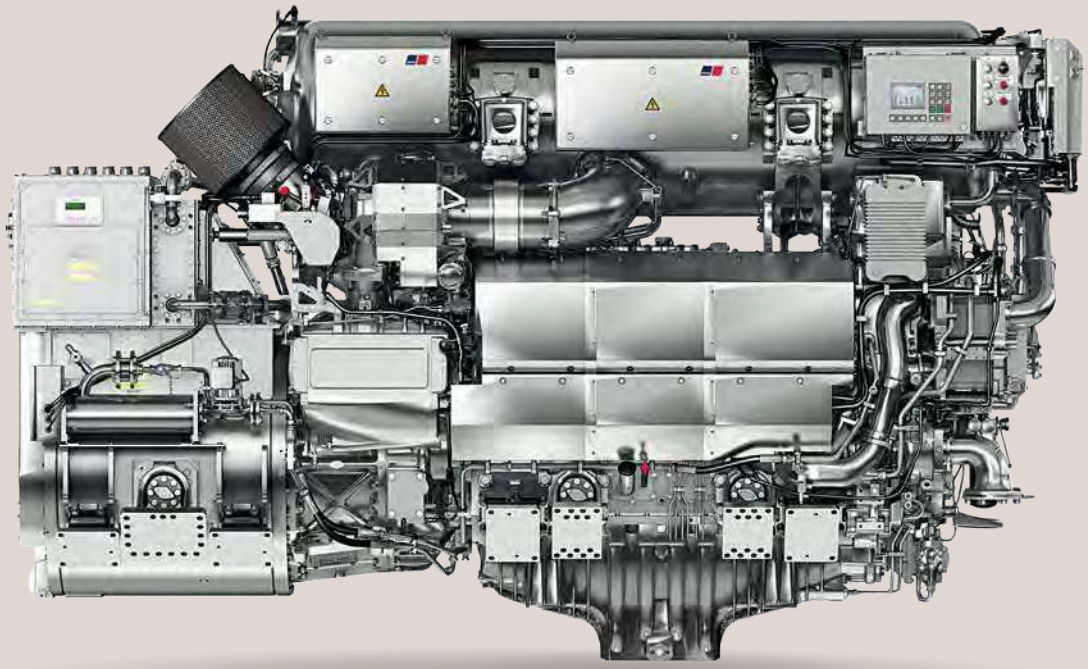

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A major project spanning land and water is helping to bring Australia's Defence infrastructure into the future, sustainably.

On the strategically important ADF base known as Larrakeyah Barracks, a $580m project is addressing reliability, flexibility, safety, and sustainability.

From power supply to stormwater management, and from purposeful ICT to sewerage infrastructure, the Northern Territory's Larrakeyah Barracks is undergoing much more than a facelift.

Having had limited refurbishment since construction in 1932, but providing a vital service to the Royal Australian Navy, Army and Joint Task Force units in the Darwin area, the barracks and HMAS Coonawarra's berthing and fuel storage infrastructure are set within an 80-hectare area known as the Larrakeyah Defence Precinct.

The Precinct, a strategically vital location from which military operations are mounted, deployed and sustained, is Australia's gateway to the Indo-Pacific.

COLLABORATIVELY DELIVERING ELEVATED CAPACITY

The project is split across two parts, with infrastructure upgrades and increased capability being provided at Larrakeyah Barracks and HMAS Coonawarra, with ground broken in August 2018 and a completion date of June 2023.

The first component is the Larrakeyah Barracks Redevelopment, which will provide reliable, flexible, and sustainable infrastructure and facilities to address current deficiencies and risks, to enhance future Defence capability. This part of the project will upgrade key services including power, water, stormwater, sewerage and information and communications technology, along with a new Base Entry Precinct and new facilities for NORFORCE. The second component focuses on facilities to support Navy operations, including a new outer wharf, warehousing and ready-use fuel storage at HMAS Coonawarra. A new outer wharf will accommodate varying combinations of major fleet units, minor war vessels, submarines, and other ancillary vessels. The delivery of these projects is being managed by Laing O'Rourke under a Defence Managing Contractor contract.

Larrakeyah Barracks

THE RESULT

Laing O'Rourke has made a large, positive impact on the community, via one of the largest active construction projects in the Northern Territory. We're very proud that a high percentage of the works packages have been awarded to local businesses. Also, a powerful strategy is in place for engaging Indigenous businesses.

The team is proudly delivering on our long and deep commitment to gender diversity and social inclusion, having recently been awarded the GOAL Indigenous Services Award for Engagement of First Nations Women at the 2021 NAWIC NT Awards for Excellence.

Our collaborative approach is also benefiting Defence as we are currently coordinating our works with other projects being carried out on Base. We drew on our vast experience on major, collaborative projects and undertook specific coordination reviews. We proactively work with other project consultants and contract administrators to de-conflict design and delivery requirements to support the future needs of these other projects. This has included coordinating the location of the Joint Health Command Facility to reduce the requirement to remove an existing building containing the Base communications node.

2021 NAWIC NT Awards

$190 million — Invested in local industry

80 hectares — Land area of the Larrakeyah Defence Precinct

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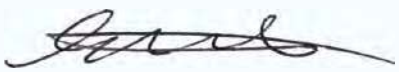
Yours sincerely,

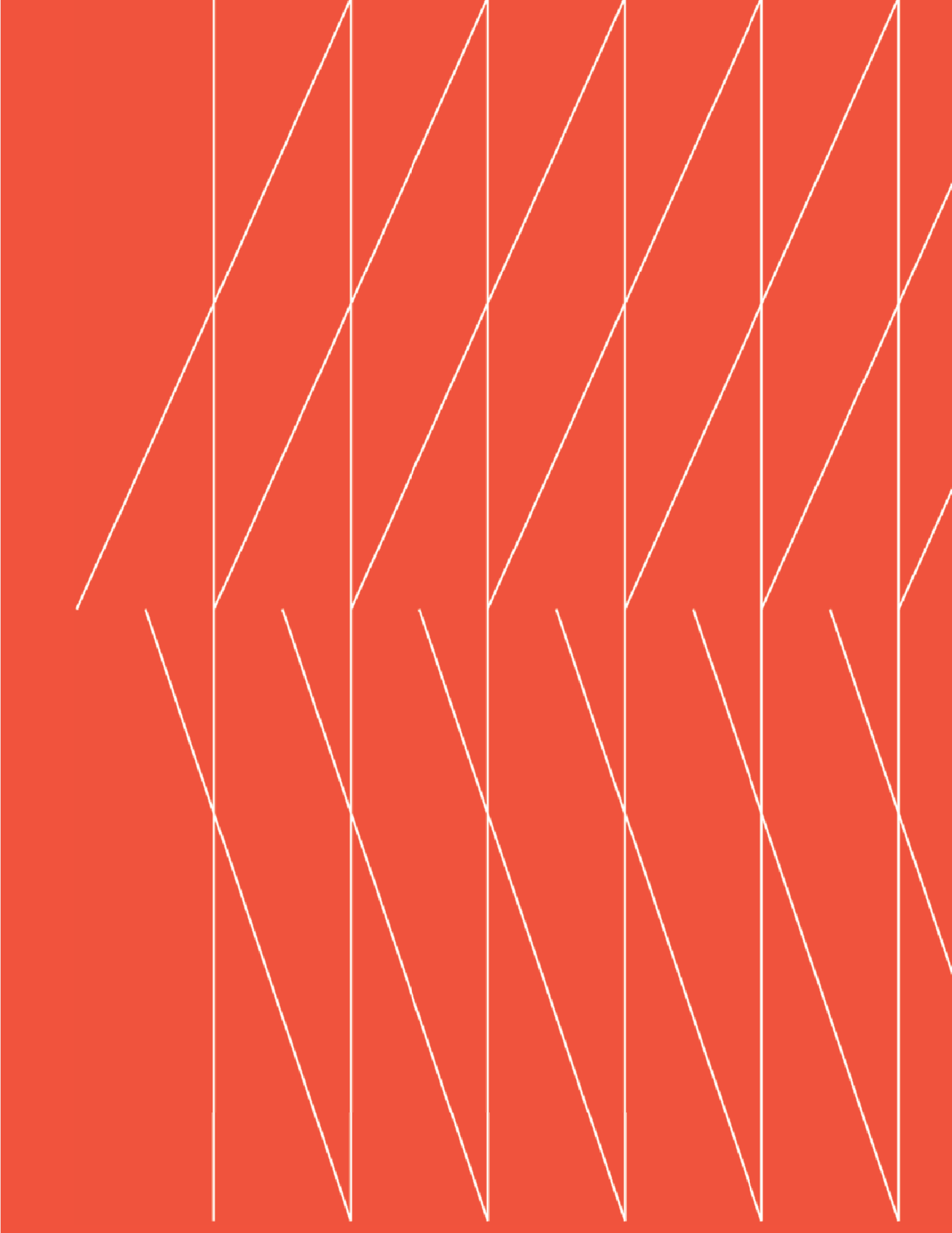
Simon White



Industry Partner, Kyndryl
Federal Government

Wayne Gray

General Manager, Delivery,
Kyndryl Federal Government
former Australian Naval Officer



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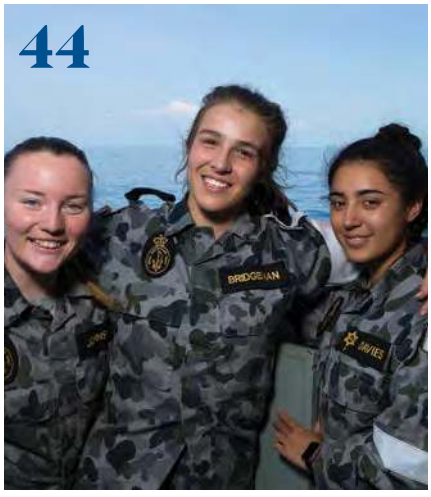

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Front Cover Image: Recruit Marlou Brown in the Royal Australian Navy ceremonial uniform. Photo by: LSIS Shane Cameron

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Vice Admiral Michael Noonan

Chief of Navy

Vice Admiral (VADM) Michael Noonan, AO, RAN, was appointed Chief of Navy on 7 July 2018 and his four-year term will end in 2022. He is the Government's principal naval advisor, whose job is to raise, train and sustain a Navy that can operate as part of the Australian Defence Force's (ADF's) Joint Force. In 2020 and 2021, Navy was at the heart of Government announcements of greatly increased combat capabilities. VADM Noonan has also faced unprecedented challenges during his term as Chief of Navy; first with the 2019 – 20 bushfires in eastern Australia and then with the COVID-19 pandemic. He has led a Navy that has grown in size and, despite the pandemic, continued to commission new ships and conduct major international deployments. A tribute, he says, to the men and women in the service. He spoke to Navy OUTLOOK's Gregor Ferguson.

What are your priorities for the Navy for 2022?
We'll see a continuation of the great work that we have achieved over the past few years. Specifically, where I want to get to in 2022 is for an alignment of Plan Mercator, which is our maritime domain strategy from now through to 2040. What we're seeking to do is optimise the Fleet-in-being while preparing for the delivery of the Future Fleet, in line with the Government's priorities around the Defence Strategic Update.

Talking of the Fleet-in-being and the short and medium-term future, mid-September 2021 saw some historic announcements regarding RAN capability — nuclear-powered submarines, the AUKUS security partnership construct, the acquisition of Tomahawk TLAMs, SM-2s and SM-6s. What do these changes mean for the RAN and for Australia?
Well, the AUKUS announcement on 16 September was clearly an historic announcement for our country and the Navy. The Defence Strategic Update and Force Structure Plan released in July last year [2020] identified that we are

Submarine USS Alexandria sails ahead of USS Carl Vinson as an FA-18 E/F Super Hornet takes off during ANNUALEX 2021 in the Philippine Sea.

IMAGE: LSIS Daniel Goodman

in a period of unprecedented strategic competition in our environment, certainly since the Second World War. Those documents signal that Government is committed and intent on enhancing the capability of the ADF and modernising the ADF over the next 10 to 20 years.

What we will see is cutting-edge technologies available to us through the AUKUS partnership, which really couldn't have come at a better time. In line with Government's commitment to 'Shape, Deter and Respond', we've now got access to military technologies and capabilities that were previously unavailable to us.

They are also huge announcements for the country as a whole. So what challenges do you anticipate in bringing the Australian people along on this new journey?

I think the greatest challenge is going to be around having a clear narrative as to why we are doing this, what it is we're doing, and clearly articulating its importance to the country's security and prosperity. Certainly, those of us within the military and Government understand these key objectives. But I personally think the challenge that we have is not alarming the Australian people but making it very clear to them that we are going to see significant investment in the ADF over the coming decades, and that this is the Government's commitment to safeguarding the security and prosperity of the country.

> "The Australian people recognise our strong and enduring partnership with the US and UK. The AUKUS partnership demonstrates the importance we place on a strong Defence Force, with a shared commitment to ensuring the Indo-Pacific region remains stable, secure and prosperous, and free from coercion.

Over the past five years, in particular, we've enjoyed a very high profile amongst the Australian people. They have a high regard for the ADF and what we do. I think our challenge is to continue to build upon that trust and confidence against the backdrop of an increasingly challenging regional strategic context.

Looking at the specifics of AUKUS, the US and the UK have been our closest naval partners for more than a century. What will the AUKUS partnership bring to that enduring relationship?

The Australian people recognise our strong and enduring partnership with the US and UK. The AUKUS partnership demonstrates the importance we place on a strong Defence Force, with a shared commitment to ensuring the

Indo-Pacific region remains stable, secure and prosperous, and free from coercion. AUKUS celebrates our shared common values and accelerates our capabilities at the very highest levels. Beyond nuclear-powered submarines, AUKUS is also an opportunity for enhanced cyber capabilities, greater investment and exploration of artificial intelligence, quantum technologies and, importantly for the Navy, undersea capabilities. Through the sharing of technologies, we will continue to grow the common capabilities and equipment that we share.

The Nuclear-Powered Submarine Taskforce and the AUKUS partners are going to undertake an 18-month study into the ways and means of acquiring a nuclear-powered submarine. How are they going to approach this?

This is a significant and vital piece of work. Over an 18 month period, Vice Admiral Jonathan Mead is leading a joint agency taskforce to determine the optimal pathway to achieve the capability. They will address not just 'what is the submarine design' we need but will also examine, in consultation with the UK and the US, the full suite of requirements including construction, safety, operation, maintenance, regulation, environmental protection, infrastructure and workforce.

We have talked about some of the relations with international partners through the lens of AUKUS. What about Navy's relationships more broadly, because everything you are doing impacts your relationships within the region and much further afield?

The relationships that we have internationally are vital to our continued international success and I'm very proud to tell you that we have very strong relationships in the region. We now have 18 formal Navy-to-Navy relationships around the world. They are one-on-one bilateral relationships.

The relationships that we have in the Southwest Pacific and the region more broadly, I think, are the strongest they have ever been. Our partnerships with countries like Fiji, Papua New Guinea, the Solomon Islands, Timor-Leste and Vanuatu are certainly the strongest I've ever known them to be. That is also significantly enhanced through the Government's efforts with respect to the Pacific Step-up activities that we've been undertaking now for more than four years.

Through the delivery of the Pacific Maritime Security Program and the gifting of the 21 Guardian-class patrol boats, we've seen a tighter level of cooperation, not just between us and those 14 countries in the Pacific and Timor-Leste, but amongst themselves. They have a common capability, they have a common commitment, they are interacting more closely and they are taking true responsibility for their maritime security and prosperity.

More broadly, in Southeast Asia, our relationships are as strong as they've ever been. I regularly speak to my counterparts in Indonesia, Brunei, Singapore and Japan and they too are very committed to security in our region. As far as the AUKUS announcement has been concerned, the feedback from them has been positive, and I've been delighted with that.

Further west, our relationship with India is the strongest it's ever been in a military-to-military sense. We have just finished participating in Exercise MALABAR for the second year, and there

IMAGE: LSIS Daniel Goodman

HMAS *Brisbane* enters the Port of Busan in South Korea during a Regional Presence Deployment.

is an intense focus on the importance of the Quad relationship between Australia, the US, India and Japan. Certainly, we've seen a significant increase in the level of military-to-military activities within that Quad relationship, and that too is extremely beneficial in terms of our common narrative around the importance of security in the Indo-Pacific.

We have talked about the headline stuff — nuclear-powered submarines and new missiles were all part of the AUKUS announcement. What other emerging technologies are going to be important to the Navy and how are you going to pursue them?

It's a bit of a treasure trove of opportunity at the moment. For Navy, the important one is the submarine capability. For me, probably the next most important is maritime strike capability, and while that is addressed under AUKUS through the acquisition of the Tomahawk missile, which we'll see integrated into our Destroyers in the mid-2020s, there is more work to be done there more broadly across the maritime domain by both Air Force and Navy.

> "...there's clearly an opportunity, but there's also a challenge for the industry to have the right people in the right place.

The next most important area is undersea warfare. We are seeing an increase in the number of submarines that are operating in our region. There will be well over 300 in the 2030s. We are seeing increased endurance and stealth capabilities in the submarines operating in our region. Ultimately, our ability to operate as we choose in the undersea environment is going to be dependent on having a robust capability, which we will have with the future submarines. We also need an increased ability to know what's happening in the undersea environment. I am keen to explore more opportunities with respect to seabed sensing, undersea autonomous systems, and looking at more opportunity for detection and sound propagation through the undersea environment. We are working very closely with our good friends in Defence Science and Technology Group. One of their STaR Shots [Science, Technology and Research Shots] is 'Remote Undersea Surveillance'.

How important is speed in acquiring and fielding the capabilities the Navy actually needs?

Time is of the essence in any environment where you're talking about strategic competition, and there is going to be an intense amount of pressure for Defence to deliver these new capabilities as quickly as possible. We also need to ensure that it's done right, particularly for the submarines. It's no good having the capability if we don't have the trained people, or if we don't have the nuclear stewardship or regulatory requirements in place,

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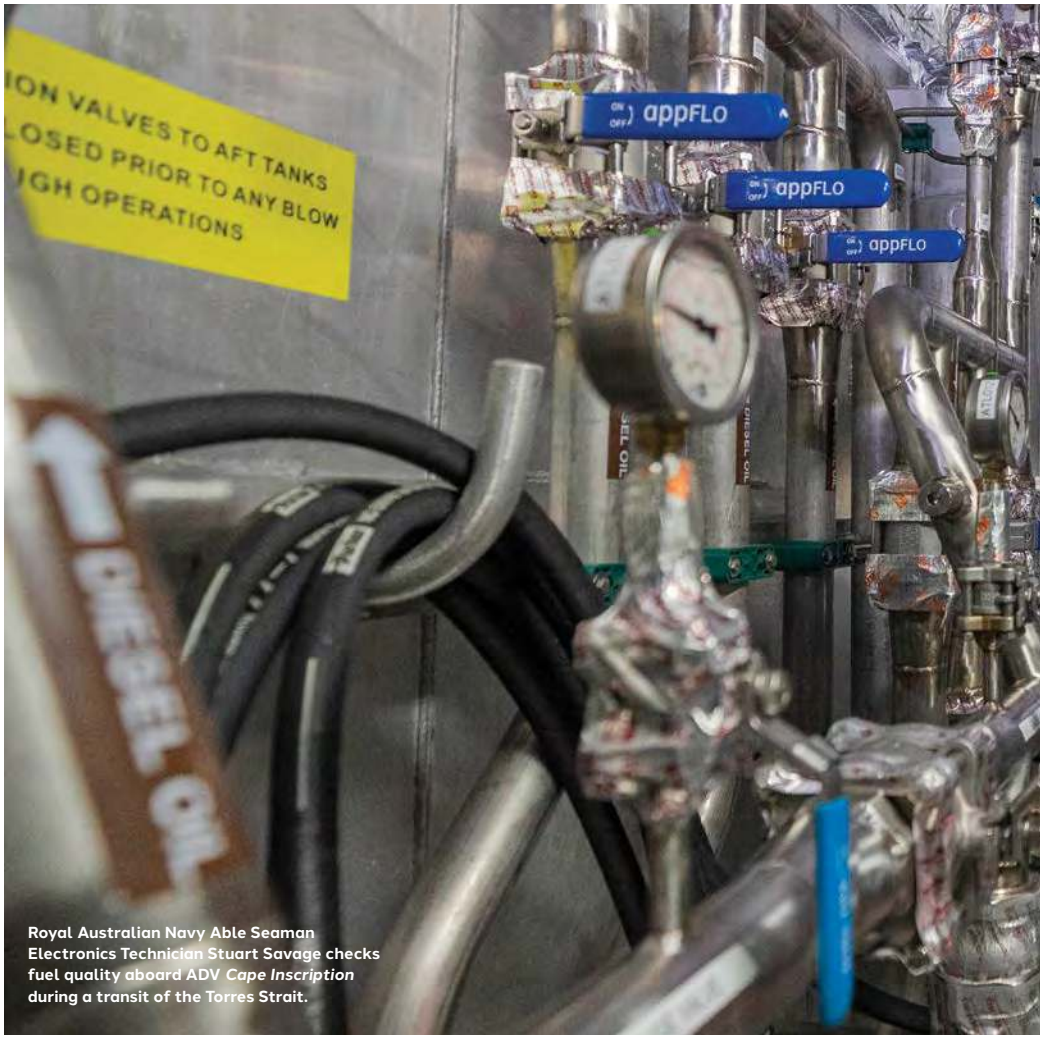

Royal Australian Navy Able Seaman Electronics Technician Stuart Savage checks fuel quality aboard ADV *Cape Inscription* during a transit of the Torres Strait.

IMAGE: SGT Sebastian Beurich

or we don't have the defence industry required to maintain the capabilities. It's a complex space, delivering these new capabilities. Government will be seeking for us to deliver these things as quickly as possible. There is no opportunity to do any rework here. We have to get it right the first time.

It seems to me the limiting factor is not industry or Defence capacity; it is the sheer complexity of the technology.

I think it's all of the above. There's clearly huge enthusiasm within the Australian defence industry at the moment. Industry have been growing our industrial base — both in terms of capability and workforce. We are now at a point where the Government's commitment to new capabilities is unparalleled in modern history.

We've heard the Prime Minister speak very openly about his commitment to increased Defence spending. But there is a large number of capability projects on the horizon — the OPVs, Future Frigates, the new submarines, the Collins Class Life of Type Extension, and the Government's commitment to develop guided weapons' production in Australia — and for the amount of production and maintenance work, the skilled workforce in Australia, in some of these very specialised areas, is very small. So, there's clearly an opportunity, but there's also a challenge for the industry to have the right people in the right place.

For Navy more broadly, our workforce has been steadily growing over the past four years, with more than 15,500 men and women as we speak today. But as we field this larger force into the 2030s, we're going to need more people. Without an expanded capability, both in the Navy and within

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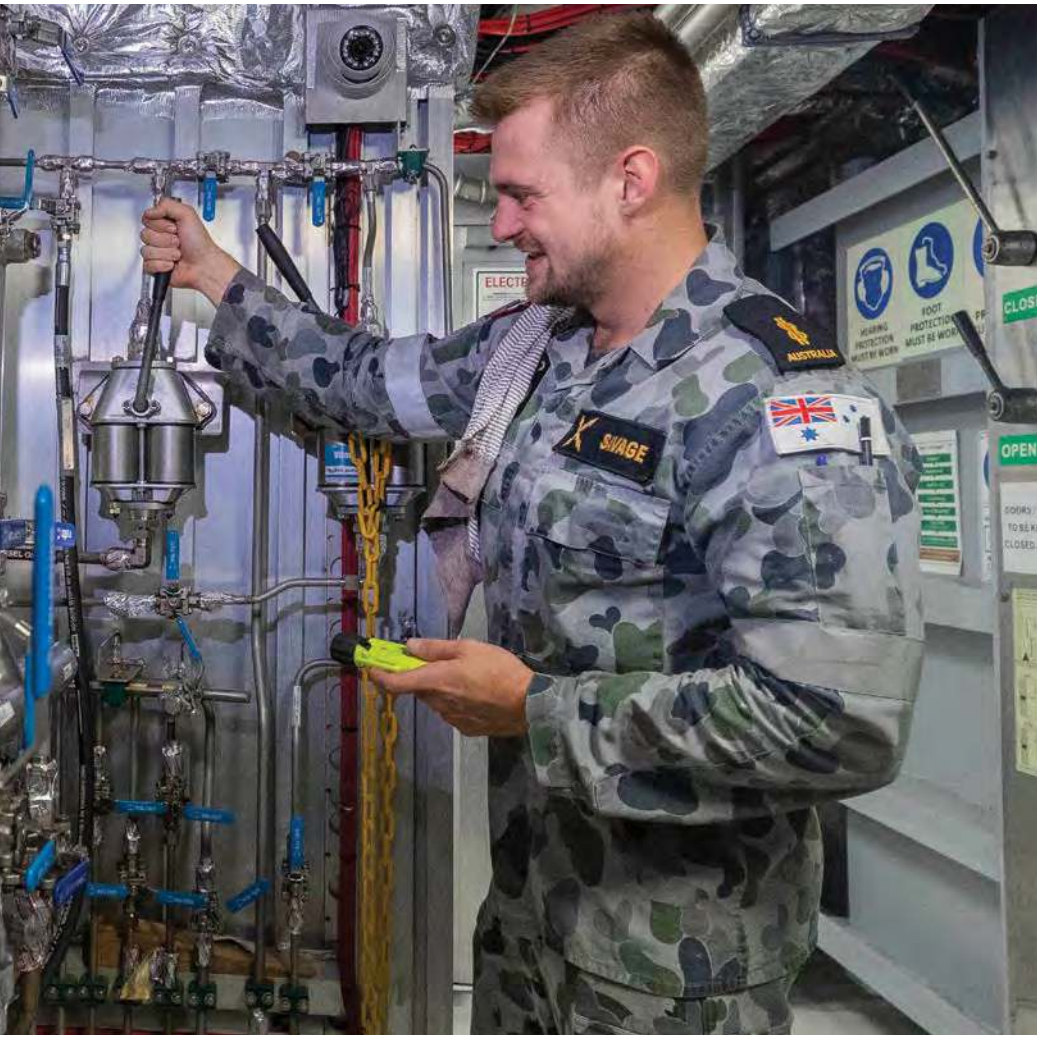

industry, it would be very difficult to deliver these future capabilities.

The expanded Navy workforce is really all about maintaining critical mass in some of your critical trades and professions, isn't it, and being able to do that sustainably?

Absolutely. Everything that is happening in our Navy, both now and into the future, has a very high level of technology associated with it. So, when you talk about the future Navy workforce, every single person in our Navy needs to have a level of technical understanding and some of them will be very, very specialised. We will have nuclear engineers in our Navy in 10 years' time.

So that workforce and that focus on technology is really important, but what it means for us now is that we need to be thinking as a country, not just as a Navy, about the importance of STEM in our high schools and primary schools and flagging those opportunities for young people right now as to what the Navy will offer them in their adult and working careers.

A sovereign industrial capability is almost the opposite side of the coin that you just described when you are talking about naval capability. What does sovereign industrial capability mean to you and the Navy, and why does it matter?

Sovereign industrial capability, to me, means our ability as a sovereign country to build and maintain those platforms, those capabilities that we ultimately need to ensure our prosperity and security. While ideally, we would have a capability to design, build and sustain our own ships, submarines and aircraft, clearly that's a long way off. In some areas we have that capability now.

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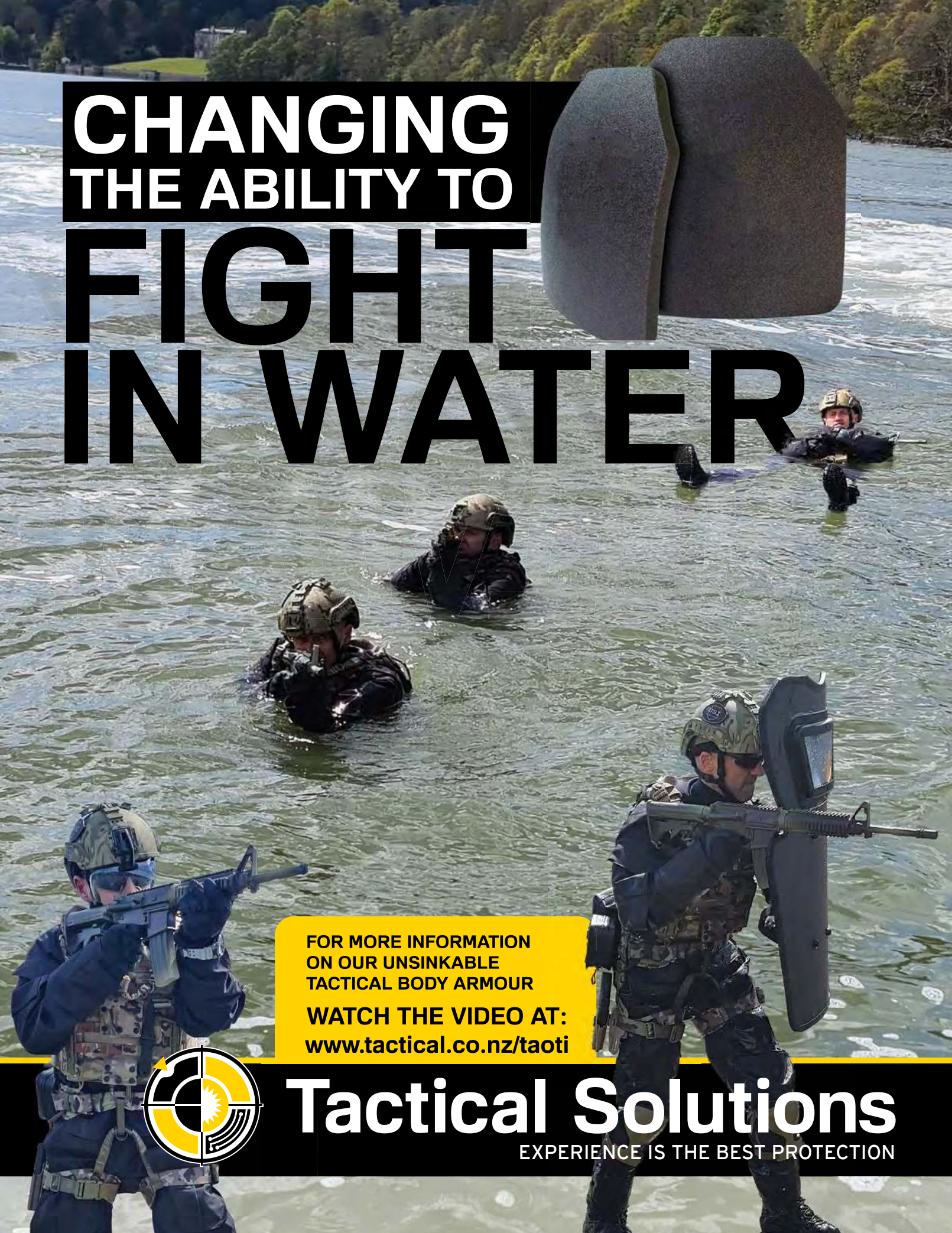
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> The challenge that I'd like to offer our people is this: if each of our people can leave their job and the things that they're responsible for slightly better than when they started, we will be a stronger organisation moving forward.

But we are going to need the support and assistance of trusted friends and partners to design, build and ultimately sustain, and I very firmly believe that we have those relationships.

Your term as Chief of Navy comes to an end next year. Any reflections on your term as Chief of Navy?

I've approached my term from day one with all of the energy and commitment I have. I reflect very proudly on our operational achievements, of which there have been many, both for the Navy and for the Nation. But my proudest reflection is in terms of the size and the shape of the workforce.

We have a larger Navy than when I started. The largest Navy in the past 28 years. It's the most diverse Navy that we've ever had. We've got the highest participation of women in our Navy that we've ever had. We've got the highest participation of Indigenous people in our Navy that we've ever had. We have a Navy that's culturally diverse and the diversity that we have, we cherish, we embrace it, we value it and we use it to good effect. Our separation rate is low, and I genuinely believe that the majority of our Navy wake up in the morning and come to work because they're inspired, they're excited, they're committed and they understand that we are doing a very, very important job at a very, very significant time in our Nation's history.

There is no finish line in our work and we are an incredibly important national institution. As I look at my tenure of four years of stewardship, I think I will be able to say that I will leave our Navy in better shape than I found it. The challenge that I'd like to offer our people is this: if each of our people can leave their job and the things that they're responsible for slightly better than when they started, we will be a stronger organisation moving forward. ●

IMAGE: LSIS Jarrod Mulvihill

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Image courtesy BAE Systems Australia

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South Australia at ready to deliver for Defence

By Richard Price, Chief Executive, Defence SA

IMAGE: Luerssen Australia

The rapidly evolving geopolitical environment may have changed Australia's acquisition priorities last year, but one thing remains certain: our industry stands ready to deliver some of the most significant maritime and naval shipbuilding projects in the history of our country.

With a strong foundation in shipbuilding construction and sustainment, over coming decades South Australia will spearhead a raft of major naval projects, reaffirming the state's position as the maritime capital of the nation.

The continuous build of warships and submarines is powering forward in South Australia, with the first offshore patrol vessel, NUSHIP Arafura, launched at Osborne Naval Shipyard in late 2021 and entering service this year. As work progresses on the second offshore patrol vessel and Hunter class prototyping, local industry is building its capability for the larger, more complex shipbuilding projects on the horizon.

Within the next two years, production starts on the Hunter class frigate program. This major project, in addition to the full cycle docking and life-of-type extension of the Collins class submarines and a major upgrade of the Hobart class destroyers' combat management system, is critical to boosting South Australia's industry and workforce in preparation for highly complex submarine construction.

The Australian Government's intent to build a fleet of nuclear-powered submarines in South Australia presents an exciting opportunity for local industry. As the scope and direction of the project becomes clearer, South Australia is working to ensure it has the industrial base with the capability to take advantage of the opportunities that lie ahead. The investments already made on the Attack class submarine program place industry in a prime position for work on the nuclear-powered submarines. Importantly, a key to delivering local industry content on the project will be the early identification of sovereign needs, supported by strategic investment to demonstrate safe, secure and repeatable manufacturing capability to the necessary certification standards early on in the program.

South Australia is working in lockstep with the Australian Government to ensure local industry is ready to take on the challenge of supporting this national shipbuilding endeavour. A key element of this is developing the skilled and technical workforce to deliver these complex, large projects. South Australia is strengthening the skills and expertise of its existing workforce — already consisting of some of the most experienced shipbuilders in the world — and increasing the volume of workers.

The local defence industry is reaping the benefits of a range of workforce initiatives, while many primes and smaller businesses are taking a proactive approach to workforce development. BAE Systems Maritime Australia is a shining example of a company committed to building a future-ready sovereign shipbuilding workforce through its school-based apprenticeship program. The company is developing a pipeline of skilled apprentices, with the first cohort now working full-time at the world-class Osborne Naval Shipyard alongside the nation's most seasoned and experienced naval shipbuilders on the Hunter class frigate program.

South Australia is fostering a highly-skilled workforce to deliver a pipeline of Defence projects now and into the future, ensuring we play our part in building and sustaining the nation's sovereign capabilities.

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Rear Admiral Mark Hammond

Commander Australian Fleet

Rear Admiral (RADM) Mark Hammond was appointed Commander Australian Fleet (COMAUSFLT) in November 2020. In this role he is responsible for the raise, train and sustain activities of the Australian Fleet and, under the Chief of Joint Operations, for the operational control of maritime operations in the Indo-Pacific. He assumed the role shortly after the Defence Strategic Update unveiled a portfolio of Navy capability enhancements and a revised threat assessment. His tenure also commenced right in the middle of the COVID-19 pandemic, which has made implementing his Commander's Intent more challenging. He spoke to Navy OUTLOOK's Gregor Ferguson.

So what is the Fleet Commander's evolving role in the 21st century?
The incumbent is responsible for force generation (the traditional role) and force employment (since 2020). As Commander Joint Task Force 635, the Fleet Commander is now force assigned to the Chief of Joint Operations for planning and commanding the majority of Australian maritime operations and exercises.

So does that skew the mindset of the incumbent more towards the warfighting aspects and contingency planning?
It places you squarely inside the operational domain and certainly focuses you on optimising the readiness of the Fleet-in-being for the challenges of the contemporary operating environment, and making prioritised

Leading Seaman Aircraft Technician Avionics Matthew Dockrill marshalls a Japan Maritime Self-Defense Force Seahawk helicopter from JS Inazuma, during flying operations as part of Exercise NICHI GOU TRIDENT 2021.

recommendations to Canberra about future capabilities, etc.

The Defence Strategic Update heralded a significant change in thinking and threat assessment for the Australian Defence Force, and that demands an optimisation lens across all that we do — and we've been getting after that. It quickly became apparent that we in the Fleet also needed to challenge the status quo and make sure that everything we were doing was optimised for our contemporary operating environment, as opposed to potentially carrying forward historic or traditional ways of doing things that may not be fit-for-purpose. This challenge sharpens your focus. My Commander's Intent ended up as just one line — *Do everything humanly and legally possible to optimise the Fleet in Being.*

In terms of optimising for the contemporary operating environment, we know that what was critical to the success of our operations in the Middle East isn't necessarily what we need now to be successful in all domains and all contingencies across the Indo-Pacific. And the 'speed of relevance' has changed. We're a Navy in transition from ballistics to whatever follows. There are other navies that have already transitioned from ballistics to hypersonics, and I think that capability domain is going to colour maritime warfare for years to come.

The three legs of our optimisation program are: Availability, which hinges on our sea worthiness approach to yield availability where and when desired; Sustainability, which is making sure you've got the resources and resilience across the supply chain and people domain to sustain those high-end, long-distance operations; and then Lethality — the right capabilities to find, fix and finish authorised targets, at the speed of relevance.

About 98.5% of everything that we exchange with our overseas trade partners enters or leaves the country by sea, so is protecting sea lines of communication still the priority?

It is not just about goods and services that transit via merchant traffic. A lot of our financial transactions are enabled by undersea cables and so the maritime domain, from the seabed to the sky, enables our economic security and is our bridge to the international community.

In this sense I wonder whether sea line of communication understates the vitality of what we are describing. We are not talking about just communication. We are talking about

> Looking ahead it's really the minor war vessel capability that will transform over the next 3 to 5 years while we execute a significant amount of capability upgrade, infrastructure upgrade and renewal across all of our major establishments and training facilities.

economic wellbeing, from which prosperity and security are derived. In many senses this is our vital national security terrain, and protection of vital terrain in the maritime domain is the reason our Navy exists.

There have been some major announcements in the past couple of months but many of them will take a few years to implement. What are the big changes in the Fleet's operational capability that you expect to see in the short and medium term, say 3 to 5 years?

I think we will see evolution through optimisation, not revolution, in the short term and some lethality improvements in our surface combatants; the advent of our offshore patrol vessel capability; and transformation/renewal of our enabling infrastructure in the medium term.

We have spent the past 12 months running the ruler over everything we have in the inventory. The way we use it, the way we generate capability, looking for those opportunities to stop doing things that no longer make sense, to adjust the things that need to be adjusted and to start new things that make more sense. And that includes everything from training certification to the battle-worthiness process, as well as reviewing decommissioning plans for some of our fleet units while we wait for other ships to come online.

And that's all been done against the backdrop of COVID, which has hindered my ability to get around the Fleet. The persistent COVID context is really important because it both underscores and undermines some of our capability and achievements this year. Despite COVID-19 in 2021 we have commissioned both *Supply*-class AORs, *Supply* and *Stalwart*; completed Air Warfare Destroyer trials, and launched the new Offshore Patrol Vessel NUSHIP *Arafura* in 2021.

Looking ahead it's really the minor war vessel capability that will transform over the next 3 to 5 years while we execute a significant amount of capability upgrade, infrastructure upgrade and renewal across all of our major establishments and training facilities. A significant investment is underway by the Government and Defence enterprise in upgrading Navy's infrastructure and that will continue over the next 3 to 5 years.

You have now got three operational DDGs. What difference are they making to the way the Navy operates and engages with its allies and its potential adversaries as well?

The *Hobart*-class DDGs are the most capable air warfare ships we've ever operated. They are very, very effective at anti-air warfare. Their radars, combat systems and sensors are state-of-the art and the weapons systems we employ are very effective. They're equipped with the Aegis Combat System and that system gives us connective tissue with the United States, Japan and, to an extent, South Korea, and there are exciting opportunities there.

As a submariner I have witnessed the depth and strength of the relationship between the Australian and US submarine forces grow profoundly over the past 20 years, enabled by equipment commonality — the BYG-1 combat system and Mk48 torpedoes. The Aegis program affords a similar opportunity for our people to train with, operate with and deploy with United States high-end warfighting capabilities in the surface domain. So that's really exciting. And when you marry the DDGs with the MH-60 Romeo helicopter, you end up with a very capable ASW package as well.

For me, the three DDGs are impressive in terms of their capability but also in terms of their visual impact. They're a lot bigger than an *ANZAC*-class frigate and that has a certain impact when you sail into somebody's port or when you operate with them. When you send that billion-dollar warship to somebody's exercise, you send a strategic message. So across the realm of diplomatic to military engagement, they are a real asset and are already doing a wonderful job.

That said, I would like to see a future upgrade to add long-range anti-surface and strike missiles to complete the lethality picture. The utility of the platform would increase markedly if we do.

This year's Exercise TALISMAN SABRE was the biggest ever held. What does that say about the relevance of the exercise and what are the abiding lessons for the RAN?

I was the lead planner for TALISMAN SABRE 2011 and I have watched it grow and develop over the years. Traditionally TALISMAN SABRE had a heavy focus on amphibious lodgement and land manoeuvre with a relatively light focus on air and maritime precursor and enabling activities. In line with the maritime context of our Defence Strategic Update, and our operating environment, we are seeing more focus on 'all domain' warfare.

The 2021 edition was a little smaller than previous editions due to the impact of COVID-19, but participation of high-end naval and air capabilities – which evolve with each iteration — is driving a stronger dividend for us from a maritime warfare perspective. Frankly, the 2021 outcome was remarkable given the hurdles our participating nations and whole of government partners had to overcome.

This augers well for future iterations of TALISMAN SABRE as we strive to evaluate our ability to create and sustain a permissive environment to deploy and employ sealift and amphibious capabilities.

You have managed to maintain the tempo of the Exercise INDO-PACIFIC ENDEAVOUR Series despite the pandemic. How have these exercises helped both the RAN and the navies that you work with in the Indian Ocean, Indo-Pacific and Southwest Pacific?

I'd say it's going very well and, at the end of the day, that's our job to breathe life into — to animate — the government strategy of Shape, Deter and Respond.

IMAGE: POIS Yuri Ramsey

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>
> *CN 2020 RAS AI Strategy*

Numerous scientific studies attribute human error as the main reason for work-related accidents and industrial incidents. As a pertinent example, The USS John S. McCain collision in 2017 was one of several incidents where there was unnecessary loss of life. Whenever we see a repetitive copy and pasting activity or expect a human analysis of vast quantities of raw data, we know there is a better alternative.

Military personnel are trained to make mission critical decisions and aggregate risk based on near real time Objective Quality Evidence. There are significant gains to be made in efficiency, accuracy and culture by automating repetitive and complex processes. Moreover, it releases valuable time to work on more abstract problems and improve decision traceability.

Paradoxically, the cutting-edge warfighting assets and systems are often supported operationally through spreadsheets and muddy data. Non-systemised data is challenging to manage and sustain, particularly given the rate of personnel churn, pre-requisite training and cumbersome file systems. This impediment diminishes our preparedness.

12thLevel has 18 years of experience working with Defence source systems and warfighting information. More importantly, we come with strong credentials in user-centred design and decision support as the key principles of the RAS AI strategy. We have demonstrated this through our successful research and development on some of Defence's complex problems. Over the last 18 months we have worked with to Talisman Sabre Logistics, Maritime Warfighting Analysis and Development, Force Structure Plan Optimisation, Experimentation Data design and Navy Seaworthiness Management to deliver measurable outcomes.

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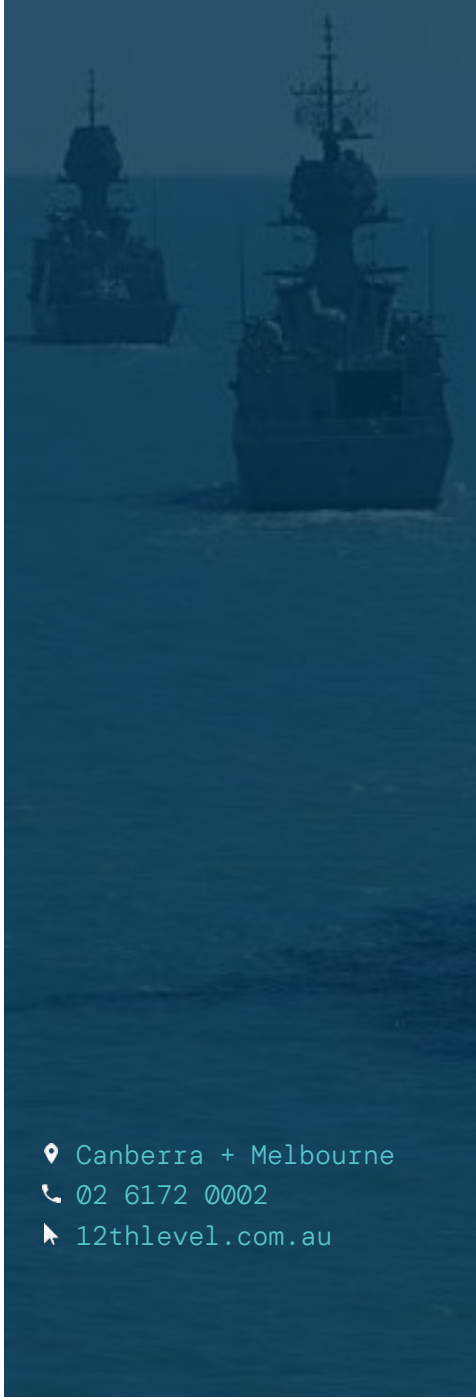

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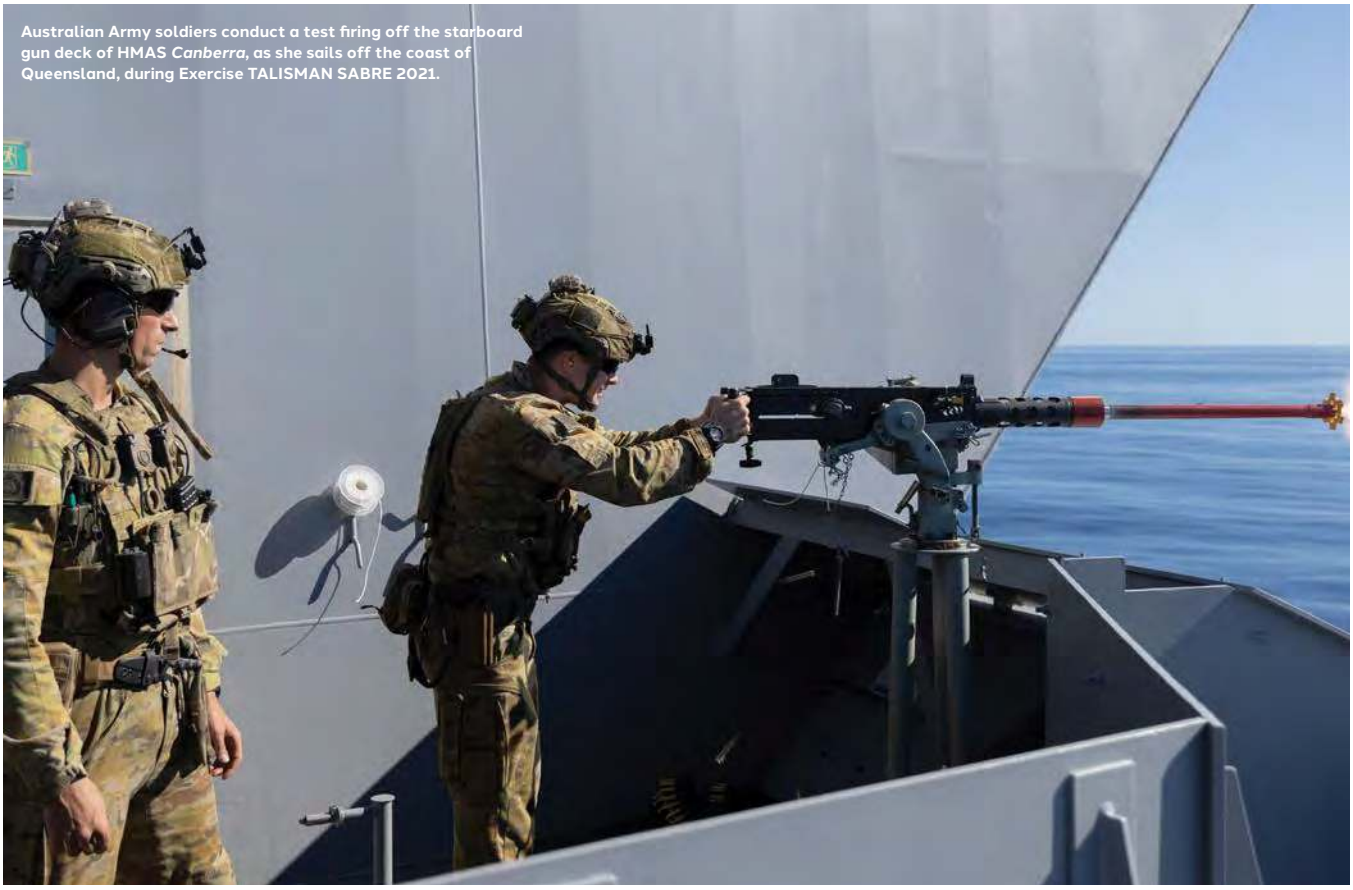

Australian Army soldiers conduct a test firing off the starboard gun deck of HMAS *Canberra*, as she sails off the coast of Queensland, during Exercise TALISMAN SABRE 2021.

The team that planned INDO-PACIFIC ENDEAVOUR for 2021 did a great job in fighting through the distractions and constraints of COVID. We pushed the envelope in terms of trying to achieve things virtually, often in a contactless environment.

If you want to shape or have influence you've got to be present. You can't do that from home port. We don't need to be good at operations off the coast of Sydney, that's the easy bit. We need to be good at sustaining shaping and presence operations 4,000 miles from home. When you do that successfully, then you build competency, capability and resilience, and you also build trust.

The team that planned INDO-PACIFIC ENDEAVOUR for 2021 did a great job in fighting through the distractions and constraints of COVID. We pushed the envelope in terms of trying to achieve things virtually, often in a contactless environment.

In some respects we've been the only Navy to do this, to show up and to engage in this meaningful way with a lot of our partners, and it has been greatly appreciated. All of the reflections I've seen — from our missions overseas, our embassies and through my colleagues in our partner navies — they've all appreciated not just the fact that we show up, but they know how much hard work has gone into this, and also the sacrifices of our people. Some of our ships deployed out of Fleet Base East in Sydney — a city in lockdown — and then they've come back to their families in a city in lockdown. Other sailors have been unable to see their families across the country or across the world, yet they have continued to prepare for and execute our deployment cycles. That, to me, is inspirational and a real testament to the quality and character of our people and their families. We are reminded that they are indeed the strength of our Navy.

COVID-19 notwithstanding, how are the changes in the way that Navy manages its people impacting on your ability to deliver the effects that government expects of you? If you take COVID out of the equation, if that is possible, how are the changes actually affecting what you do?

You can't not discuss COVID when you talk about Navy operations in 2021. It has been an abnormal 12 to 24 months due to COVID, and the impact on our people has varied across the country — but it does colour everything.

2021 has been a year without normal overseas port visits – plenty of wharf visits and logistic stops, but no real R and R opportunities like we took for granted pre-COVID. It has meant deploying from home ports in lockdown — leaving families during periods of great uncertainty and deploying into uncertain environments regularly. It has meant our crews have had to focus on

IMAGE: LSIS Nadav Harel

animating, deploying and sustaining our deployed teams despite not seeing their families who live interstate – their partners, their kids, their mums and dads. In this sense we have asked a great deal of our people and their families, and they have delivered time and again.

And despite these challenges our Navy has delivered the effects traditionally expected of us by Government, and some new ones (eg COVID Assist). So, superficially the impact is negligible but I expect we may see longer term impacts in the separation rates as our people contemplate potentially doing it all again.

I know assumptions are dangerous, but if we assume that the pandemic is a relatively short-term phenomenon, what are the longer term logistics challenges that you can see coming?
Global supply chains — this is on everybody's mind, especially ahead of Christmas. In our case the challenges are still revealing themselves in many instances but the risk treatments are pretty clear – innovation, and great partnerships with Industry and allied Navies.

> "...it's the character and quality of our people that are the strength of our Navy...

In the last couple of years we have made significant strides with regards to 3D printing of spare parts — but there is more to be done in a controlled 'risk managed' approach. COVID-19 has forced more momentum in this regard, and that is an exciting challenge.

The strength of our relationships with industry in Australia has also become a real positive. That's one of the changes I think that we should celebrate more often. You can go back to Operation BUSHFIRE ASSIST, when contractors sailed on HMAS *Adelaide*, completing a gas turbine install. That's a great example of what partnership with industry looks like. More recently Thales and the Capability and Sustainment Group established a rapid antigen testing facility in the Fleet Base East car park to keep our people safe (I used it several times before visiting our ships alongside). We also had contractors deploy a couple of months ago in a contracted vessel to the Southwest Pacific to conduct repairs on HMAS *Diamantina*.

So I would say that our partnerships with industry are and will continue to be our strongest risk mitigators with regards to COVID impacts on our operations, and we need to leverage these relationships to optimise our ability to mitigate the global supply chain risk.

Additionally, where we are dependent on overseas sources for items, our relationships with foreign navies such as the US Navy or the Spanish Armada means that we can lay our hands on many spare parts pretty quickly. Our mature logistics and support agreements then enable us

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to identify and move spare parts at pace to where we need them to keep our ships operational.

In your position you actually run all the ships and it was Rudyard Kipling who said, "The strength of the ship is the navy, the strength of the navy is the ship". He was writing about a different navy and a different time, fighting a different war, but is there still some truth in what he said?

Yeah, there is, but I also think there is more to it than the quality and quantity of our ships.

Our Navy has arguably been too fascinated by platforms and systems as symbols of our capability and strength. To me it's the character and quality of our people that are the strength of our Navy and, you could argue, the character and quality of our defence industry and partner navies that underpins the strength of our Navy.

"It is the strength of character and quality of our people that define our Navy, upon which so much depends."

(l-r) HMAS *Brisbane*'s Commanding Officer Commander Aaron Cox, Commander U.S. 7th Fleet Vice Admiral Karl Thomas and Lieutenant Commander Matthew Stobo, talk on HMAS *Brisbane*'s forecastle during a port visit to Yokosuka, Japan, as a part of a Regional Presence Deployment.

IMAGE: LSIS Daniel Goodman

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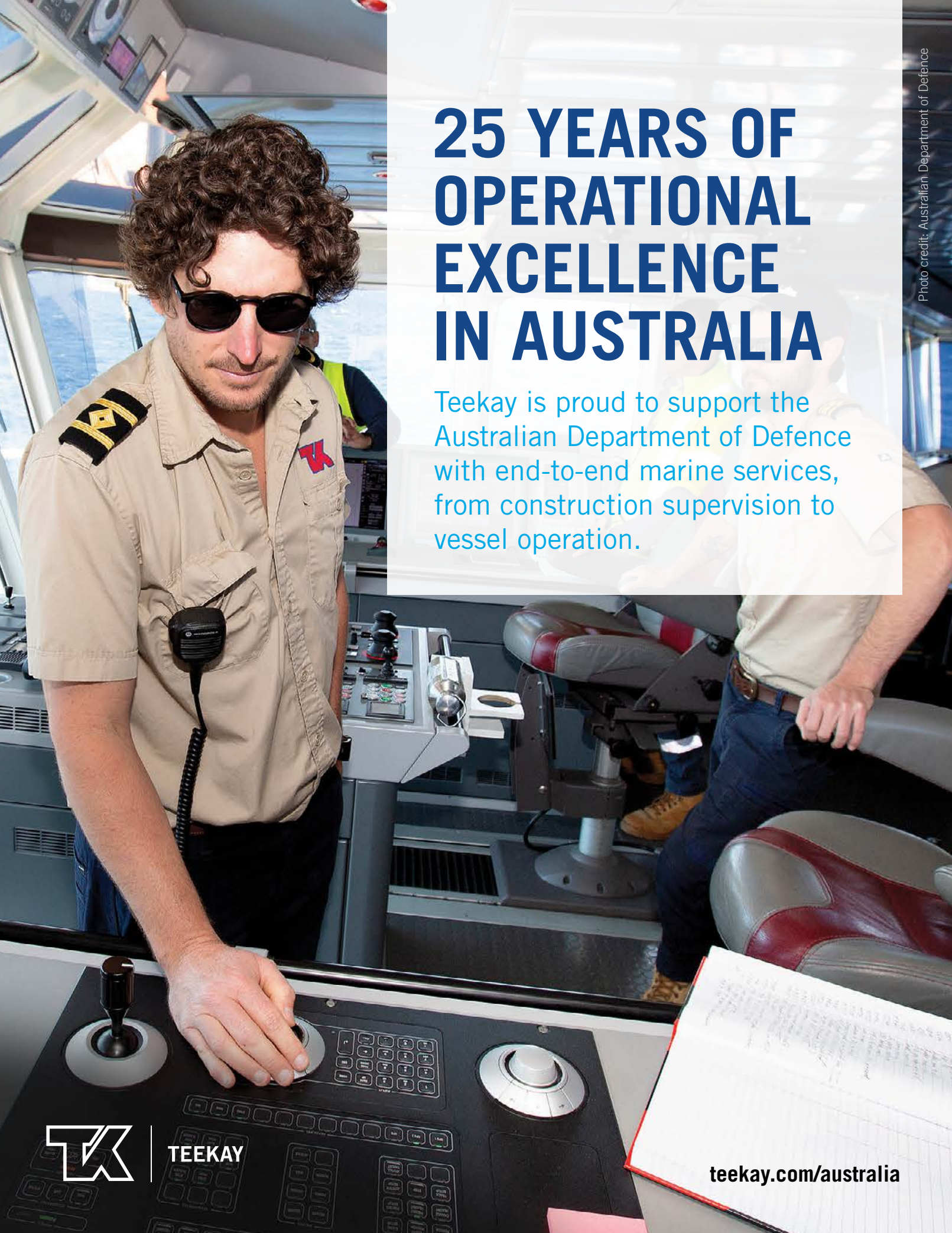

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In September 2021, Teekay was awarded a contract with the Department of Defence to provide In-service Support for five existing vessels as part of the Defence Marine Support Services Program (DMSSP). Immediately after the awarding of the contract Teekay engaged crew in order to begin planning and training to provide platforms, MV Besant and MV Stoker, to support the BLACK CARILLION exercise.

The BLACK CARILLION exercise brings Navy personnel and private companies together to conduct submarine abandonment, escape and rescue operations. The objective is to demonstrate that parties can meet the appropriate requirements and be ready to respond at short notice to conduct such operations. Thanks to the teamwork, professionalism, and technical expertise demonstrated by all parties involved, the exercise met its objectives. The success of the exercise, which ran between 17 October and 10 November, resulted in the certification of the Navy's submarine rescue protocol for another year.

On signing the DMSSP agreement, Teekay had just five weeks to prepare for the large-scale exercise while overcoming Covid-19 related restrictions. That process included manning, taking over management of the vessels from the previous operator, undertaking class surveys, and passing the Sea Release while also preparing for the exercise itself. Even within these parameters, Teekay demonstrated its ability to meet the technical and professional demands of such a rigorous submarine exercise, all while setting a new benchmark in cooperation. The success of the exercise further demonstrated that Teekay's flexible model, manning capability, and innovative operational techniques are a positive addition to the Navy's defence capabilities — now and into the future.

IMAGE: Department of Defence


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Sailors pivoting during the pandemic

Warrant Officer of the Navy (WO-N) Deb Butterworth embarked on her three year tenure with the goal of "leaving the place better than I found it". Key to this was building the capabilities of Navy's enlisted people and making them stronger contributors to Navy's strategic goals. The sailor who joined Navy as an 18-year-old because she "wanted a challenge and was seeking adventure" has had some unexpected challenges as she pursued that goal over the last two years, as she told Lachlan Colquhoun.

Soon after Deb Butterworth took up her position as WO-N, the world was plunged into the COVID-19 pandemic.

For a role where travel and face-to-face communication with the Navy's 15,500 people is critical, the pandemic added another layer of complexity to what is already a challenging job.

"It seems to have gone quickly but also slowly, with the ebbs and flows around COVID," WO-N Butterworth says.

"We've had some pretty significant Defence strategic guidance changes over the past 12 to 18 months, with the Defence Strategic Update that was released in July last year and the Force Structure Plan.

"Then obviously, the Government's AUKUS and nuclear-powered submarines announcements recently.

"It's been a pretty complex time to be honest."

"We as a Navy, and as a collective leadership of Navy, pivoted a lot more towards technology. I've spent a lot of my days connecting virtually with our workforce and doing virtual town halls."

WO-N Butterworth is Navy's ninth Warrant Officer and is the first woman to hold the role, coming to the position after a distinguished career in naval logistics, serving in HMA Ships *Jervis Bay*, *Success*, *Sydney*, *Manoora*, *Newcastle* and a short time in *Paramatta*.

As a Chief Petty Officer, she was awarded a Conspicuous Service Medal in 2006 in recognition of her service on Operation CATALYST, the Australian assistance to the reconstruction and rehabilitation of Iraq.

A bar was added to her CSM in 2014 in recognition of her service as Ship's Warrant Officer in HMAS Success. The ship was deployed as part of Operation SOUTHERN INDIAN OCEAN, an activity to support the search for Malaysian Airlines flight MH370, and then later to the Middle East.

WO-N Butterworth's role, as leader of Navy's enlisted personnel, centres on relationships, listening, observing and communicating. She is an advocate for Navy People, and a crucial point of contact between enlisted personnel and senior Navy leadership.

With closed borders and lockdowns throughout the pandemic, she could link virtually with people but was unable to do the on-the-ground observation, which is so critical.

"Observation is the part that really allows me to feed into senior leadership about where we potentially have some problems, and where we've absolutely got some opportunities," WO-N Butterworth says.

"It's also about me understanding how, in a big organisation such as Navy, where we can smooth out the rough points and influence a whole range of things for the better."

Enlisted personnel have gone above and beyond in making time to keep those lines open and bridge the communication gap interrupted by the pandemic restrictions.

"When COVID first started, I felt that I was fighting to communicate. But our workforce has really embraced the opportunities of video conferencing," she says.

"I've been humbled and honoured by how much of people's personal time they've given up to provide me support, because I can't go to where they are and have those conversations and those observations."

One example was a video conference WO-N Butterworth organised with Navy's Warrant Officers early in the

WO-N Deb Butterworth

pandemic. She expected there might be 20 participants, but ended up with almost 200 people on the call.

On another occasion, a video conference with the team in Darwin was a good opportunity for them to raise the issue of soaring rents in the Northern Territory capital.

"They raised with me that the rent had gone up 20 per cent in 12 months in Darwin," WO-N Butterworth says.

"Rockingham, in Western Australia is the same. That's a problem for us because they're large Navy footprints.

"By that simple virtual conversation, I could go and look at the policy, identify the problem and then get some key players into another virtual meeting, and now we're fixing the policy problem."

In some ways, the move to virtual meetings has enabled more communication than ever before, including with international partners.

Before the pandemic, "you either went to the activity or you didn't," but now it is possible to go virtually.

WO-N Butterworth was able to recently attend a video conference for senior enlisted personnel in the South Pacific from Darwin, while other participants called in from Washington.

She has more regular contact with her opposite number in the Royal Navy, and also with the US Pacific fleet, now that video conferencing is an accepted and regular part of the working day.

"This morning, I spoke with my UK counterpart and the next minute I was talking to someone in Nowra. I couldn't do that pre-COVID.

"I feel that is one of the big wins and one of the things I'll hope to leave as a legacy for those that come after me; maintaining international communication when you are not travelling and going to other countries."

The call with her counterpart in the Royal Navy was to discuss the visit of one of their Astute class submarines to Western Australia.

"The UK sailors were really good with our young submariners … obviously our workforce are very excited about the [nuclear submarine] announcements … so I just wanted to pass on my thanks to him."

> We've really embraced some technology on our ships...

The pandemic communication challenge has taken place at a time when Navy has had a record number of people in the training system.

At around 3,500, many of them are in new specialisations training for new platforms.

On top of that, up to 30 per cent of Navy People have been tasked to Operation COVID ASSIST over the course of the pandemic, working to support the national response across the country.

Navy has balanced those commitments while also continuing to maintain a regional presence in the Indo-Pacific. The 2021 deployments were largely contactless, which meant that instead of personnel being able

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Leading Seaman Communication and Information Systems Christopher Sanders answers a call on board HMAS *Adelaide* during Operation FIJI ASSIST 20-2.

IMAGE: CPL Dustin Anderson

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to do normal port visits and have recreation time ashore, they had to stay aboard their vessels.

"A lot of it has been about balancing and maintaining a presence and making sure that we look after our people and are able to manage their fatigue, particularly when they're doing a deployment and their families have been locked down [in Australia]," says WO-N Butterworth.

"We've really embraced some technology on our ships, such as additional communications packages so they can get some better quality of life, Skype or Zoom the kids at night and do the things everyone else takes for granted.

"I don't think we would have had such an impetus for this if we didn't have the new complexities we have had. Normally, people would stay at a hotel and use the hotel wi-fi, but none of those things were an option for us."

Training has also pivoted towards the online, with another layer of complexity added by the fact that most of Navy's training operations are in Victoria.

One of the key courses is the Joint Warrant Officer Course, which assists in the preparation of senior Australian Defence Force Warrant Officers for Tier B and C appointments by providing an executive-level understanding of contemporary Defence issues at the strategic, operational and functional levels of command.

This course was done entirely online due to the pandemic but participants will be brought together for the first time in April 2022.

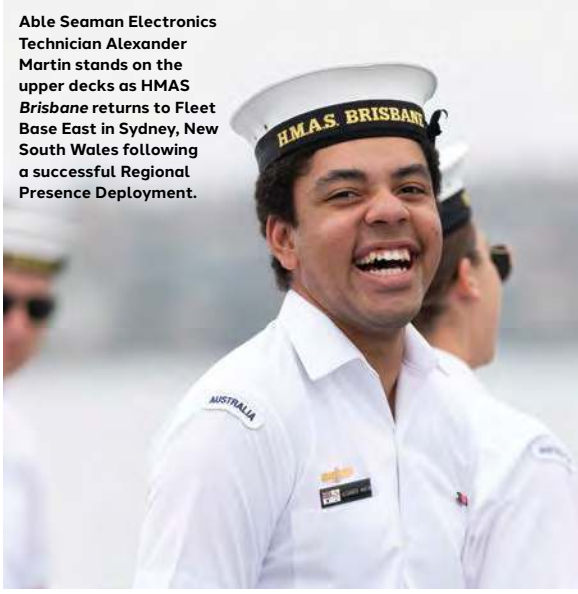
"They've done the learning, now they just need to build the relationships."

Some of these changes will stay once the world returns to normal post-pandemic.

Navy intends to have a blended training model, which leverages the advantages of the online world with face-to-face contact.

"By blending the training, people will get more time in their home port with their families, so we're not taking them away for a month, we might be taking them away for a week.

"We're trying to work out what is optimal. We pivoted to everything online, but we're now trying to bring it back [to some face-to-face]. The foundation of good leadership is relationships and influence."



Able Seaman Electronics Technician Alexander Martin stands on the upper decks as HMAS *Brisbane* returns to Fleet Base East in Sydney, New South Wales following a successful Regional Presence Deployment.

All of this has been occurring as Navy is preparing for the largest capitalisation program in its history, which is also requiring an increase in the number of Navy People and a tripling of the education budget.

Already Navy is 'topping up' the training opportunities available to sailors and building skills through colleges and institutions aligned to the National Shipbuilding College.

WO-N Butterworth says, "For example, last week I spoke with a team in South Australia, and we are sending some people to do six units of electrical training."

"When the offshore patrol vessels enter service, those people will be able to pull cables and do their trade. We don't do that at the moment because it's shipbuilding work.

"We are looking at all sorts of opportunities to get people to hone their skills with short courses as opposed to the traditional university study.

"It just gives the members another perspective, but it also means that we build rich skills that they can then bring back next time they go to sea or work in a workshop."

In this, the roll-out of the National Shipbuilding College is proving advantageous. TAFE colleges around the country are aligned and it facilitates the ability for sailors to grow their skills.

The advent of an 'evergreening'

IMAGE: ABIS Daniel Goodman

Lieutenant Kylea Jones works on a portable computing system during Exercise SPARROW at HMAS Penguin in Sydney, New South Wales.

IMAGE: LSIS Daniel Goodman

approach to training demands an ability to train quickly and develop specialisations. One example is training around autonomous vehicles.

Technical training and the rapid specialisation of sailors will be vital to remain ahead in the present environment of strategic competition, as outlined in the Defence Strategic Update, WO-N Butterworth says.

Navy's ranks have grown in recent years, but it is still in the process of managing a 'hollowness' in certain ranks. This will be addressed through recruitment and as junior sailors gain experience and training, but it is an issue which needs ongoing attention.

"We are a hierarchical workforce. We really have a little bit of a gap still in people in the leading seaman, petty officer, and lieutenant and lieutenant commander ranks," WO-N Butterworth says.

"That's technically referred to as workforce hollowness. It's about 1000 people in the sailor cohort in those rank groups. We've got an overbearing in more junior folk that just need to grow experience and qualifications to be able to fill those positions.

"That's the journey we've been on for about the last 10 years.

"We are starting to see some good opportunities. However, Defence Force Recruiting has been challenged during the pandemic in terms of delivering the recruiting numbers."

Travel restrictions have also had an impact. Some sailors have been unable to travel to the US to undertake training courses for the Aegis Enterprise, for Navy's Hunter-class destroyers.

"We did have a bit of a delay last year getting people to the US but we're back in there now, people are coming backwards and forwards."

Despite the challenges, Navy had 2,055 sailors go through new recruit training at HMAS Cerberus over the course of 2020 and 2021.

"We have to make sure that we're doing that 'evergreening' development of the workforce system alongside the advancement of technology, because they can't be disconnected."

WO-N Butterworth also makes the point that promoting Navy's brand within the community is key to its future. She believes strides have been made in this area in the aftermath of the 2019 bushfires and cyclones in the South Pacific.

"One of the things that's really changed is our connection to community," she says.

"HMAS *Supply* now has a ceremonial home port relationship with Eden, New South Wales, and HMAS *Choules* now has a ceremonial home port relationship with Mallacoota, after assisting during the bushfires.

"HMAS *Stalwart* also has a ceremonial home port relationship with Geraldton in Western Australia, which is near where HMAS *Sydney* was lost in the Second World War." ●

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Navy People

Taking a total workforce mindset to deliver sustained benefits. **By Gregor Ferguson**

The Royal Australian Navy (RAN) is an outcome-focused organisation. Behind that piece of management speak, however, is an enduring reality. Ultimately, it is Navy's people that generate the capability that delivers those outcomes.

The RAN is acutely conscious of this and is leading the Australian Defence Force (ADF) introduction of human resource management and personal wellbeing processes. That is partly because of the unique nature of service aboard a warship — strong, smart, resilient individuals from a range of backgrounds working as part of a high-functioning team make an Australian warship at least as great as the sum of its parts. It is also partly because Navy has found that investment pays off in both recruitment and the retention of precious, trained personnel.

Driving Navy's focus on wellbeing is a new Director General Navy People, Commodore (CDRE) Eric Young, who stepped into the post in October 2021 in what could be termed interesting times. "COVID-19, [the 2019 – 2020] bushfires and a range of other events and activities have created this demand and expectation in society where Defence is the go-to option for Government," he tells Navy OUTLOOK. "It's a double-edged sword, and there's an element of performance punishment there. When you do a good job, they come back to you again and again and again." This has a pervasive effect on the Navy and its people, hence the focus on wellbeing.

CDRE Young is backed up by a Maritime Human Resource Officer, Captain (CAPT) Dina Kinsman, who has personal responsibility for the Navy People Wellbeing Program. However, the most immediate battle they have had to fight is for the health of Navy's workforce through the COVID-19 pandemic of 2020 and 2021. The effects of COVID-19 have not been uniform across the Service. CDRE Young says that some people working from home have enjoyed unprecedented family time while others have found the isolation extremely difficult.

In spite of all this, Navy has delivered every single outcome set for it over the past 18 months. He says, "So I think the resilience of the organisation, its flexibility and our ability to work differently and still be able to make it work has really come to the fore.

"For my branch, there's no greater contributor to the morale of our entire Navy than a Navy People Branch full of people who are happy, healthy, empowered and motivated. So we've

IMAGE: LSIS Daniel Goodman

Director General Navy People, CDRE Eric Young

got to look at our backyard first. If we want to make positive change to Navy, we've got to make sure that we are the exemplar. We're doing what we need to in our branch, and that's absolutely my focus."

In nearly 30 years' service, he has seen major demographic differences and the changed expectations of modern recruits, an impression reinforced by his conversations with recruiters. Recruitment messaging that worked for his generation does not work for today, for example.

And once in the Service, people generally expect now to be connected almost permanently. Modern warships are fitted with Wi-Fi hotspots so individuals can Facetime their families or undergo remote training online. That makes a huge difference to the psychological wellbeing of Navy's people but it also brings an expectation management challenge. "Those Wi-Fi hotspots are great when you're not doing classified ops," comments CDRE Young. "Necessarily, the minute we do something that's classified, those things have to get cut off. So not being connected can have significant impacts."

The third major area of change is the need to balance an individual's needs against the organisation's needs. Thirty years ago, individuals joining the Service submitted to the needs of the Service. Nowadays, he says, it is about ensuring the right people are in the right job at the right time, balancing the individual's needs with those of the Navy.

"And that's our vision," CDRE Young says. "Yes, we have to have the capability, but we recognise if we treat people poorly and we don't look after them, then we won't have people for next year's fight or the year after's fight, or to deliver capability in 10 years' time. So, there's always a balance and we need to take people more on an individual level, understand what their individual circumstances are, and I think that's a fundamental difference as well."

Hence a more holistic Workforce Generation System and initiatives such as Navy Mastery (see p.54). They are about empowering people to deliver Navy's outcomes, says CDRE Young.

"The reality is we always achieve the outcome and we will continue to find a way to achieve the outcome. But the creation of the Workforce Generation System also recognises that for a very long time we've been asking too much of our people. We've been asking them to do back to back sea postings, or we've been asking one person, because they're in a critical category, to go to multiple platforms. It's been about getting those ships or aircraft or submarines to sea.

"So the Workforce Generation System is about giving our people a better work-life balance, to give them more certainty in what they do, whilst we also better meet the Navy's force generation requirements".

The ideal end-state, says CDRE Young, would be a force of about 20,000 personnel with a Workforce Generation System that can deploy fully crewed ships and submarines in what it now calls the 'Ready Phase'. The Navy would simultaneously have about the same number of people in the 'Readying Phase', preparing to take over from them — people doing courses, specialist training for professional development, conditioning training and so on. And then there would be a group of people in the 'Reset Phase' in shore establishments. They have come off a seagoing job or a deployment, and can now get some shore respite, enjoy dedicated time with their family, take some leave and do more professional courses.

That is the theory. The reality is, Navy is not big enough yet to introduce that system fully and is forced sometimes to break its contract with its people in order to crew its platforms, because of some lingering hollowness in critical trades and professions.

And then there are unexpected contingencies such as bushfires, or COVID pandemics, or sudden demands from an operational area. The resulting surge stresses the entire system still further — everything from training establishments to ships, submarines and helicopter squadrons.

New technology compounds the problem, though this is a double-edged sword. Navy needs to keep up with new operational technology and train its people to use and sustain it. But some of that new technology can also be applied to training and readying people, CDRE Young points out. For example, does all post-induction training still need to be done at HMAS Cerberus or HMAS Creswell, taking people across the country, away from home base and family?

(From left) Royal Australian Navy sailors, Able Seaman Maritime Logistics - Supply Chain Rebecca Johnson, Seaman Maritime Logistics - Personnel Hannah Bridgeman and Seaman Maritime Logistics - Personnel Carmen Davies on board HMAS *Newcastle* during Exercise 2018.

IMAGE: LSIS James McDougall

"Why can't we do that training virtually," asks CDRE Young. "Why can't we do it using AI or by virtual means? Why can't we do it in a different location? There's a whole raft of ways that we can innovate, not just with technology but in terms of process or location."

Much of the necessary planning underpinning this is now the domain of the Navy Future Workforce Branch under CDRE Anthony Klenthis (see p.50) which focuses on the planning function while CDRE Young focuses on day to day job management and workforce generation.

The Navy Future Workforce Branch can identify new technologies the Navy will adopt in years ahead, the implications for personnel numbers and training and future career management, and then hand over a package to the Navy People Branch saying the service needs, say, 23 people with certain qualifications to crew a new capability. So CDRE Young knows his target and can brief Commodore Training in good time about the necessary training and education needs.

"Creating the Future Navy Workforce Branch was a game changer," says CDRE Young. "It was a master stroke by the Chief of Navy and I think it's paying massive dividends for us."

So what are his priorities for 2022? Recruitment and retention, for one. "Coming out of COVID at the moment we're starting to see separation rates increase. It has also challenged our ability to get out and recruit, numbers are down this year, so our absolute focus next year is on retention." The pandemic has made people reassess their lives and priorities. Some will want to leave the Navy and do something different; others will want to embrace the sense of purpose and drive that it provides. CDRE Young sees both risk and opportunity in that.

His focus will be on doing everything possible to retain the right people in Navy, "because if we don't, there's no way we can meet this increasing demand we're getting from Government in other areas."

His second priority is about consolidation. "I don't remember in my 27 years a period of greater HR transformation in Defence. Trying to keep up with what we're doing, how we're doing it, and communicating it to our people internally, is very challenging." So, there won't be any new initiatives for a while. Instead, the people delivering things like the Mastery Model, Performance Development System, and Workforce Generation System will have a chance to digest them and assess their effectiveness before Navy considers any more changes.

"The third priority is our ongoing focus on culture," CDRE Young tells Navy OUTLOOK. "We've had a journey in Navy for 10 years in our culture program which we do through Next Generation Navy. So that is, for me, an absolute focus."

In this emerging post-COVID environment, part of the cultural change is Navy's People Wellbeing Program being delivered under CAPT Kinsman. The primary focus of the program, she tells Navy OUTLOOK, is to support individuals in all aspects of their wellbeing through a virtual and physical one-stop-shop. This is aimed at supporting the individual, their chain of command and their family so that they are empowered to look after their own wellbeing and wellness and peace of mind.

"I should state that we do not duplicate any efforts or any programs that currently exist through the Joint Health Command," she adds. "This is not a health initiative. It's a people initiative because we are a people-centric organisation."

Navy Future Workforce Branch has three main lines of effort, explains CAPT Kinsman. "The first is to keep people at a deployable status so that they're ready to be fit to fight as required. The second is to support people who can't provide unrestricted service so that hopefully they can increase their wellbeing and health status and can become deployable. Or, at the very worst, make sure that they remain employable and that they've got access to everything wellbeing in the one-stop-shop."

Data is from latest industry reports (2019).

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IMAGE: ABIS Leon Dafonte Fernandez

Let's Go Surfing owner Miss Brenda Miley coaches Royal Australian Navy personnel as part of a surfing program to support the mental health and wellbeing of serving Navy women at Bondi Beach in Sydney, New South Wales.

The third is for people who at a particular point in time, or over a period of time, do not fit in with the first two lines of effort. To transition them either out of the ADF or to a different Service category, possibly as a reservist. "So everything that we have and we do supports those three lines of effort."

Navy has created 10 pillars of wellbeing — community support, transition, resilience, mental health, physical wellbeing, spirituality, passions and hobbies, health, financial matters and personnel management. The program provides a link (typically online) to the thousands of services available to ADF people, most of which they probably have no idea even exist.

The program does not own any of these activities, CAPT Kinsman emphasises, but it ensures the links are current. People then become empowered to manage their own physical wellbeing and mental health and their lives in general, she says. "And once they're empowered, they become a little bit more resilient."

The Wellbeing Program is partly a response to a perceived problem within the Service, and partly a bit of proactive thinking, says CAPT Kinsman. "Defence was always looking at continuous improvement and how we can look after our people better, but it was a natural progression to be proactive in the management of our personnel. The best way to do that is to make the programs and products that already exist more accessible, because there's no point in having them if people don't know they exist."

One of many benefits is to recruiting, she believes. "It provides that assurance to families when Johnny is going to be looking at joining Navy, Army and Air Force and the parents of this 16 or 17-year-old want some sort of assurance that we've actually got the wellbeing of our people in mind, and they can see themselves what's available out there and they can access it themselves, as well, through the internet.

"And it will also impact retention in terms of building that empowerment within people so that they're actually happier because they have control of their lives. And they know where to go to find the help that they need which will hopefully transpose into longevity of their careers."

The Wellbeing Program began at the beginning of 2021 and the virtual portal has now been delivered, but it is too soon to say what effect it has had on either recruitment or retention.

Initial Operating Capability is not scheduled until January 2022 reaching full Operational Capability by December 2022.

One thing that Navy's Maritime HR Officers acknowledge universally is the importance of qualifications and

> It's not about reserves, or permanent, or part time, or flexible, or SERCAT this or SERCAT that. It is saying that, for us to take advantage of a post-COVID environment, we have to take a total workforce mindset to everything we do and think differently.

expertise that might be available outside the Service. "Navy recognises and values the diversity that comes with working out in private industry and we can learn a lot from it," says CAPT Kinsman. Some direct entry officers and sailors bring those skills with them, other people leave the Service, gain new experience and knowledge and then re-join. CAPT Kinsman is just one example of this scenario.

"Is it something that's important? Yes," says CDRE Young who himself had a mid-career break in the IT industry. "Is it something recognised? I would say, partly. I think the leadership in Defence absolutely recognises the benefit. The Chief of Navy hasn't himself had a break but he is the reason why I am back, and he has brought back a number of key individuals because he personally sees the value."

Importantly, product delivery within the Wellbeing Program is being achieved through the use of a small team of uniformed specialists, says CAPT Kinsman. "We don't have any contractors or consultants on our team. Everything has been done on a zero budget by Navy people for Navy people. But we also have a really strong mix of different backgrounds and it's that diversity of backgrounds that has produced what I think is an excellent product."

Her team includes a Deputy Director who was a former Command Warrant Officer, three senior sailors, along with a doctor, an engineer and a Reservist who is a Project Management guru. Shortly, it will also get a mathematician who just happens to be a chaplain as well. So the team will be able to draw upon deep expertise in organisational, spiritual, medical and nutritional issues.

Navy's Wellbeing Program is just one of a number of important goals for Navy People Branch, alongside CDRE Young's three main priorities for 2022. But, as he tells Navy OUTLOOK, it is a total workforce mindset that will deliver sustained benefits. "It's not about reserves, or permanent, or part time, or flexible, or SERCAT this or SERCAT that. It is saying that, for us to take advantage of a post-COVID environment, we have to take a total workforce mindset to everything we do and think differently." ●

Petty Officer Imagery Specialist James Whittle and his two children, Charlotte and Jack, Skype with his wife and their mother Aircraftwoman Serena Whittle.

IMAGE: CPOIS LSIS Richard Cordell

An ambitious plan to develop Navy's future workforce

Navy focuses on developing its people. **By Gregor Ferguson**

The old cliché that 'The heart of the Navy is the ship; and the heart of the ship is the Navy' is just that — old. Modern naval warfare is fast, complex and technology driven. The people operating and maintaining the systems are what provide modern navies with their capability advantage and warfighting edge. The complexity of this challenge is compounded by rapidly evolving technology and, for the Royal Australian Navy (RAN), the need to grow its uniformed workforce significantly over coming years.

The strategic direction for the Navy is set out unambiguously in the 2020 Defence Strategic Update and Force Structure Plan (FSP). The Chief of Navy has stated categorically that the biggest risk to the Service's ability to deliver on that plan is its workforce.

Over the past three years in particular, the Navy has accelerated its efforts in workforce development and the transformation of its human resource competencies and systems of work. With the enthusiastic support of the Navy senior leadership team, the Navy People Enterprise have been laying the foundations for a larger, more capable and more sustainable workforce, and one that reflects the deeply shared Australian values of fairness, courage, innovation and inclusion.

"There is a very real sense of purpose, deliberateness and urgency in Navy's approach to developing its future workforce, preparing to deliver capability in an increasingly challenging strategic environment, and integrating with the Joint Force and our Allies," says Commodore (CDRE) Anthony Klenthis, Navy's Director General Future Navy Workforce. To deliver on Defence's objectives to 'Shape, Deter, Respond', our Navy must be, "Seaworthy, battleworthy, ready to fight tonight if necessary, and available to government as a resolute instrument of national will and strategic intent. Our fellow Australians should expect no less of us," says CDRE Klenthis.

Driving that intent is a portfolio of National, Defence and Service level plans, such as the recent AUKUS announcements, Integrated Investment Program, and Plans Mercator and

IMAGE: Ricky Drummond

> **What has been enabled is a more strategic articulation of workforce requirements. What was previously missing at the senior leadership level was a voice for the workforce as a capability in-and-of-itself, and that is the focus we've been able to bring**

Pelorus. "My job is to turn that planning direction and guidance into a clear, coherent and executable workforce plan," says CDRE Klenthis. "The Navy Workforce Plan 2024 is a step change from what we've had in the past. It is framed around 2024 to meet a nearer term target for workforce recovery and growth, and to set the stage for what is to follow. The FSP provided Navy with significant front-loaded investment in our workforce to build momentum for a bolder, more ambitious future."

But the planning goes well beyond 2024. By 2040, the Navy's workforce needs to be one-third bigger than today's 15,500 full-time personnel, and with vastly more part-time personnel rendering Service. So why does the Navy need more people?

Australia needs a bigger Navy for two main reasons. Put simply, it needs to be able to deliver more capability, more often. To do this, it must have a workforce with the critical depth in numbers and capacity to deliver the right person, with the right skills, at the right time, while meeting contemporary expectations of work-life balance and the opportunity for family and a career, not one or the other.

Navy is rapidly adopting robotic and autonomous systems, information warfare capabilities, long-range strike weapons, more helicopters, more and bigger submarines, and more capable surface combatants. It is increasingly being driven by mission-based systems rather than platform-based capabilities, and the special ingredient that pulls this all together is people.

It is more complex than just generating personnel for our ships, squadrons and submarines, says CDRE Klenthis. The Navy needs to be able to resource a future workforce model that enables it to operate, maintain and support its advanced capabilities sustainably. In close partnership with the Nuclear-Powered Submarine Task Force, led by Vice Admiral Jonathan Mead, Navy is assessing the workforce required for its future fleet of nuclear-powered submarines, with larger crews and a different blend of embarked professional and technical skills to our Collins-class boats. "The work of Future Navy Workforce Branch is to deliver the sustainable workforce to realise Government's very clear directions, and to ensure we never get back into a situation where the capability is more available than the workforce — that was the reality for the RAN for many decades."

Raw numbers are not enough in themselves. The Navy Workforce Plan is designed to grow the base of Navy's workforce and result in more junior sailors and officers to build sustainability back into the workforce, says CDRE Klenthis.

A number of lessons learned have emerged from the large-scale Defence civilianisation and commercialisation programs of recent decades. Many functions in fleet bases and shore establishments, previously delivered by junior Service personnel, were discontinued or transferred over.

"We are now reconsidering the true cost of doing so," he says. "I think the cumulative effect of these programs did real harm to Navy's workforce. We didn't set out to do that, of course. It was implemented through a cost lens and specifically focused on reducing the cost of service delivery. I am a taxpayer too and understand that. However, when you take away shore-based employment for our junior personnel, you are directly undermining the sustainability of our workforce. The realised cost savings are now being spent many times over on increased recruitment activities and retention incentives to deal with the workforce turnover. Our people have made it very clear — they expect opportunities to be provided for a sustainable work-life balance," says CDRE Klenthis, citing the example of base catering in Darwin.

CDRE Anthony Klenthis, Navy's Director General Future Navy Workforce

"We were able to negotiate Navy cooks taking over base catering functions at HMAS Coonawarra. This was to establish improved workforce depth to support the Darwin-based patrol boats, and also to give our Navy cooks better shore stability so Darwin would became more attractive as a posting location," he tells Navy OUTLOOK.

"I've seen first-hand that mess life has been revitalised, morale is high, and the quality of the food has improved significantly, and that's by no means disrespectful to the contractors, but Navy just does it better. Our junior cooks up there are proud of the work they're doing. They're actually working in their trade and keen to develop their skills further. I'm told that Army and Air Force personnel travel to eat at the Navy base because the food is so good."

The Chief of Navy's articulation of workforce as his key capability risk triggered the establishment of Future Navy Workforce Branch which CDRE Klenthis leads. "Quite clearly, we needed a strategic workforce planning capability that was integrated across all parts of Navy (including Navy Capability Division), that could do deliberate long-range modelling, identify risk drivers and implement an action-orientated plan to mitigate them.

"What has been enabled is a more strategic articulation of workforce requirements. What was previously missing at the senior leadership level was a voice for the workforce as a

capability in-and-of-itself, and that is the focus we've been able to bring," he tells Navy OUTLOOK.

CDRE Klenthis and his FNW Directors have been driving deep and far-reaching reforms to how Navy undertakes its workforce planning, how workforce development is to be transformed through the lens of professional mastery, and how Raise-Train-Sustain settings are adjusted to develop the future Navy workforce aligned to future capabilities and the Defence Capability Program architecture.

"The biggest improvement to Navy's approach to workforce planning has been the shift to a clear focus on what current and future maritime and joint capabilities require, and less on the narrow view of specific workgroup requirements (such as bosun's mates or marine technicians)," he says. "We're investing an incredible amount of time in capability project teams and program boards identifying risks and opportunities to deliver sustainable workforce outcomes. We are a trusted voice at the table." The Branch now routinely delivers input on capability related matters, particularly the introduction of new capability that takes the workforce into account at the outset, not as an afterthought.

High fidelity workforce analytics requires leading edge tools and Navy is now supported by a very advanced workforce modelling and simulation toolset developed jointly by the Service, DST Group and a civilian university. This is called ATHENA and it is being rolled out as a Defence-wide modelling tool. The other two Services are contributing to its ongoing development and sustainment, and Canadian National Defence is also an important partner in its development, says CDRE Klenthis.

"A main focus for the Branch now and into 2022 is analysing and developing the workforce required to implement nuclear submarine propulsion and other cutting edge technologies, such as artificial intelligence and quantum computing, announced recently by Government under the AUKUS trilateral security pact."

The schedule for introduction of the new submarines is yet to be set, CDRE Klenthis says, but the nuclear education and training aspects of operating, maintaining and supporting the boats are already being considered. "An early consideration for the Task Force, supported by Navy, is developing the personnel exchange programs and nuclear education and training continuums that can be accessed now in Australia and through our US and UK partners."

Navy personnel will likely need three levels of nuclear-related skills development, says CDRE Klenthis. Familiarisation courses for 'lay' or non-nuclear specialist personnel so they can understand what the capability is; postgraduate qualifications in nuclear engineering and nuclear science to develop personnel with nuclear stewardship and regulatory expertise; and nuclear propulsion training and first-hand operating experience for the specialist engineers and technicians who will go to sea aboard nuclear-

Measuring the electrical charge output from textured piezoelectric ceramics (inset) is providing insights into enhancing the performance and processing capability of naval sonar systems.

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powered boats. All of these are being actively examined right now.

Amidst all of this and central to it all, Navy is reshaping how it invests in its people through the Navy Mastery project, led by Captain Virginia Hayward, Director Navy Workforce Strategy and Futures. The Navy Mastery Model — based on three separate development areas focused on technical mastery (professional skills), maritime mastery (mariner skills) and social mastery (interpersonal skills) — is already changing the discussion with our people on how we support their skilling and experience through employment. Our aim is to encourage lifelong learning and the pursuit of excellence as part of mastery progression, rather than a focus on rank-based progression. Mastery provides the RAN with its warfighting edge.

It is an incredibly exciting time to be in the Navy, and it remains an institution comprised of everyday Australians doing remarkable things in the service of our nation.

Vice Chief of the Defence Force Vice Admiral David Johnston AO, and Associate Secretary Ms Katherine Jones commended Australian Defence Force and Australian Public Service personnel in a small ceremony held at Russell Offices, Canberra.

IMAGE: Jay Cronan

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Navy Mastery

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The Navy Mastery Model was approved by the Chief of Navy in April this year and the Head of Navy People, Training and Resources, Rear Admiral Smith, launched the Navy Mastery System communications in July. Since then Navy has been ramping up service-wide awareness of Mastery. Navy Mastery is driven by external and internal drivers, according to the Director of Navy Workforce Strategy and Futures, Captain (CAPT) Virginia Hayward.

"If I go to the externals — we need to be an employer of choice," she says firmly. "We are in a war for talent; we have no choice but to grow, adapt, retain, reskill and influence others to join. We need to create a culture and environment that meets the fundamental needs of each generation. And the external market is telling us that employees have a choice. So, we need to have a personal and performance development offer that is modern and contemporary."

Internally, she says, Navy's Plan Pelorus calls for the right people with the right training and sets priorities around workforce reconstitution and developing resilience, because people create capability. CAPT Hayward said that Navy recognises that people create capability; and Navy's keystone capability policy, Plan Pelorus specifically calls for the right people with the right training, to be part of an organisation that has prioritised organisational and individual resilience.

The Mastery Model supports the design of career and learning continuums pivotal to the development of Navy people and consequently, Navy power. The model is a triangle. Its three sides are Social Mastery, Technical Mastery and Maritime Mastery. It is based on the now-classic Dreyfus Model of skill acquisition across four levels of competence — foundation, intermediate, advanced and master. It allows people to see their future and opportunities for skill development and growth in Navy, CAPT Hayward says:

"When you look at the triangle — Maritime Mastery is about why you joined the Navy, what it means to be a mariner, and what the Navy brings to the joint battle and so to the defence of Australia.

"Technical mastery is about being good at what you do, whether you joined as a chef, an engineer or a pilot. Social Mastery is about achieving results with and through your team. So in essence, you know that you will not only be developed in your maritime and technical skills, but also in your social skills and your emotional competence and behaviours.

"It is a pretty simple concept," adds CAPT Hayward. "But the flow-on effects are significant. It's modern, it's new, and it incorporates personal and professional development."

Navy has just launched the new Social Mastery and Performance Appraisal Handbook and for the first time it is setting up ways to assess people on their social mastery, something addressed by CMDR Sally O'Connor on p.56.

"Technical Mastery will be set up through what we're now calling Mastery Career Pathways," says CAPT Hayward. "We're doing that through the three Es — education, experience and exposure. Traditionally, our career continuums have been like a ladder with rank-based progression which is, 'do a course, do a job at sea or ashore, then you're ready for promotion'. Mastery is more than that. Mastery supports lifelong learning, skill acquisition, competence and expertise.

IMAGE: CPOIS Cameron Martin

IMAGE: CPOIS Cameron Martin

"We're using the adult learning environment 70, 20, 10 concept — 70% is experience, 20% is exposure and 10% is education. And so using those three Es, our career pathways will be developed against our four levels of mastery — foundation, intermediate, advanced and master — on what's required for you within that level. It also acknowledges that not everyone needs to progress to master in every domain.

Balancing your mastery development will vary across the three mastery elements and will depend on the environment you are working in (at sea, ashore, study or in a different pattern of service). "Everyone in the Navy needs aspects of maritime mastery. Social Mastery is the same. It doesn't matter whether you're an engineer or a pilot or a boatswain's mate, it's all important. And your technical skills will be how you good you are at your job and what technical skills you bring to the team. But there will be a different emphasis on learning some of those competencies across those masteries."

It is still a work in progress and needs to be implemented and communicated properly. Mastery is not going to mean much to the workforce unless it can be seen to change and enhance their career direction and training.

Navy Mastery needs to be future-proof. "We've got lots of new capability coming down the line and it's going to need new skills," CAPT Hayward tells Navy OUTLOOK. "I'll touch on just one — human-machine teaming and Robotics, Autonomous Systems and Artificial Intelligence (RAS-AI). That's new, that's not going to be bounded by one community or one profession. RAS-AI is going to be right across the Navy. It's here. We just have to get ready to develop our people for it."

The Maritime Mastery competencies are set around a framework of four competencies:

1. Sea. Policy and doctrine and understanding the maritime environment.
2. Sailor. Understanding command, leadership and management, and teams.
3. Ship. Naval capability, digital literacy and knowledge management.
4. Fight. Critical thinking, planning and decision making, and fighting effectiveness.

Recruits will get an introduction to these concepts at the foundation levels. As their careers progress and their experience levels grow, the concepts and skills will develop far more depth and complexity.

Mastery is being implemented through different projects and will progress at different rates. Social Mastery has already commenced and is being included in our performance assessment reporting system. In the Navy Warfare Community, Navy is already developing foundation and advanced common warfare training around the maritime and technical masteries and starting to build out the first of the new pathways for the warfare community.

Director of Navy Workforce Strategy and Futures, CAPT Virginia Hayward.

Responsibility for designing and planning Navy Mastery lies with Future Navy Workforce Branch, although "at some point it will transfer into being no longer future but just a part of how we do our business."

Leading Seaman Maritime Personnel Operator Anthea Smith talks to Lieutenant Jacob Stewart about Navy's Social Mastery.

IMAGE: POIS Bradley Darvill

Social Mastery – part of Navy's backbone

Before people start talking about 'the good old days', it is worth remembering that the Royal Australian Navy's mission changed in 2019. Its mission is now to prepare Naval Power in order to enable the joint force in peace and war. **By Gregor Ferguson**

The speed and complexity of modern naval warfare means that a ship's company is now a highly integrated team. That puts the emphasis firmly on Navy's people, both as individuals and as teams. And that is why the Navy has embraced Social Mastery, says Commander (CMDR) Sally O'Connor, Navy's Project Manager for its Performance Development System.

"People are the backbone of Navy," she tells Navy OUTLOOK. "Ultimately, they're our competitive edge and that drives our capability. So, when Navy people are at their best then Navy is at its best."

That would be true at any time, but Navy is also in a period of significant growth and competing for talent. To be competitive, the Navy must provide an environment for its people which is high functioning, inclusive and supportive.

Social Mastery is one of three types of mastery that Navy has identified as the bedrock of its professional excellence. The others are Technical Mastery (because Navy requires its people to have the professional skills for their primary qualification) and Maritime Mastery (because Navy is above all a sea-going fighting force). "Maritime Mastery is the deep understanding of successful operations within the maritime domain and the core requirements of individuals and teams to generate capability. When you achieve Maritime Mastery, you will

understand how to operate effectively to fight and win at sea." (Navy Mastery Introduction Booklet)

The embrace of mastery as a construct is addressed elsewhere by Captain (CAPT) Virginia Hayward (see p.54) but it is telling that the first element of this triad to be adopted formally is Social Mastery, which was launched in October 2021.

Why is Social Mastery, in particular, so important? CAPT Hayward, Director Navy Workforce Strategy and Futures, says, "From my perspective it's the element that's been missing. We have all got stories of leaders and managers and high performers achieving results, but often at the expense of their team. We've no real way of calling that out."

Social Mastery, she explains, is critical to the cultural and behavioural improvement that Navy seeks in its workforce. "Social Mastery is about fostering a culture of accountability. Of how Navy members lead, communicate, influence and work together for fighting and organisational outcomes."

It challenges some old military man-management paradigms but the purpose of Social Mastery is to create a stronger, more resilient, more innovative and flexible Navy, says CMDR O'Connor, who brings her own unique background to this issue. Formerly a Maritime Warfare Officer, she gained her Master's in Human Resources Management before leaving the Navy to work in HR roles in multiple industries, most recently in aviation. The tectonic shifts caused by the COVID-19 pandemic made her available to the Navy at just the right time and with just the right skillset to introduce Social Mastery, so she returned to the service towards the end of 2020.

"Now's the time to focus our efforts on how we achieve our results, not just be outcomes-focused or task focused," she says. "Social Mastery is going to allow us to do that, to develop our fighting edge by unlocking our own potential individually, therefore unlocking the potential of Navy so that we can give the best versions of ourselves in defence of our nation."

Each type of mastery has four levels: foundation, intermediate, advanced and master. Not everybody needs to be a master in any one of these areas, but an effective, smooth-running team to which each of the members willingly gives their best needs each member to embrace Social Mastery.

"The importance of Social Mastery can be demonstrated by looking at another framework, and that's Navy's high-functioning teams framework," CMDR O'Connor tells Navy OUTLOOK. "This recognises that when all of the individuals in a team are working towards higher levels of Social Mastery, that provides the foundation for more effective team interactions."

At the Foundational Level, Social Mastery focuses on the skills and behaviours that contribute to effective participation in a team. This is the level at which social and people skills evolve. At the Intermediate Level, the focus is on enhancing the skills required to lead and develop a team and get it working together effectively.

At the Advanced Level, Social Mastery focuses on making multiple teams work effectively together. It might be teams of specialists within a ship, or teams of ships in a task group. And then at the Master Level, the focus is on the skills required for strategic capability development at the community level, says CMDR O'Connor. "So, it is spanning boundaries and removing barriers between disparate teams so that we can build capability.

"Social Mastery will be the lens through which we develop and assess people and, through this framework, we expect to see behaviour that supports a more collaborative, inclusive and socially aware mindset."

How will Navy grade people as foundation, intermediate, advanced and master practitioners? There are four competency areas: self-awareness, social awareness, self-management and relationship management. Because the awareness competencies are internally focused, they are unobservable objectively by others. "You and I could make a pretty good subjective determination on how self and socially aware somebody is," CMDR O'Connor says, "But you can't put that in a performance report and be objective about it."

Leading Seaman Maritime Personnel Operator Anthea Smith reviews Navy's Social Mastery as part of the Navy Mastery Model.

IMAGE: POIS Bradley Darvill

CMDR Sally O'Connor

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However, consideration of those awareness competencies provides an opportunity for members to self-reflect. So Navy, for the first time, will add the option for its people to record their self-assessment and reflection in their annual performance reports. This is an explicit recognition that self-reflection is an essential component of building self-awareness, which is a foundation block of Social Mastery.

The self-management and relationship management competencies are more easily identified through objective observation and are, therefore, assessable by supervisors within the framework of the Navy's updated Performance Appraisal Report.

"We've created a behavioural descriptor matrix which will support the members to recognise the behaviours that are expected at each mastery level," says CMDR O'Connor. This will guide the members' self-reflection for the two awareness competencies and guide assessors in making robust assessment decisions for self-management and relationship management.

Social Mastery was launched as a new part of Navy's workforce management toolkit in October 2021, CMDR O'Connor tells Navy OUTLOOK. "Officers' reporting periods commence on 1 October each year. So from today, officers and their supervisors are setting goals for their reporting period. They'll be doing so with Social Mastery in mind. We've launched the program and told them what Social Mastery is about."

Every rank and rate in the Navy will now be expected to have at least some proficiency in Social Mastery. On completion of initial training, all members will be required to develop themselves along the Social Mastery continuum. Supervisors will support their teams to help them identify development opportunities and coach them as they progress, noting that you would not expect every officer and rating in the Navy to become a master — it is role and context-dependent.

"It's all about the contribution to the team and using the strengths of people in the right contexts to create better team performance," CMDR O'Connor emphasises.

Navy has not yet finished working out how much weighting will be given to each type of mastery in assessing an

IMAGE: POIS Yuri Ramsey

individual's performance and prospects. This could depend on the type of job an individual is doing.

"If somebody's the functional expert then maybe their Social Mastery skills don't need to be as high as somebody who's, say, in a command position," says CMDR O'Connor.

Importantly, this is not about developing charm or popularity, she emphasises: "It's possible for different personality types to develop high levels of Social Mastery. The application of these skills might look a little different and each distinct personality type might bring strengths in different contexts. But no personality type is more or less disadvantaged through the assessment of Social Mastery.

"We're really focused on the behaviour that enables the effective performance of individuals and teams in the workplace. So, somebody's ability to self-manage their emotions and reactions, their communication and interpersonal skills, and their ability to contribute to and lead high-functioning teams."

The mastery construct was steered by the Deputy Chief of Navy, who is head of Navy People, for a couple of years before CMDR O'Connor re-joined the service in late 2020. "Social Mastery had been conceptually designed and at that point handed over to me for implementation," she tells Navy OUTLOOK. "The high-functioning teams framework has been around for about the same period of time. Social Mastery is focused on how an individual can contribute to high-functioning teams. So, unless we have both a team focus and an individual focus we're not going to be able to unlock our potential."

This construct is also designed to help Navy deal with increasing diversity — gender, ethnic and even generational. "We've got up to four generations in the workplace at the moment," she points out. "But Social Mastery is based on a foundation of being empathetic and understanding others, so we understand that regardless of what their background is, what generation they come from, being able to use that diversity is key.

"If we can be helping people to build their self-awareness and their awareness of others by being empathetic towards others, that's the basis of attaining Social Mastery.

(l-r) Petty Officer Marine Technician Anastasis Koutsoukis, Seaman Marine Technician Kasaca 'Ritchie' Dau and Able Seaman Marine Technician Emily Hesling at Fleet Support Unit - West in HMAS Stirling, Western Australia.

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Able Seaman Combat Systems Operator Damon Jackson on his operations room console during the fleet synthetic training exercise held in the Anzac-class frigate simulator at HMAS Watson in Sydney.

Training looks to the future

Navy Training Force prepares for transformation. **By Lachlan Colquhoun**

From his office at Garden Island in Sydney, Commodore (CDRE) Charles Huxtable looks out of the window and sees HMAS *Supply*.

"That ship took three years to build, but many of the crew took 10 years to train and develop and the commanding officer took 20 years," says CDRE Huxtable.

"So, for Navy training, the task is to generate the workforce now to operate our future fleet of bigger, more advanced ships.

"I can't generate all that future workforce on the fleet we've got, so I've got to start moving now and look at more efficient ways of training Navy's people before those new ships get here."

Looking to the future is very much a part of CDRE Huxtable's role as Commodore Training, or COMTRAIN, and this has rarely been more important as Navy prepares for a 'generational' change in platforms and technologies.

To meet future challenges, Navy recently released the Concept of Training 2030, providing the vision of Navy's future training system and the required transformation to achieve it.

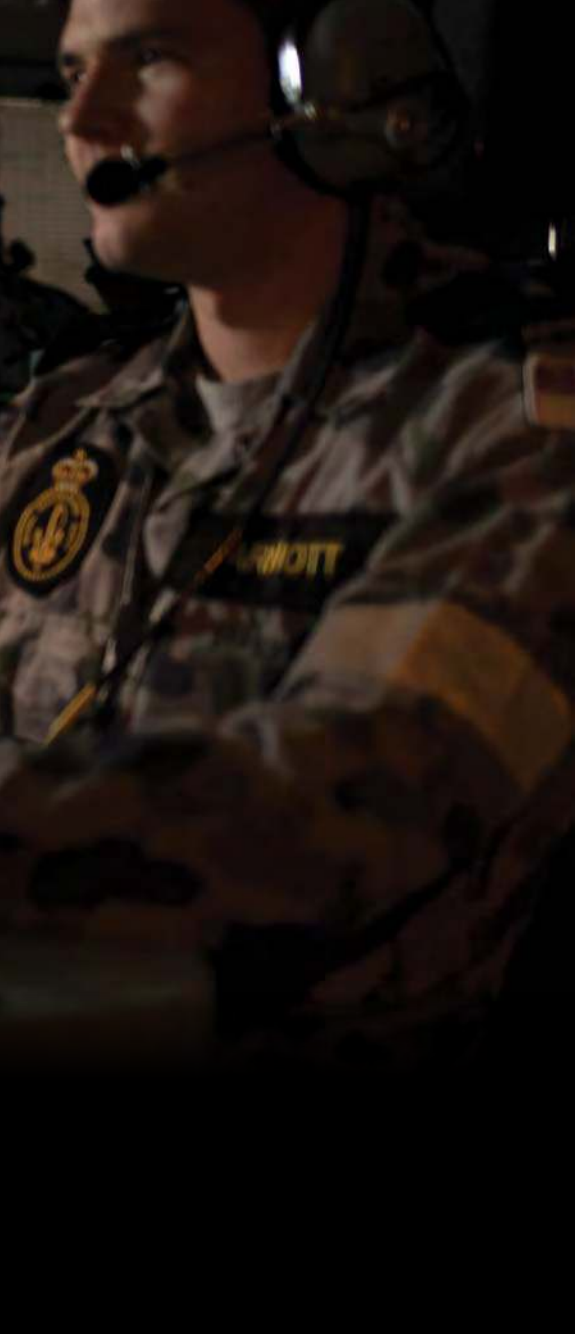
Navy Training Force is preparing for transformation through its Training Force Plan 26, providing the blueprint on how Navy training will transform to meet the vision of the Concept of Training. Suitably, the Training Force's new mission is 'Plan and deliver the right training, to the right people, in the right place, at the right time, to enable current and future Navy capability'.

Where in the past the Navy replaced ships 'like for like' numerically, Navy is getter more new ships that are significantly more sophisticated in terms of their technologies and systems, and this poses a major training challenge.

Compare, for example, an Anzac frigate from 1995 and the current generation of Anzac ships. The differences go well beyond the platform and into almost every system, so training needs to be agile and keep up to date not just with the present, but upgrades in the future.

Part of the answer lies in new training technologies, such as simulation and also e-learning, a subject on which CDRE Huxtable recently completed a thesis at the Australian War College in 2019 before taking up the role at COMTRAIN.

IMAGE: LSIS Jarrod Mulvihill



Chief Of Navy, Vice Admiral Michael Noonan, AO, RAN, enjoyed watching the Rigid Hull Inflatable Boat (RHIB) Rollover Training Simulator after the official opening of the Maritime Skills Training Centre during a visit to HMAS Cerberus, Victoria.

"The way we respond to the challenge is to start training ashore more than we have in the past, and training with more rigour," CDRE Huxtable says.

"We train our officers of the watch on simulators ashore at HMAS Watson, and they then head to sea to achieve their platform endorsement. Achieving competencies ashore in this manner is a process which needs to occur across more workgroups, more categories, and our engineers need to be able to train on the systems they are going to use at sea," says CDRE Huxtable. Another example of this are the aviation technicians, who currently do a Certificate 4 course with the RAAF in Wagga Wagga on older systems and platforms not in service with Navy. They then go to Nowra and do helicopter conversion-to-type training on an MRH-90 or Romeo helicopter, which adds to the training pipeline.

To address this, Navy is currently running trial courses where the aviation technicians train in Nowra with an industry based supplier, with the practical components completed on Romeo helicopters at HMAS Albatross, so they can be certified on the same type they will work on regularly.

All of this is in the area of individual training, which will increasingly be done ashore so that when crews go to sea they can all train together.

This has the advantage of ensuring a higher collective baseline, and then the bar is continually raised as they train together as a team.

CDRE Charles Huxtable

IMAGE: LSIS James McDougall

Chris Little from the Capability Acquisition and Sustainment Group stands with his support team during the official opening of the Centre for Innovation West at HMAS Stirling in Western Australia.

IMAGE: CPOIS Damian Pawlenko

We are always looking for improvements in simulation and the simulation game continues to evolve.

"We need to get people qualified before they go to sea so that when they are at sea, our ship's companies are concentrating on collective training rather than going to sea less trained and achieving individual competencies there," says CDRE Huxtable.

In addition to bringing training ashore, another change is to bring that training to the waterfront, in close proximity to the ship's home ports.

"This will mean that instead of doing all technical training at HMAS Cerberus in Victoria, if these technicians are joining ships in Western Australia, we might move them across there, so they can establish themselves there, do their platform and systems training, and then go to sea on those same ships.

"So we are looking at different methods of delivering training and, if I can use civilian competencies as a baseline where appropriate, I should be able to use a wider range of service providers to deliver that training to Navy's people."

Another initiative is the creation of Mariner Mastery Centres, where training can be done during working hours on a naval base and not on board a ship.

These are where people can come together individually or in small teams to do collective work.

"On board a ship is great, but if someone is doing maintenance on a system and the power goes down that is disruptive," CDRE Huxtable says.

Part of the answer also lies in the increasing use of simulation, where high-end warfighting scenarios can be experienced with increasingly realistic virtual reality technology.

"We are always looking for improvements in simulation and the simulation game continues to evolve. We want to be at the forefront, so I'm never going to say no to more technology.

"But it's about using it intelligently, and making sure the training systems are connected so I can get more people involved."

People are also being prepared for sea in newly introduced Crew Support and Readying Groups, a CSRG, where they receive intensive and integrated training before they take to their ships.

Online training is also part of the mix, but CDRE Huxtable says its "more than just putting power point presentations online."

"Yes, we were able to have some quick wins by doing things like that, particularly during the COVID-19 pandemic, but we realise it's got to be much more than that," he says.

"We need to change the way we present content online and we are getting better at it. We are starting to run some of our initial employment training online; for example, elements of the training systems officers' course and the maritime human resource officers' course. But there are limits and, where appropriate, we will roll it out."

Training must also be ongoing and continuous. Instead of doing a promotion course every five or six years, the idea is that the skills learned on those courses are embedded in the way people are instructed and taught at more regular intervals, so improvement and learning become innate.

There are some areas where online training is not suitable, and leadership and management training is one example. Leadership training is about human interaction and relationships. It requires collaboration and the development of peer relationships which ultimately produces teamwork and a positive Navy culture.

This is what CDRE Huxtable calls "social mastery", the softer skills of leadership and management which are critical to Navy.

"We need to be sensitive to this and to make sure we generate a learning culture that is also a culture of excellence," he says.

"We are striving to be the best and get the best out of our people, but getting the best from your team doesn't mean breaking your people. It means bringing them along with you and making sure it's a learning journey, a collaborative journey towards excellence as a team.

"That is a big focus across Navy, creating high performing teams and not breaking our people along the way."

One example of this is the Maritime Warfare Officer (MWO) training continuum, where training was previously "cookie cutter in delivery", with everyone learning at the same pace.

Now, there is a recognition that individuals all learn differently and at different speeds, so Navy has begun streaming trainees, ensuring everyone is given an opportunity to achieve the required standard.

"We give the faster ones the opportunity to achieve their Bridge Warfare Certificate at an early stage," says CDRE Huxtable.

"During the final Stage 4 part of MWO course, trainees traditionally completed 23 runs in the bridge simulator before they attempted the final assessment, Run 24. Now we give those in the fastest stream the opportunity to conduct Run 24 after 17 runs. If they pass they are out into the fleet much quicker.

2021 Navy Training Staff Awards

Navy's 2021 Training Staff Awards highlighted the innovation and collective teamwork which is a feature of Training Force.

The Training Force Staff Awards run annually and recognise individuals and teams who have excelled in the development or delivery of Navy training making a tangible contribution to Navy capability.

The awards were announced in October 2021 at a Navy Industry Academia webinar by Commodore Training, Charles Huxtable.

They included the following awards.

BEST BLENDED LEARNING SOLUTION

This award is presented for demonstrating excellence and impact in the delivery of training by utilising a combination of learning delivery mechanisms, methodologies and modes in a new or existing training course.

The winner was Training Authority Maritime Logistics and Health for the Clinical Manager's Courses Futures Program.

This program redesigned the course from a yearlong residential course, to a flexibly delivered blended learning solution. The redesign has had a large impact on Navy training, saving approximately $56,000 per student for a course which is now more flexible and better meets trainee needs.

BEST CAPABILITY BUILDING OUTCOME

This award is presented for implementing new or improved training that has resulted in a demonstrable improvement in individual or team performance in the workplace post-training.

The winner was Training Authority Maritime Logistics and Health for the HELM PCRF Collective Training and CERTEX. This program offers a blend of a rigorous SADL procedural guidance and a collection of scenario-based exercises mimicking the pressures and environments experienced during missions and operations. Its main purpose is to support the RAN operational capability, and to provide Fleet Command with positive assurance of the seaworthy and battleworthy state of individual fleet and force medical elements.

BEST TRAINEE PERFORMANCE IMPROVEMENT SOLUTION

This award is presented for improvements to training, resulting in a demonstrable improvement in trainee performance while under training.

The winner is Training Authority Maritime Warfare for the Maritime Warfare Officer Course Stage 4. This program introduced a new approach to how each individual trainee would be trained, to allow a blended learning solution for trainees who needed the benefit of diversity to achieve their potential. Implementation of a Streaming System allowed staff to divide trainees into streams based on performance, fast-tracking some and freeing up resources to coach those identified as requiring assistance.

"There were many high quality submissions this year and choosing winners was not an easy task. This reflects the quality of our people and the quality of the work happening in Training Force as we strive to deliver content to mariners," Commodore Huxtable said.

"I was particularly pleased to see that some of our group nominations have included individuals from industry and academia in addition to Training Force personnel. This highlights the fact that much of our training is a joint effort".

Individual awards were also announced for the Training Professional of the Year, which went to Chief Petty Officer Mark McLure, from Training Authority Initial Training Leadership and Management.

Chief Petty Officer, Christian Duncan, from Training Authority Initial Training Leadership and Management, was named Training Facilitator of the Year.

"The standard streams go to run 24 as they always have, but other people might take a bit longer and they are given 30 runs to get through."

In 2021, for the first time, everyone doing the Stage 4 course made it through to gain their Bridge Warfare Certificate. A result which validates the approach.

"My job is to train people, not fail people, and I've got to be flexible in ensuring I deliver the best training, tailored to the individual, to get the Navy proficiency we need at the end," CDRE Huxtable says.

As part of training, Navy is also offering mentoring to people through a coaching program called Lifeology, which encourages people to understand how they learn and how they deal with stress.

Lifeology is a private company which provides a mentor for the Maritime Warfare Officers to talk to, so while they can go to their Navy instructors for training on the technical aspects of the job, they can turn to another person for the social mastery element and have a sounding board to help them evolve as individuals.

CDRE Huxtable is halfway into his tenure at COMTRAIN, and says that from day one he has been guided by one mantra — to Deliver Content to Mariners.

The simulators and the e-learning are simply channels to provide this content in a better way.

"When I talk about delivering content to mariners, I often draw it like a fire triangle," CDRE Huxtable says.

"For a fire you have heat, oxygen and fuel, and if you take one of those things away the fire goes out.

"If you are training, you have the Delivery, the Content, and the Mariners and if you take out one these elements then the process doesn't work.

"I could schedule and Deliver all the courses possible and fill them with Mariners, but if the Content is not right then I'm wasting my time, so I have key performance indicators under each of those streams."

IMAGE: LSIS James McDougall

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General Entry 396 Rogers Division march off the parade ground on completion of their graduation ceremony at the Royal Australian Navy Recruit School at HMAS Cerberus, Victoria.

Under the Training Force Plan 2026 there are a number of key performance indicators (KPIs) which measure if the training is successful.

There are KPIs, for example, for moving career, platform and systems training out of the traditional venues of HMAS Cerberus and Creswell towards the waterfront.

Then there are KPIs for mariners, for example, whether courses are being filled, if mariners are passing the courses and enjoying them, and also if the Content is optimally linked to a job task profile.

The Navy headcount is at around 15,500 and is set to increase in coming years. As a result Training Force is the largest it has been in many years and is operating at close to capacity.

There is also a greater recognition that training is key to Navy's capability development cycle because its people are critical to its success as an organisation.

"Navy traditionally defined itself by its platforms," says CDRE Huxtable.

"We bought a new ship and then the training was almost an afterthought, but we are getting much better at having the training organisation involved right from day one when we decide that platform is going to be introduced, even some years away."

In his role, CDRE Huxtable says he relies heavily on his colleagues across Navy, Defence and industry and the innovative ideas which come from all directions and from all ranks.

"It's always inspiring to talk to trainees because we have some very smart men and women in Navy and I find them a huge motivator in my role, and draw inspiration from them," he says.

"We have a big team with a lot of great ideas. So my job is to harness the enthusiasm, the great ideas, make sure these are acted upon and to facilitate better training outcomes.

"That, to me, is the essence of leading a team and helping Navy achieve the Chief of Navy's vision for a thinking, fighting Australian Navy."

66

Leading Seaman Electronics Technician Andrew Flanders explains to Commodore Training, Commodore Charles Huxtable, RAN, the use of one of the drones that can be found at the Centre For Innovation - South, on completion of the official opening for the Centre For Innovation - South, HMAS Cerberus, Victoria.

IMAGE: POIS James Whittle

Ethics, culture and innovation

Captain (CAPT) Tony Mullan joined Navy 30 years ago and has had many roles in a varied career, but says he thinks his current position as Director of Navy Training is the "best job I've ever had". **By Lachlan Colquhoun**

That is a big call after a career which has spanned a posting to sea as the Training Manager on HMAS *Kanimbla*, where he undertook two deployments to the Middle East, and also as Deputy Director of the Centre for Defence Leadership and Ethics at the Australian Command and Staff Course.

"As one of two captain level Training Systems jobs in the entire Navy, Director of Navy Training is a fairly unique role and touches so much of what happens in this organisation," he says.

"I work down and across the organisation with my peers, but I also spend a lot of time working with COMTRAIN and into the One and Two Star space as well."

CAPT Mullan's Naval career has been all about training, and while he has worked in other roles which dealt with key issues of cultural reform and ethics all of the roles have been about improving Navy's professionalism, preparedness, and its integrity as an organisation.

"I have a passion for education and training, and I don't think I'd still be in the Navy if it didn't have that and I wasn't able to exercise that passion," he says.

"I've spent a lot of time working in Navy culture, and spend a lot of time

IMAGE: ABIS Jarrod Mulvihill

Members of the Australian Mine Warfare Team 16 pilot the Gavia Autonomous Underwater Vehicle during an internal training period at Pittwater, NSW.

working on improving the organisation, and that has been fantastic."

At different points in CAPT Mullan's career, HMAS Cresswell has loomed large. It was there he went for his initial officer training, in the same intake as the current Commodore Training (COMTRAIN) Commodore Charles Huxtable, and where he returned to later as the Training Commander and Deputy Director – Initial Training Leadership and Management.

"Apart from the fact that Cresswell is a beautiful place to turn up to work every day, it is extremely rewarding working with new entry officers" he says.

"You watch people get off the bus as civilians, and then five months later they graduate as freshly minted naval officers and that is a fantastic opportunity to be involved in helping them at that point in their careers."

CAPT Mullan is also the Head of Professional Requirements for the Training Systems Work Group, where he oversees the career continuum and workforce issues of Navy's approximately 140 Training Systems officers. A role which has a strong community engagement focus and also a focus on the future.

"It makes for some good variety in my role," says CAPT Mullan.

"I look across Training Force with COMTRAIN, and where others look at engineering, or logistics, I have the advantage of looking across all of these strategic areas and being involved in a range of different issues."

One particular area of interest in CAPT Mullan's career has been culture and ethics, and he also served as Deputy Director of the Navy's Directorate of Leadership and Culture in 2016.

From all of this experience, CAPT Mullan observes that Navy culture has come a long way in his three decades of service.

"It is a very different Navy now, and anyone who doesn't think it has changed hasn't been paying attention," he says.

CAPT Tony Mullan, Director of Navy Training

"People who wish for the good old days, well sometimes the good old days weren't that good.

"This organisation has come a massive way in terms of ethics, culture and workplace behaviour. In some cases, we've simply been adapting to changes in society and that is appropriate because we are a reflection of that and we are here to defend the ideals of society."

In other ways, however, CAPT Mullan believes Navy had led the way.

"There are a lot of competing voices out there and because of that sometimes wider societal change can be slower, but by our very nature as an organisation, which moves as one, we have sometimes been able to get out in front a little bit and get there a bit quicker."

Many of the issues CAPT Mullan dealt with in the area of culture were related to ethics, which has become a significant factor in the development of the modern Navy culture.

"Ethics is a thread which goes through everything now," he says.

"Everything we do now which touches the development of our leaders, and also our people, has an ethics component.

"It is a lot more important in much of the operational training and preparation we do across all of Navy, and there is a broad understanding that ethics matter and, in some cases, it significantly differentiates us from the people we might be competing against."

Ethics, says CAPT Mullan, gives Navy a sense of 'legitimacy' and without a firm ethical compass Navy would be poorer both reputationally and operationally.

Recruits may not immediately recognise the ethical dimension to

Royal Australian Navy sailor Petty Officer Matt Perry experiences a virtual reality program at the Fleet Base East Centre for Innovation in the Garden Island Defence Precinct

IMAGE: LSIS Nicolas Gonzalez

> We are far more down the path of having partners in delivering training with industry and academia because a lot of the really good ideas come out of there and we need to be able to grab them and run with them

their training, but the reality is that ethics is a cornerstone 'woven into' Navy's modern identity.

"If we threw ethics out of the window I think we'd fail as an organisation, both internally and externally," says CAPT Mullan.

"Because it's not just about how we treat people in the organisation, it's about how you treat everybody, your partners and even your adversaries."

Navy's values and ethics are also important in making the organisation attractive to recruits.

Like any prospective employer, Navy has to make itself attractive and if its values are fundamentally different to wider Australian society "no-one would join".

"My value set as a middle aged man is different to that of a 17-year-old who is potentially joining the Navy," says CAPT Mullan.

"They are not wildly different, but they are different and we need to continue to evolve to reflect those changes in society."

Another major change over CAPT Mullan's career has been the nature of training itself.

When he joined it was "overhead projectors and blackboards, not even whiteboards".

This is a stark contrast to Navy training today, which uses virtual reality (VR) and augmented reality (AR) technologies and distributed 'on demand' learning.

"We are using all sorts of things which wouldn't have been imaginable 30 years ago, and these are things that people routinely use and interact with outside of Navy," CAPT Mullan says.

"All you have to do is look at a games console, and you are seeing VR and AR. These are things people grow up with and they expect to see them and use them when they come into Navy, so we are grasping on to that technology and using it in clever ways to provide meaningful learning."

Where several decades ago Navy would have spent 'millions' to recreate a ship, now it is possible to work with software engineers to develop VR and AR applications which can deliver similar experiences.

One example is a new augmented reality platform being trialled by Navy's Centre for Innovation (CFI) which could also transform maintenance and repair tasks.

Warfare Innovation Navy has trialled software called Manifest which connects handheld devices and digital goggles (Microsoft HoloLens II) to overlay virtual information on top of physical equipment like a control room or an engine.

The AR technology is like having an instructor beside you in real-world situations.

Earlier this year, 10 sailors and officers from different training authorities were invited to the CFI and spent two days learning to use the software and had two weeks to build real-world use cases.

At the end of the two weeks, participants built training and maintenance scenarios for practical tasks such as machinery maintenance, electrical power isolation, fibre optic maintenance and 3D metal printing in a few hours.

One participant built a virtual operations room console and an entire ops room to test warfare manoeuvres, and other scenarios developed included medical situations and small-arms weapons training.

There is a very real challenge, however, in how quickly technology is being developed.

"We are being challenged by the sheer speed at which technology is evolving, and we are being challenged by its complexity," says CAPT Mullan.

"When you have continual changes in training and need to continually upskill the workforce, that's not a model which supports you dragging sailors back off ships and putting them in classrooms for three weeks every time a major software update occurs to a combat system.

"That's the sort of environment where you need just in time agile learning delivered in the workplace where they can use it immediately because you can't afford — for all kinds of reasons — to pull them out of their day to day roles."

While CAPT Mullan says the "good news" is that Navy has embraced innovation, he believes more can be done to make the organisation more agile and "shorten the time between flash to bang for some of our good ideas".

In doing this, partnerships with industry and academia were more important than ever, and relationships with these sectors are growing ever closer.

"We are really leveraging what industry and academia have to offer very hard these days," CAPT Mullan says.

"I think the days of us having industry contractors who just turn up and work for us are over.

"We are far more down the path of having partners in delivering training with industry and academia because a lot of the really good ideas come out of there and we need to be able to grab them and run with them."

An example of the links with academia are the close relationship with the Australian Maritime College (AMC) in Tasmania, where for 30 years the AMC Search training and consultancy division has delivered courses, bespoke training, vessel-specific training and online/onboard solutions to the Navy.

The courses, approved by both the Standards of Training, Certification and Watchkeeping and the Australian Maritime Safety Authority, have played a critical role in equipping the Royal Australian Navy with the skills to operate the latest naval technology.

Most recently, AMC Search has supported Defence's SEA 1778 Task Group Mine Countermeasures (MCM) and SEA 1770 Rapid Environmental Assessment – Maritime projects.

The projects aim to offer a pathway for the development and evolution of an off-board robotic technology in support of the Royal Australian Navy's future MCM and hydrographic operations.

Many of these programs are also short in duration, which has the advantage of not taking personnel away from their day to day jobs for long periods.

The Autonomous Maritime Systems Fundamentals course, for example, runs for just two days and provides trainees with a targeted education on the science, terminology, capability and limitations of the systems.

Navy's approach is encapsulated in the RAN Concept of Training 2030 which describes the broad vision of what Navy training needs to look like in 2030. This is supported by the Training Force Plan 26, which is COMTRAIN's 5-year plan for what actually needs to be done, and by when, to reform Navy training and achieve the vision of 2030.

"In some areas it's a tweak on what we are already doing, because we have been moving along this path already, but in others it's a fundamentally different way of thinking about training and the way it is delivered," says CAPT Mullan.

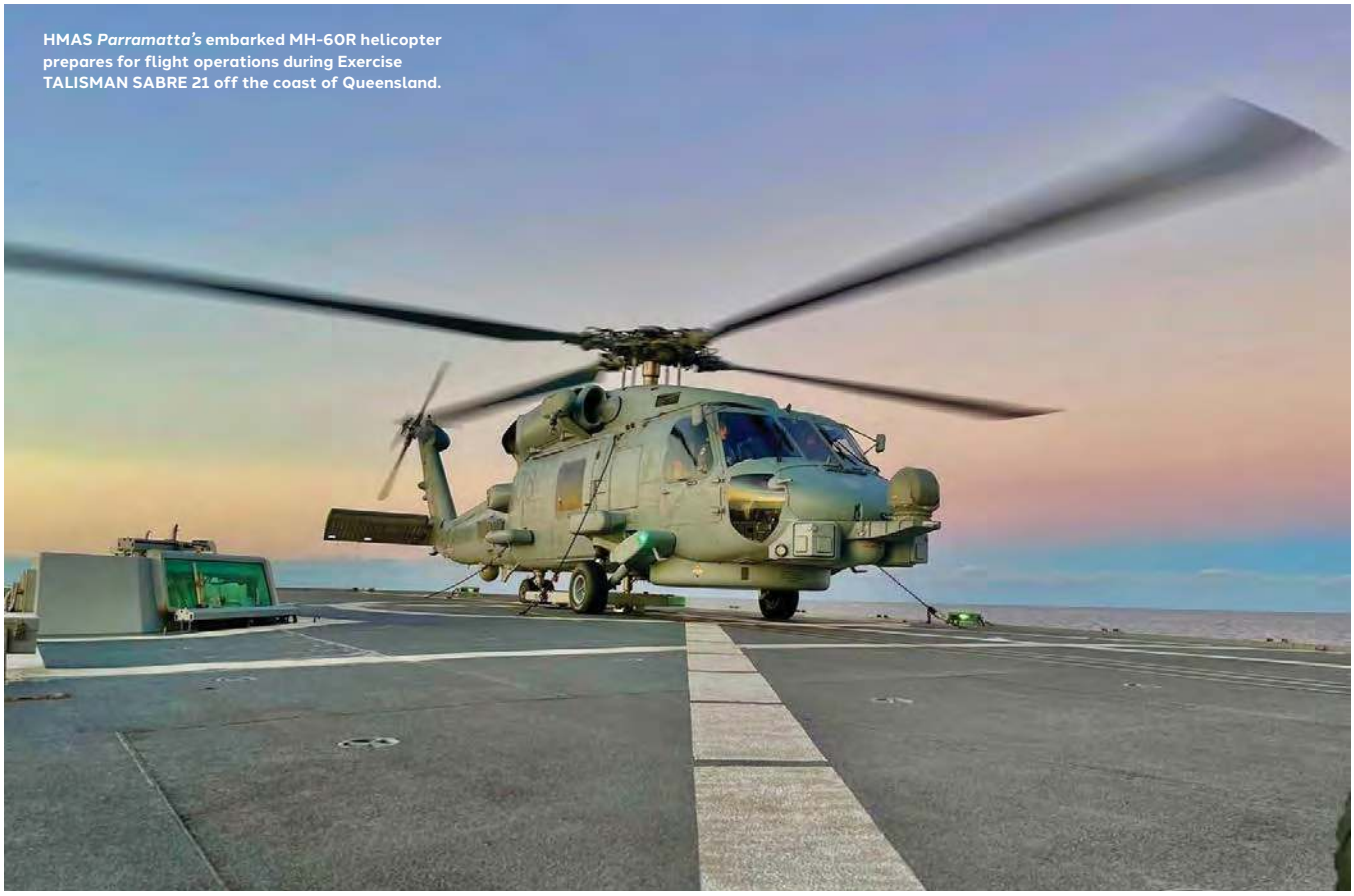
"But it sweeps up all those things in areas of technology, innovation and culture along with other reform activities we need to do to make sure that training can deliver the type of Navy we want in 2030.

"It's an ambitious reform plan, and has some very clear lines running through it and it's the vehicle through which COMTRAIN is going to drive innovation throughout the organisation in the next few years."

(l-r) Sub Lieutenants Taylah Guttormsen and Amy Steele and Midshipman, Laura Triffitt are completing phase 2 of their maritime warfare officer course, onboard HMAS *Brisbane* during Exercise TALISMAN Sabre 2021.

IMAGE: LSIS Daniel Goodman

IMAGE: ABIS Bonny Gassner



HMAS *Parramatta's* embarked MH-60R helicopter prepares for flight operations during Exercise TALISMAN SABRE 21 off the coast of Queensland.

Finding the future training edge

In a language school outside Melbourne, Defence students engage with a person on a television screen who appears to be a Japanese woman framed by a typical Japanese background. **By Lachlan Colquhoun**

In a language school outside Melbourne, Defence students engage with a person on a television screen who appears to be a Japanese woman framed by a typical Japanese background.

The reality, however, is that this Japanese teacher could be an Anglo Australian male, who has put on a special suit in the next room and been transformed into an avatar by purpose built software.

Avatars, says Captain (CAPT) Pat O'Brien, are part of the next wave of technology which is finding itself into Navy training, and the wider Defence.

In recent years Navy has made great strides in implementing simulation and has moved towards adopting virtual and augmented reality, but the use of avatars is pushing the technology even further.

"Defence has been using the avatars for about 18 months now, and it's an innovation which came out of peace operations training," says CAPT O'Brien, the Director of Navy Training Strategy and Futures, Training Force.

"In peace operations training the avatars could have weapons, they might have radios, they might be a child soldier.

"The students forget they are talking to a TV screen and start having arguments with the person, you can see them getting quite emotive and they forget that they are speaking with an avatar."

Australian Army officer Major David McEvoy, from Army Headquarters aviation capability, instructs an Air Force cadet flying a Sikorsky S-76 helicopter, using the Army helicopter flight simulator

CAPT O'Brien's remit is to think long term, both about the platforms that Navy will be using in the future and also developments in technology which will make that training more effective.

It is a role for which he is well qualified, rejoining the Navy in 2020 after a three year joint appointment as the Director of the Defence Education, Learning and Training Authority at the Australian Defence College.

"We need to think decades in advance about new capabilities coming into service," he says.

"New ship platforms are often thought of about 15 years ahead, and that has its own challenges because we change the way we do training over that time.

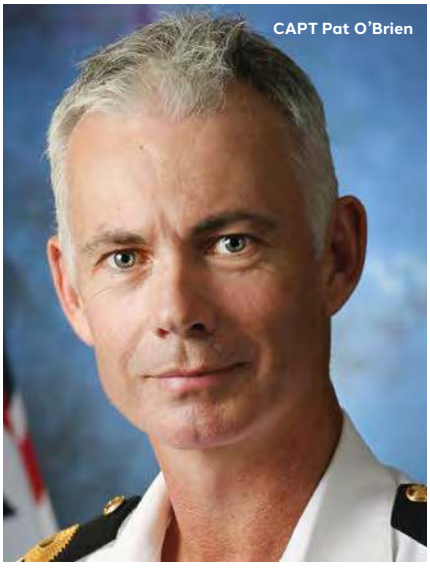
"Training technology changes, as does some of the technology on the platform, and what we've asked the contractor to do now might be either out of date or not supportable in the future, or we might ask the contractor to do something and the technology hasn't got there yet". This is why Navy recently released the Concept of Training 2030, providing the future vision of Navy's future training system.

Simulation and virtual training has been the major trend over the last decade and offers significant advantages, from better preparing mariners to savings on fuel, maintenance and sea time for Navy's key assets, its ships.

The bridge simulators at HMAS Watson in Sydney are a case in point. These have been in place for a number of years, but have been developed so the mariners are now achieving some of their qualifications in the simulators and going to sea to round out their skills and experience.

"This has only happened in the last five years, and its only happened because the fidelity of the system and the reality of the simulator is so much better than it ever used to be," says CAPT O'Brien.

"The simulators cost millions to build, but the fact that we can put trainees through the simulator and it doesn't cost fuel, doesn't need anything other than electricity, means we don't need to put people to sea, and when we do they are far more advanced in their skills and can almost keep their own watch."



CAPT Pat O'Brien

Another significant facility is the virtual reality (VR) replica of the landing helicopter dock (LHD) platforms which have been developed at Randwick in Sydney.

"The LHD's are huge, so having a VR environment where marine technicians can practice before they go on the

IMAGE: LSML-P Kylie Jogiello

HMAS *Parramatta's* embarked MH-60R helicopter prepares for flight operations during Exercise TALISMAN SABRE 21, off the coast of Queensland.

ship has delivered benefits beyond expectations," says CAPT O'Brien.

"They join the ship and it's like they have already been there. They are safe, they do their rounds, and we can introduce scenarios where there might be smoke or a flood or a system that is not reading correctly, and they have to react to it.

"If you do that on a real ship, not only do you have to monitor the person because they don't know their way around but also, how do you get smoke or create any of those emergency situations? So this is bringing a reality into training we couldn't do otherwise."

The success of the LHD simulator, and earlier submarine simulators in Western Australia — which began as a basic 'walk through' — have led to the development of the 'Ship Zero' concept where each of the Navy platforms will have a land-based virtual 'twin' which is as realistic as possible and where personnel can train.

CAPT O'Brien says, "What we have done in the past is to teach the individual and we have moved that on to have some small ability to teach teams.

"At the School of Ships' Survivability and Safety, for example, what they do is team based and then they go to sea and do that again in collective training in workups.

"Ship Zero is about doing that in the safety and confines of a building. You will have classrooms set up to develop team training in operations and engineering, for example, but more importantly, they can talk to each other. So when we conduct emergency drills or operations training, each team can do their bit, but also react to what is happening in other parts of the virtual ship."

"We'll be modelling all these situations but not using any diesel fuel."

The next Ship Zero project will be around the offshore patrol vessel platform to be delivered in 2023.

Another training challenge will come with the delivery of the future frigates and the Evergreen Strategy.

The first four ships will generally have the same technology, but the next four will have upgraded and new systems, and then the first four will be upgraded.

"That is a challenge because no sooner have you trained people and evaluated the training, than you have to change it because of the upgrade and, in some cases, go back to square one," says CAPT O'Brien.

"Our different and growing number of specialisations are also a challenge and we only have so many people in Navy , so we need to look to industry to help us and also be our partner in achieving our mission.

"Mine warfare is an example where the game is really changing. The people in that area today — and tomorrow — need to use more technology than they have in the past. The challenge is to train the current workforce as well as recruit and training the future people"

Some of the new technologies come through the Defence Innovation Hub, one of the Australian Government's flagship Defence innovation programs which invests in innovative technologies that can enhance Defence capability and grow the Australian defence industry and innovation sector.

The Government has invested around $3 billion over the next decade in Defence innovation as part of the 2020 Force Structure Plan. Of this funding, $800 million is being invested in the Defence Innovation Hub through to 2030.

The Hub, says CAPT O'Brien, also acts as a 'post box' for small and medium sized Australian companies who believe they have brilliant ideas which might have an application in Defence.

One example of this is the development of virtual 'hot fire', where mariners experience the tactile feeling of heat but without the presence of actual fire.

This might have applications in replacing some of the training at the School of Ships' Survivability and Safety where teams train with real fire.

"We need the virtual training to become tactile and further develop the haptics of the training," CAPT O'Brien says. "You need to feel stuff, to use your hand and feel a switch, or heat or vibrations, and that means getting sensors into the virtual environment and I think making that as realistic as possible is the next obstacle."

Some of the technology Navy uses is adapted from the gaming industry. The Defence peace operations training, which uses avatars, also has a virtual Land Rover as part of another exercise.

The team is in the classroom seated within a virtual vehicle, with one member at the steering wheel, and they move about a virtual environment.

"They might get to a certain spot, and then the leader 'gets out' and engages with a person (the avatar) to gather information," CAPT O'Brien says.

"Just like the machinery rounds for the LHD, this is just the beginning of getting into a completely immersive world where we forget we are in a classroom altogether."

CAPT O'Brien says Navy is developing a simulation roadmap where it is looking at future technology being developed, or potentially becoming available — what is possible.

"When do we expect we will be using more VR, for example, and what is the next technology after avatars, and what proof of concepts can we do and then how do we roll new technology out across Training Force?

"What comes after that? Is it using holograms and engaging with a holographic instructor?"

CAPT O'Brien is enthusiastic about technology but, perhaps because of his earlier training as a teacher, still believes strongly in the power of face to face learning.

He sees technology as a critical aid, but believes that the best way to learn still comes from the instructor's ability to engage with students, explain concepts in a different way, understand where they are struggling, and then intervene and help when needed.

"Technology is allowing us now to do face to face learning without actually being face to face, so we still get the ability to do all of that powerful stuff that makes the transfer of knowledge so much easier, but we could be anywhere. Even the instructor could be remote. So I see technology's greatest gift making face to face learning more accessible to everybody."

As part of his previous role, CAPT O'Brien was involved in driving the implementation of a new student management system which has involved configuring a new ICT infrastructure based on cloud technology.

"We have a system that communicates between the learning system and the HR system, so that when someone finishes a course it immediately gets recorded into the student management and HR systems, and it all happens automatically," he says.

"The same will happen with the curriculum eventually so that when we change the curriculum it will then change in the learning management system and back into the HR platform, through the student management system.

"The idea is that someone can be on a ship and learn, or anywhere for that matter. But getting those systems and services to talk the same language and use one system rather than bespoke systems already in service has been a challenge."

Using cloud technology in a Defence environment for the first time was a challenge, and one of these was around security even though CAPT O'Brien estimates that 75% of the training is unclassified.

"We had never used cloud before and we were the first to look at using it in a protected manner, so we had some hoops to jump through but we have proved that it is possible," CAPT O'Brien says.

Like many other technologies, cloud technology offers significant benefits to Navy in the training environment.

"Cloud technology offers that instant access that is scalable up and down, and you only pay for what you use," says CAPT O'Brien. "But this is today's solution. Who knows what ideas tomorrow will bring and our challenge is to embrace new technology, but maintain the safety of our people and their information. It will be a challenge, but it will also be exciting." ●

Personnel from HMAS *Melville* use a crane to lay two inert dummy minefields off the coast of Queensland, as part of Exercise TALISMAN SABRE 21.

IMAGE: ABIS Jarrod Mulvihill

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Supporting Plan Mercator: Western Australia strengthening sovereign capability

As we transition into a new, complex phase of major power competition, military modernisation and disruptive technological change, we are witnessing a strengthening of the Australian defence industry in support of the Navy to fight and win at sea.

The need for sovereign capability within Australia has been highlighted by the COVID-19 pandemic and exposed critical vulnerabilities and assumptions which may not have been considered by planners or decision-makers. This is acknowledged within Plan Mercator which sets one of the strategies of our maritime forces to "improve our supply chain resilience and therefore self-reliance". As the three services transform to address Australia's emerging threats, the Western Australian defence sector has pivoted to meet the increasing needs of Defence and the Australian Navy.

The National Naval Shipbuilding Enterprise demands long-term planning and a national approach. In support of the One Defence Enterprise, the Western Australian State Government has committed $89.3m to accelerate infrastructure developments at the Australian Marine Complex in Henderson. This investment looks to the long-term maintenance, capacity and taskings emerging for HMAS Stirling, and partners with both state and federal bodies to support our Navy men and women at their home base location.

Academic partnerships are also pivoting under the demands of the Defence Transformation Strategy. A recent Research Higher Degree Student Grant administered by the Defence Science Centre in Western Australia funded a 34% increase in grant recipients and grew the number of non-traditional defence industry partners by 40%. This is a demonstration of how Defence units, capability managers, and acquisition programs can strengthen partnerships with the broader Australian national science and technology community, and 'spin-in' non-defence technologies to contribute to Defence's priority capabilities.

Commercialisation of research continues to be a focus, recognising that capability must transition from the lab and into the hands of the warfighter. The Defence and Research Teaming events have proven to be highly productive in solving Defence-sponsored problems. Competing teams have developed two undersea communication prototypes for Navy's Clearance Diver Teams, in addition to a dynamic two-way communication protocol for controlling robotic and autonomous systems.

As the Chief of Navy mentions in his opening message for Plan Mercator, "doing nothing or waiting for allies to solve our challenges is not an option". The team at Defence West are actively engaging our diverse stakeholder portfolio to learn, evolve, align and deliver real capability outcomes within Navy in support of the One Defence Enterprise.

The Defence West team stands ready to assist the achievement of our national Defence priorities. If you are looking to collaborate in the areas of defence science, veteran issues, infrastructure or industry, reach out to the team today at **www.wa.gov.au/DefenceWest** or **DefenceWest@jtsi.wa.gov.au**

Surface shipbuilding program on track

Despite supply chain interruptions from the pandemic, the *Hunter*-class frigate and *Arafura*-class OPV programs are progressing well and gaining momentum.

By Lachlan Colquhoun

IMAGE: LAC Stewart Gould

Late November in Adelaide, the first group of students working on the *Hunter*-class frigate program became full-time apprentices at BAE Systems Maritime Australia.

The 16 students finished their Certificates in Education and, during that time, completed a Certificate II in Engineering in preparation for their apprenticeships and full-time work on the frigate program.

Ultimately, 1000 apprentices and graduates will be needed to work on the multi-decade program to build the nine anti-submarine frigates for the Navy.

The graduation of the apprentices coincided with the awarding of three more contracts for the $45 billion *Hunter*-class program for nine frigates, with businesses in New South Wales,

Arafura Class Offshore Patrol Vessel, NUSHIP *Arafura*, at Osborne Naval Shipyard in South Australia.

Victoria and South Australia contracted to deliver products into the prototyping phase.

A multitude of Australian companies will supply manufactured parts for prototyping blocks which are currently under construction at the Osborne Naval Shipyard in Adelaide. Companies already under contract include Defence Seals & Spares, the ABECK Group and PRP Manufacturing.

Another good example was the July 2021 announcement that Western Australian marine technology company VEEM had been awarded a contract to work alongside Kongsberg Maritime to develop a prototype propeller blade for the frigates.

These developments are part of what Tony Dalton, Deputy Secretary of National Naval Shipbuilding, Department of Defence, says is the positive story about the progress of Navy's shipbuilding program and the development of Australia's sovereign capability.

Tony Dalton, Deputy Secretary of National Naval Shipbuilding, Department of Defence

Dalton acknowledges there have been some issues along the way, largely caused by the pandemic and its impact on the supply chain, but contends that the programs for the three key surface ship programs are progressing well.

"The plan announced in 2017 was built around four key projects, one of which was the Attack-class submarines that has now been cancelled. The other three were the *Hunter*-class frigates, the *Arafura*-class Offshore Patrol Vessels (OPVs) and the Guardian-class patrol boats, with those boats being gifted to our Pacific Island neighbours," says Dalton.

"If you look at those programs, all are making progress."

Dalton points out that the frigate program went to "second pass" on schedule in 2018 and, in the period since 2017, a new $535 million shipyard had been constructed at Osborne.

"Then in December of 2020 we started prototyping for the frigate program on schedule, in our new shipyard" he says.

"And in November of 2021 the very first unit emerged from what we call Building 20, demonstrating that robot welders, the laser cutters and all of those pieces of the shipbuilding infrastructure are all working.

"And that unit has gone into Building 21 where it will effectively be consolidated into a block and that process is working well."

Dalton says there have been challenges with the frigate program but says they largely flowed from the pandemic disruptions in the UK, where the design of the Type 26 frigates originates.

"There were design maturity issues in the UK, and we've been able to contain that and while there will be a delay of up to 18 months to the first ship commencing construction, it won't be any longer," he says.

"We are confident we'll be able to bring it back from 18 months based on what we are seeing now in the shipyard based on those first prototyping blocks being built, but it does rely on the level of design maturity coming out of the UK.

"At the moment we are not flagging issues in the supply chain which will impact the *Hunter* program."

BAE Systems Maritime Australia — or BAESMA — the prime contractor for the *Hunter* class, is on track to deliver an Australian capability equal to 58% of the total contract value, and Dalton says he is confident this would increase to over 60% by the end of the program.

There is "room to manoeuvre" with BAESMA on a case by case basis where there are opportunities for greater Australian participation.

"This process is working well at the moment," says Dalton.

"We are still a while away from entering the construction contract for the first three frigates and we understand there is always a sense of expectation management around the question of when more Australian companies will go on contract.

"There are a range of Australian players on contract now supporting that prototyping activity and as we get towards letting the contract for the first three frigates then the level of involvement among the small and medium-sized Australian businesses which go on contract with BAESMA will increase exponentially."

The *Arafura*-class OPVs are the second largest of the surface ships to be constructed, with the first two to be built at Osborne before work transfers to Western Australia for the remaining 10 ships.

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AUSTRALIAN
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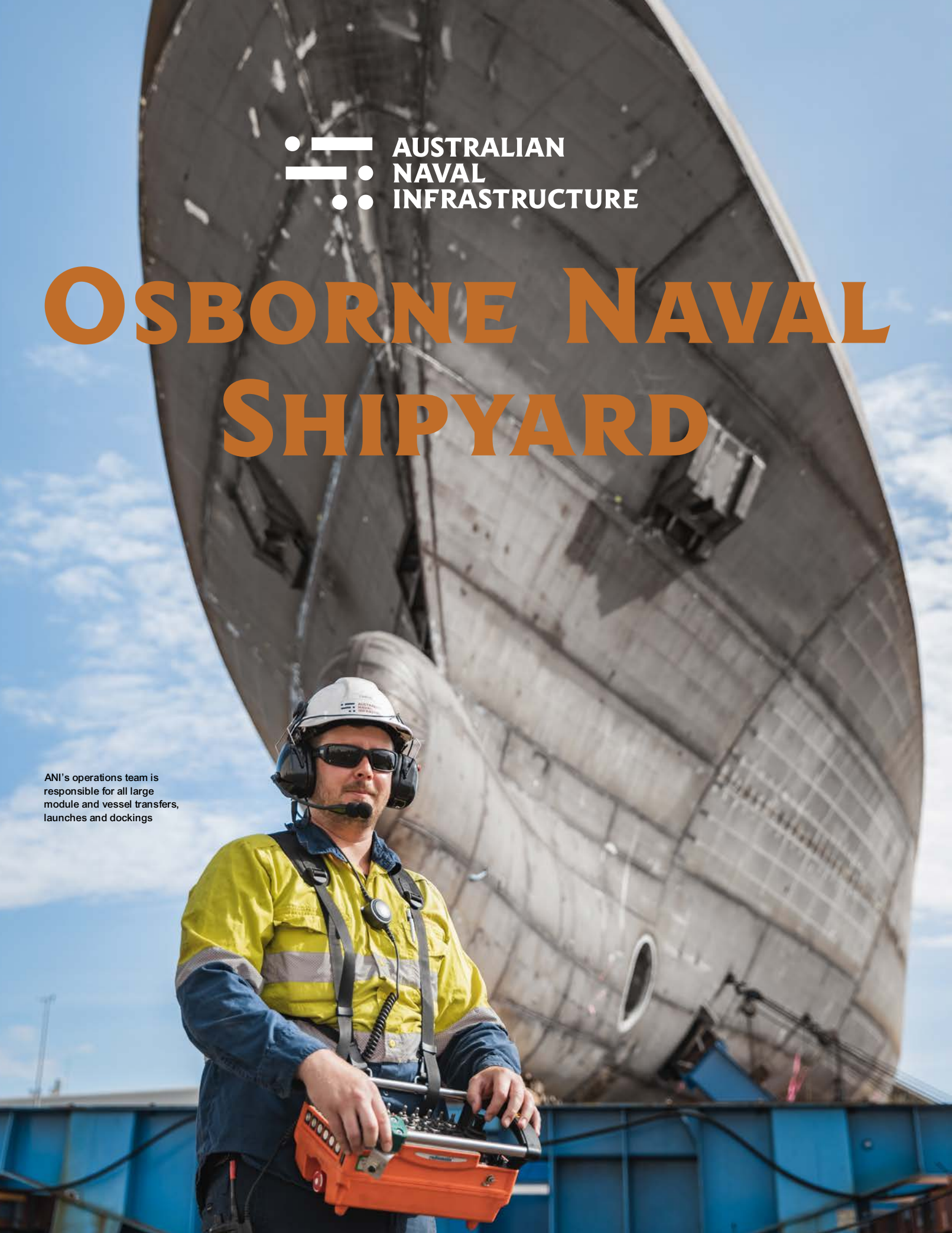
Osborne Naval Shipyard



ANI's operations team is responsible for all large module and vessel transfers, launches and dockings

Australian Naval Infrastructure Pty Ltd (ANI) is the owner, developer and manager of the Osborne Naval Shipyard (ONS) in South Australia.

A Government Business Enterprise, ANI's joint shareholders are the Minister for Finance, Hon Simon Birmingham and the Minister for Defence, Hon Peter Dutton.

As a key enabler of the Naval Shipbuilding Plan, extensive expansion and modernisation of ONS into a world-class, fully integrated shipbuilding hub for existing and future naval shipbuilding programs has been implemented by ANI.

Since acquiring existing facilities and surrounding properties, the shipyard has grown to more than 110 hectares, making it the largest naval shipbuilding hub in Australia.

Also boasting the largest shiplift in the southern hemisphere, ONS is home to several programs including:

- *Collins*-class submarine (CCSM) full-cycle dockings
- *Hunter*-class Frigate Program (HCFP)
- Offshore Patrol Vessels (OPV) — first two of 12.

Future programs intended for delivery at ONS include the:

- *Collins*-class Life of Type Extension (LOTE)
- *Hobart*-class destroyer upgrades
- Nuclear-Powered Submarine Program.

ANI is a member of the Nuclear-Powered Submarine Taskforce (NPST) Infrastructure Committee tasked with ascertaining the infrastructure needed for the construction of nuclear-powered submarines.

At the end of 2020, ANI successfully delivered the expansion of Osborne South (surface combatants) and handed the new facilities to tenant, BAE Systems Maritime Australia. BAE has since commenced prototyping for the HCFP.

Modernisation of existing facilities in the south yard also commenced in 2020, with the first project being the repurposing of an existing workshop into a pipe fabrication hall.

Following the AUKUS announcement in September 2021, new production facilities planned for Osborne North (new submarine construction yard) were put on hold awaiting outcomes from the NPST.

Expansion and modernisation of the ONS continues however, and other projects planned or under development include the following.

Common User Facility

A key driver in the expansion and modernisation of Osborne South was to enable the concurrent construction of two vessels up to destroyer size, and all new facilities were built to facilitate this.

The Common User Facility (CUF) provides critical shipyard infrastructure to support naval shipbuilding and commercial users. This includes facilities such as:

- a 156m L x 34m W Syncrolift shiplift with a lifting capacity of over 14,000t and operational to a water depth of 18m
- a 235m L x 20m W outfitting wharf
- dry berths for ship consolidation, maintenance and repair works
- a wharf support building comprising workshops, offices, canteen, lunchroom and amenities
- dry berth and wharf services such as HV power, seawater, water, industrial gases, air, communication and security.

To further enable the shipyard's ability to accommodate two destroyer-sized vessels, several projects in the CUF area are planned or underway, including dry berth and wharf extensions and shiplift modifications.

Dry berth and wharf extensions

The dry berth area is used for final consolidation, maintenance and repair activities. Currently 260m long, the dry berth is to be extended by 56m to enable end-to-end placement of two larger vessels.

Planning is also underway for an 80 – 100m extension to the outfitting wharf to provide over 300m of berthing space.

Shiplift modifications

The CUF shiplift has a nominal lift capacity of 14,304t; however, due to the omission of four hoists and associated main transverse beams (MTBs) during construction in 2009, it does not have a uniform load distribution across the platform. This project will see the installation of the missing hoists and MTBs to enable a constant lift capacity of 135t per linear metre over the entire length of the platform, thereby increasing the nominal lift capacity to almost 16,000t.

Collins-class submarine transfer corridor

The original shiplift at the shipyard was commissioned in 1992 specifically for the docking and undocking of the CCSM.

A second, larger shiplift was constructed as part of the CUF development in 2007 – 2009 to support the Air Warfare Destroyer Program.

With the CCSM shiplift requiring extensive refurbishment, ANI has deemed it no longer viable to operate two shiplifts when the same result can be achieved by one. The CCSM shiplift will be demolished, and a transfer corridor constructed between the CCSM facilities and CUF to enable the future docking and undocking of all vessels via the CUF shiplift.

Shipyard security

ANI is developing a security services package that includes consolidation of security contractor services, perimeter and internal physical security measures, hardware and other security elements. This package will involve new infrastructure and upgrades to existing security measures across the precinct.

Carparking

With a workforce of more than 5000 expected at the peak of shipyard production, additional carparking is required. ANI is progressing the planning and construction of a carpark and pedestrian bridge across an adjacent rail line to service Osborne South. The new carpark will accommodate up to 1500 workers.

Additionally, ANI is responsible for precinct planning and management to ensure shipbuilding needs are fulfilled whenever possible. This includes management of existing facilities to ensure they are properly maintained and upgraded, as required.

All vessel transfer, launch and docking operations, as well as large module transfers — the most notable to date being the OPV mega-block moves and recent NUSHIP Arafura launch — are also undertaken by ANI's operations team, along with commercial dockings which assists skill retention and training of personnel.

The Osborne Naval Shipyard spans more than 110 hectares across the Lefevre Peninsula in South Australia

> ...the OPV program has worked really well, and we've been able to carry the trade supervisors who are the really experienced shipbuilding professionals and they are now starting to work on the Hunter-class prototyping activity...

The program is estimated at around $4 billion and will create more than 400 jobs, plus additional supply chain opportunities for hundreds of South Australian businesses.

German company Lürssen won the Australian Government's competitive tender for the OPVs, and has partnered in Adelaide with ASC Shipbuilding and with Civmec in Western Australia. Adelaide-based Saab Australia is providing the combat management systems, and this will create hundreds of high-tech defence jobs.

Dalton explains that the construction was split between the two states as a way of "forming a bridge for the workforce", with the Adelaide-based workforce recently coming off the Hobart AWD program.

The first two OPVs, he says, will carry these people across to the *Hunter* program, enabling them to maintain their jobs and their skills.

When the two OPVs are completed in South Australia, the shipyard will be completely refurbished and made ready to build the *Hunter*-class ships.

"In that sense, the OPV program has worked really well, and we've been able to carry the trade supervisors who are the really experienced shipbuilding professionals and they are now starting to work on the *Hunter*-class prototyping activity," says Dalton.

"That program has picked up some delays as well, and that is purely related to COVID.

"When you are building a ship you start with flat pieces of steel and weld them together to form boxes or compartments, but if you apply the COVID four square metre rule the number of people you can have working on a compartment is reduced."

Along with supply chain issues from overseas, Dalton says the OPV program has been delayed around six months behind the original schedule, which he rates as a good result given two years of managing the pandemic.

HMAS *Armidale* (left) and Papua New Guinea's new Guardian-class Patrol Boat NUSHIP *Francis Agwi* (middle) in Darwin Harbour.

IMAGE: ADFa

In addition to the work on the OPVs at Osborne, work on the next three ships has also begun in Western Australia.

The Western Australian work has also been hampered by COVID and the border closures — both national and international — but this is expected to ease and there are plans to open up skill migration pathways for the program.

The first of the OPVs is the *Arafura*, bearing the name of the sea to the north of Australia, and she was launched at Osborne on 16 December 2021. The ship is expected to be commissioned in 2022.

The third shipbuilding program is for the Guardian-class patrol boats, which will be gifted to Australia's South Pacific neighbours.

These steel-hulled ships are being manufactured by Austal in Western Australia in a suburb south of the Henderson facility, with the fit out completed at Henderson.

"That process is producing boats every three months on schedule, and we have just delivered the third boat to Papua New Guinea, and that is boat 15 of 21," says Dalton.

"They have been really well received by the Pacific Island countries and they are quite a big step up from the older boats they've had for 20 years, and these are quite capable patrol boats in their own right and the program is running well."

There have also been COVID related issues with the Guardian class, however, with issues around bringing the Pacific Island crews into Australia for training.

"We had some delays with the Kiribati boat and getting the crew into the country but we caught up with that program in around October and got it back on track."

Other changes made to the shipbuilding program were included in the Force Structure Plan released in 2020, which increased the level of shipbuilding to be done in Western Australia.

Six additional Cape-class patrol boats were brought into the program, along with a range of other vessels such as eight new mine warfare and hydrographic ships constructed on a variant of the *Arafura* platform.

Much of the shipbuilding plan has been informed by the learnings from the earlier Hobart class destroyers, which

New Evolved *Cape*-class patrol boat hits the water

Austal has recently launched the first of six Evolved *Cape*-class patrol boats which will ease the transition risk to the Navy's new, larger and more capable *Arafura*-class offshore patrol vessels.

The first of these new boats hit the water at Austal's Henderson shipyard south of Fremantle in September last year and will be accepted in March. The new boats will replace the *Armidale*-class fleet which entered service from 2005.

"The Evolved *Cape*-class patrol boats will ensure the Royal Australian Navy is well-equipped to keep Australia's borders safe," says Head Maritime Systems, Rear Admiral Wendy Malcolm.

"With all six boats to be built in WA, we are continuing to strengthen Australia's naval capability while supporting local jobs."

Under a $350 million contract signed by Austal in April 2020, the new 58 metre long boats are expected to improve operational capability and availability, and bound the requirement to conduct a life-of-type extension on the Armidales.

The Evolved *Cape*-class patrol boats are set to be in service until 2030, when the Arafura class are expected to reach final operational capability.

The keel for the first vessel was laid down in mid-2020. The Evolved Capes incorporate improvements into the vessel's original design and include a larger crew complement of 32 instead of 22.

The original *Cape*-class boats entered service in 2013, and have been operated successfully by the Navy, the Australian Border Force, and by the Trinidad and Tobago Coast Guard.

Border Force operates eight *Cape*-class boats, while the Navy currently leases another two of the vessels, meaning the nation's fleet is eventually expected to grow to 16.

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were built in a distributed way with some blocks built in South Australia, others in Newcastle and Melbourne, and also some in Spain, home to the prime contractor Navantia.

"We recognised that this was not the most efficient way to build a ship, and we have moved to the construction of the vertically integrated shipyard," says Dalton.

"We are already seeing some of the benefits of that with the first units under construction at Osborne, and the efficiencies we are seeing augur really well and set us up for success with the *Hunter* class."

He says Defence has also introduced a different contracting model with the *Hunter* class, with a single prime contractor.

"We only need to press one 'belly button' and BAESMA has a range of conditions in their contract that requires them to perform well and create an environment where we can all deal with issues if and when they emerge," says Dalton.

Alongside the prime contractors, local industry and local capabilities are vital to the success of all of the programs, which takes the discussion back to the Shipbuilding College.

"The college has played an important part in understanding the demand for skills we will need across the next decade," says Dalton.

"All the shipbuilding primes have participated and they've agreed to share their demand data.

"We've also developed, along with industry and through the shipbuilding college, an agreed job taxonomy, so we have 200 jobs all agreed with descriptions and skill levels, and all the qualifications required.

"This is a really positive way of building the workforce."

The Shipbuilding College is also working on supply side analysis for the workforce, but it was important to build the demand side first, Dalton says.

"You need to build the demand side first, and then you can work out what the supply side strategies will be, and we've refined the supply approach over the last 18 months," he says.

"We are influencing the supply side strategies a bit more with graduates and people going through

BlueScope Distribution's National Product, Processing and Solutions Hub adds to sovereign capability

Sam Gerovasilis, BlueScope Distribution General Manager

As Australia's shipbuilding program gains momentum, the Navy's next generation ships will need many materials, including steel. To meet the needs of significant national projects, BlueScope Distribution has made a strategic investment in a new National Product, Processing & Solutions Hub. The new capability will deliver centrally managed steel plate processing and project management services to the primes and small and medium-sized enterprises which will do the shipbuilding.

Sam Gerovasilis, BlueScope Distribution's General Manager, says the company has invested around $7 million into Phase 1 of TheHub, and the facility will open in the first half of 2022, located in Unanderra, NSW, near the Port Kembla steelworks. Phase 2, 3 and 4 will follow.

Gerovasilis said BlueScope Distribution's investment in TheHub looks to support the significant development in key industry segments over the next decade. The National Product, Processing & Solutions Hub focuses on delivering surety of supply, an efficient national supply chain and in-depth project management to provide customers with productivity and efficiency improvements.

In addition to supporting Navy shipbuilding projects, TheHub will also distribute steel and aluminium products for other Defence projects, such as the Army's Land programs, and civilian sectors in infrastructure, renewable energy, agriculture, mining, and oil and gas. "When we looked at the sovereign capability we have in Australia we saw an opportunity to complement our 15 existing BlueScope Distribution sites around the country with a national capability to deliver product, processing and solutions for large customers," Gerovasilis said.

"We are a single source supplier of sovereign capability. We provide steel and aluminium, design processing outcomes rather than just standard products, and our semi-finished components can really help the efficiency of those large Naval projects."

Gerovasilis said BlueScope's company purpose is "to create and inspire smart solutions in steel, to strengthen our communities for the future" and TheHub, part of the BlueScope Distribution business, is an example of this high-level company-wide purpose in action.

TheHub is a state-of-the-art facility which will have plasma and laser processing and offers its customers the ease of dealing with one single source provider, along with industry expertise and technical know-how, with a centralised project management team.

The Illawarra location is close to supply partners like the Port Kembla steelworks and wharf facilities, and major road and rail infrastructure which will help with logistics and the efficient delivery of product to customers Australia-wide.

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Mr Blake Pilgram briefs the Chief of Navy, Vice Admiral Michael Noonan, AO, RAN, on the proposed upgrades during a tour of BAE's shipbuilding facilities as part of a visit to Defence Industries in Western Australia.

the vocational education system, but the reality is that if we wanted to fix today's issues, we would have had to influence the number of engineering graduates who came out of universities in 2014."

As a result of the demand side planning, there would be a role for skilled migration to deliver the right workforce for the programs. Reliance on this would wane over time as more graduates and skilled trades completed their education in Australia.

Dalton says Defence was also talking to the Government about some changes to the governance of the shipbuilding program, but these had not matured to any formal proposals as at the end of 2021.

"We have some ideas on how to improve the Defence side," he says.

"A key focus is what is the most efficient structure to deliver the enterprise and what resources we need in the current environment.

"There is a feeling that we might be a bit too 'skinny' for the work at hand, but we've recognised that those issues will be dealt with as the programs continue to gain momentum." ●

Nuclear submarine choice reflects strategic environment

Tony Dalton says there is no doubt that if the Attack-class submarine program had continued, Australia would have been operating the best conventionally powered submarines in the world.

However, he said that between greenlighting the Attack program in 2016 and this year, there had been major changes in the strategic environment.

"The Attack-class program made absolute perfect sense in 2016," says Dalton.

"When the Government approved the program we had the 2016 Defence White Paper and had a view of our strategic environment and a view of the types of technology we could access and what we couldn't access."

Since 2016, Dalton says, the strategic environment for Australia had changed faster than anticipated, and this was reflected in the latest Defence strategic update in 2020.

"With some of the issues coming out of the update, the Government asked Defence to have another look at the art of the possible in terms of the submarine capability," he says.

The Government's subsequent decision in making the AUKUS announcement and the acquisition of nuclear powered submarines has been well documented, but Dalton says the work done on the Attack program was still important in building Australia's shipbuilding capability.

"Australian workers have been involved with Naval Group and Lockheed Martin on the Attack program, and we will be able to keep and retain this is experience," says Dalton.

"This experience remains important to our shipbuilding enterprise, particularly in South Australia."

IMAGE: POIS Bradley Darvill

HMAS *Choules* Contract Delivering Success to Australian Defence Community

Atlantic and Peninsula Australia (A&P Australia) Pty Ltd specialises in providing marine platform through-life and in-service support to the Australian defence sector.

Best known for providing outstanding in-service support for the Bay Class Landing Ship Dock, HMAS *Choules*, the company has expanded its presence significantly since its incorporation in Australia in 2012.

Today, A&P Australia is an established partner for the Capability Acquisition and Sustainment Group (CASG) on behalf of the Royal Australian Navy (RAN) and is looking forward to the new opportunities presented by CASG's Plan Galileo and the Future Maritime Sustainment Model.

Starting with a small team of five in 2012, A&P Australia has grown to operate a team of over 80 dedicated employees, who offer all facets of a modern defence sustainment organisation. Ranging from our origins in ship repair and sustainment, and now including asset management and design and engineering for major platform systems, weapons, communications and specialist mission systems.

Today, A&P Australia is proud to be delivering the largest ship repair project in Sydney in the last decade.

A&P's support to *Choules* predated her sale to the RAN in December 2011, when the United Kingdom based A&P Group had maintained *Choules* (formally known as RFA Largs Bay) and her three sister ships since their entry into service in the mid-2000s.

A&P Group successfully secured the 10-year Future In-service Support Contract in 2019 to the UK Ministry of Defence and today continues to support the RFA Bay class, as well as RFA Argus and HMS Scott at home and in operational theatre.

In an acknowledgement of A&P's expertise and deep understanding of the vessel, A&P Australia was established to provide an interim support solution when *Choules* arrived in Australia.

A&P Australia soon demonstrated its capability to support *Choules* when a major defect required the replacement of the propulsion transformers.

Following the successful execution of this program, A&P started to manage and deliver all External Maintenance Periods (EMPs) for *Choules* which allowed A&P to build an effective and robust local supply chain and relationships with Defence and industry alike.

A&P's proficiency in delivering EMPs and provision of support for *Choules* resulted in the award of a sole source In-service Sustainment and Support Contract (ISSC) which was signed in 2015 to provide lean, flexible and effective support from the Garden Island Defence Precinct in Sydney. During the first few years of the ISSC, A&P worked with Defence to mature the asset supportability model and improve budget and maintenance plans for *Choules* based on actual sustainment needs

This has allowed A&P and CASG to optimise the maintenance output for *Choules* and deliver the required sustainment outcomes to meet Navy's operational requirements in keeping *Choules* at sea.

A&P Australia's sustained high performance and growing capabilities enabled the company to successfully secure the $180m Capability Assurance Program SEA 3030-2. This program will address major obsolescence, Australianise the platform and install key capabilities in order to assure and improve *Choules*' capability and performance until her planned withdrawal date early next decade.

The Capability Assurance Program (CAP) commenced in 2018 and was only the second time an acquisition type contract was embedded within sustainment. This was done to integrate both project and sustainment activities. It enabled CASG to draw from A&P's intrinsic vessel knowledge and reach back to the RFA Bay class upgrades, and allowed A&P to create synergies in resourcing, design and execution across sustainment and the CAP.

The CAP encompasses 44 capability enhancement areas and over 80 discrete engineering changes including major redesigns and the complete renewal of critical platform systems, such as HVAC, exhausts, galley, and ballast which will include the installation of a water treatment system. In addition to the platform systems, a number of new mission system capabilities are being installed and upgraded.

A&P has provided full turnkey systems engineering solutions from needs and requirements determination, concept and detailed design, material selection and procurement, supplier management, installation, disposals, V&V and trials.

Integrating the CAP with sustainment has provided CASG and Navy with some real benefits. The first upgrades took place early in the project during Intermediate Docking in 2019, including the major galley and laundry refresh. Taking a programmatic approach allowed CASG and A&P to deliver enhanced capability ahead of plan. This was realised when the galley upgrade was soon critical to support the evacuations from Mallacoota in January 2020 where over 1000 people were rescued and more than 4000 meals were served in a 24-hour period.

A&P could not be prouder to be supporting *Choules* and takes deep pride in the fact she was available and immediately ready to sail for Operation BUSHFIRE ASSIST when called upon. *Choules* and her crew sailed from Sydney on 1 January 2020 after the decision was made only the day before — a great achievement for Defence and industry.

Over time A&P has built an Australian supply chain of over 300 business all of which uniquely help to support *Choules*. With this, A&P has achieved close to 90% Australian industry content which is a great effort for a European built vessel.

With three sister ships operating from the UK along with several key platform subject matter experts, A&P Australia has found a real advantage in maintaining some of its links with the European supply chain. However, much of the capability originally delivered by the UK and EU-based suppliers has now been transferred to local industry through relationships instigated by A&P, with some of these suppliers now permanently established in Australia and supporting other RAN vessels.

Scott Willey, Managing Director of A&P Australia said, "A&P's success in Australia can be pinned to two key factors: our team and their expert knowledge and diversity across maritime, defence, ship repair, sustainment and marine engineering; and A&P's relationships, not only with customers and suppliers, but also within our own team. This has built a culture of pride, dedication and success centred around HMAS *Choules*.

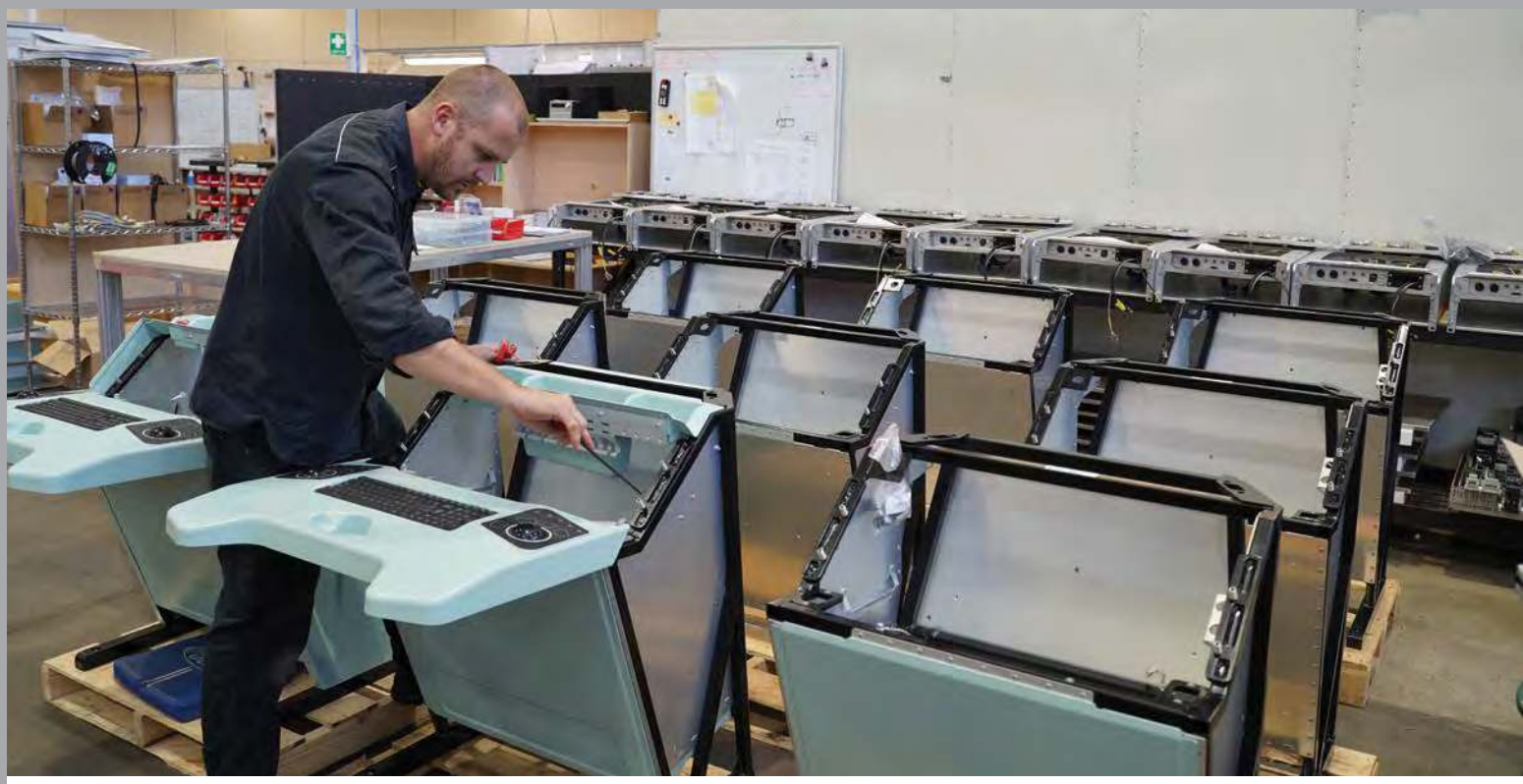
"We are eager for the opportunity to provide our level of support to other platforms and areas of Navy and CASG in response to Plan Galileo and the Naval Shipbuilding Plan.

"Through our supply chain and team of over 80 marine professionals and support staff, we are currently delivering what is probably the largest ship repair project in Australia today and the most ambitious in Sydney in over a decade.

"RP21 will span over 300 days at an approximate value of $90m in production costs alone. This would not be possible without the people, suppliers, customer, ship staff and wider stakeholders and the relationships that A&P has built during almost 10 years since HMAS *Choules* arrived in Australia in November 2011.

Atlantic and Peninsula Australia — Delivering Success Together

A&P Australia is part of the A&P Cammell Laird Group, which operates four ship repair and construction yards, including 11 dry docks in the UK for Defence and commercial maritime sectors. ●



Creating new local capability from a legacy of unique maritime expertise & development

A legacy of leading combat management system (CMS) development, integration and delivery, coupled with unique experience and understanding of Australian defence requirements continues to drive Saab Australia's (Saab) delivery of innovative solutions designed, developed and manufactured locally.

Leveraging its local expertise and experience as well as its close collaboration with Australian industry and academia, Saab's latest innovation has arisen from the in-country design, development and manufacture of its Multi Function Console (MFC) — an interface for integrated management of complex systems.

Saab built a solid reputation and formidable presence in Australia on the back of its 9LV CMS delivery and performance. While first thoughts about a combat system for most people are of missiles, radars and guns, these are only elements of a platform's combat system. At the heart is the CMS, which integrates sensor information and provides situational awareness and decision support to the war fighter in both defensive and offensive action. This technology must be flexible and adaptable to enable rapid integration of new technologies to meet evolving threats.

After securing the CMS contract for the *Anzac*-class frigate program over 30 years ago, Saab has worked closely with the Royal Australian Navy (RAN) to upgrade, enhance and develop it to meet their operational needs. Over that same period, and in response to unique Australian requirements, Saab AB progressively transitioned development work and the skills and capacity for future work to its subsidiary Saab Australia. The culmination of this technology transfer ultimately enabled the development of the 9LV Mk3E CMS for the highly successful Anzac Anti-Ship Missile Defence Upgrade.

In every sense, this CMS is unique to Australia. Its developed by Australians for Australian requirements and the company continues to nurture the in-country capability, developing a range of new applications and features to evolve the CMS to meet the current and future unique requirements of the Australian customer.

Saab has had a profound imp act on

Australia's Defence capability and its CMS already, or will in future, equip six RAN classes of vessels; Anzac, Canberra, Supply, Arafura, Mine Countermeasures and Military Survey Vessels. As the sovereign Combat Management System Enterprise Partner to Defence, Saab is also developing and delivering the Australian Interface for the *Hobart*-class destroyers and *Hunter*-class frigates.

Following in the steps of its CMS development legacy, with the integration of the Situational Awareness System (SAS) for Australia's newest surface fleet, the *Arafura* Offshore Patrol Vessels, Saab began establishing another new capability in Australia with the local design, development and manufacture of a new generation MFC.

The new generation MFC provides a stable, intuitive platform for the monitoring and control of multiple systems simultaneously. From 2018, working collaboratively with local industry, universities, ergonomics experts and naval operators, this innovative MFC increases efficiency and enhances operator comfort. When used in conjunction with Saab's command and control software (for example, the 9LV CMS), its characteristics combine to reduce operator mental load and fatigue, increasing reaction times and saving valuable seconds in critical situations.

The console provides a clear and distinct presentation of the tactical and operational environment, and is combined with innovative system design and hardware elements. Together with a logical human-computer interaction concept, the MFC is not only suitable in a naval platform environment, but for all types of defence and commercial applications. Uniquely modular, the MFC's five modules can be individually modified or changed to allow full customisation to meet any specific requirement, making it incredibly versatile.

The MFC design balances technical requirements, time and cost efficiencies with operational effectiveness and sustainability. This balance was achieved through partnerships including specialist engineering services by Applidyne, and human factors and ergonomic studies by the University of South Australia and Defence Science Technology Group. Combined with a proven local manufacturing supply chain, after successful capability testing and demonstration, the new generation MFC is manufactured locally by SAGE Automation.

Previously the capability only existed in Sweden. Now the in-country design and manufacture of the innovative MFC represents 60% Australian industry partner content, with the remaining 40% Saab's design and personnel expertise in Australia.

Operating in a complex environment during COVID-19, Saab's commitment to increasing Australian industry capability is allowing on-time delivery of hardware products, such as the MFC, to meet RAN requirements through reduced reliance on international products and services that were impacted by the pandemic.

Through the delivery of its domestic and international portfolio of programs, and its successful track record of technology transfer, Saab continues to support local SME participation, increasing opportunities for supply chain partners to secure workshare in its current and future programs for delivery both here and globally.

So why is this so important and how does it help Australian Defence? Saab's shift to in-country design, development and manufacture of the MFC, further supports the transition to increased sovereign capability across the defence sector. Ultimately this enables Australia to quickly modify, update and customise aspects of an already specialised product to meet the unique aspects of the Australian Defence Force (ADF) doctrine, needs and preferences.

Strengthening our sovereign industry and capability growth, local design, further enables local capability support, better realisation of needs and solutions for Australian defence, and better value for money.

Saab continues to support the design, development and production of innovative software and hardware in Australia to meet the evolving capability needs of the ADF to protect our people and keep our society safe.

Industry as a trusted partner

Under a revised model for above the line support services, CASG has appointed a small number of Major Service Providers (MSPs) capable of delivering larger, longer term and more integrated work packages to Navy. Lachlan Colquhoun speaks with two of these MSPs.

Navy's collaboration with Australian industry is critical to the delivery of a sovereign naval capability, and Navy and Defence are supported by a major and diverse ecosystem of companies ranging from prime contractors through to small and medium-size enterprises (SMEs).

Many of these firms have been working with Navy for decades, and also have international experience to bring to the table from their work with Australia's strategic partners.

Working within these companies are often people who have had significant Naval careers before moving into industry roles, and Dean Schopen is one of these.

Before his current role as the Head of Maritime at KBR, Schopen had a 24-year career in the Navy, which included operational service in the Persian Gulf and Solomon Islands, command of two mine-hunting vessels and the Mine Warfare and Clearance Diving Task Group.

"I firmly believe that with anyone who has done a significant period of time in the military, their loyalty to the service is always part of them," says Schopen.

"They always want to make sure the services they deliver are the best they can possibly be, and they keep that commitment to the people in uniform and to the nation."

As part of his role at KBR, Schopen works in an advisory and relationship management role with senior Navy leaders, many of whom he knows well since his early days in the service.

KBR's professional services business in Maritime is delivered predominantly into CASG on programs such as the Amphibious Combat and Sealift (ACS) SPO Capability Support Coordinator (CSC), and also through its collaboration with strategic advisory firm Ernst & Young in the MSP program.

"In ACS SPO CSC we deliver specific skill sets into Navy for capability lifecycle management, whereas the MSP program is more flexible and agile around small, focused teams to deliver task oriented outcomes in our clients' areas of concern; for example, data management, engineering or ILS," says Schopen.

KBR has worked with Navy on projects such as the transition and remediation of the Landing Helicopter Dock (LHD) to reach final operational capability, and on the successful transfer of two *Adelaide*-class guided missile frigates to the Chilean Navy in 2020/21.

In many of these projects, KBR staff sit side by side with uniformed Navy people and Commonwealth public servants.

"Quite often our people are indistinguishable, and I think that's a compliment and speaks to the genuine partnership we have with the Commonwealth and our commitment," says Schopen.

HMAS *Choules'* embarked MRH-90 Maritime Support Helicopter, HAT-TRICK re-joins the ship as they both continue to support Operation BUSHFIRE ASSIST.

IMAGE: ABIS Jarrod Mulvihill

"I have witnessed senior naval officers not being able to recognise who are the CASG public service staff and who are the contractors with KBR, and that's a strong example of how our people integrate.

"We've had people on our staff receive commendations from the Chief of Navy, and that speaks to a terrific relationship."

KBR's commitment has been demonstrated on several occasions through recent national emergencies. In Operation BUSHFIRE ASSIST in 2020, Navy deployed HMAS *Adelaide* and *Choules* at very short notice and got the ships ready over the Christmas and New Year period.

"Our people were in their boots and all to ensure those ships were ready to deploy on January 2, 2020, and go to the assistance of the public," says Schopen.

"It was very much a unified effort and I'm proud that our staff go that extra mile to deliver."

KBR was also actively involved with CASG as it conceived Plan Galileo, the new framework for sustaining Navy's new platforms. In that exercise, KBR could draw on its experience in sustaining the two LHD ships, which have passed through the acquisition phase and into sustainment and full operational capability.

"That process has been able to test some of the hypotheses on the art of the possible and that has been important in learning for the future, and we were able to share that," says Schopen.

"We all acknowledge that we have entered an unprecedented period of change in terms of the complexity of design, the size of the platforms, and those aspects of Navy business are the ones which need to be appropriately addressed to ensure that Navy delivers the right outcome to Government."

Training is another major area in which Navy relies on industry partners, and KBR has been a proven provider of advanced training services.

John Robertson, General Manager of Systems & Training Solutions at KBR, says that the showcase for much of Naval training is the LHD training which takes place at Randwick in Sydney.

KBR has developed a ship walk through computer model for the LHDs which can be a model for the future 'Ship Zero' concept that Navy training is planning for all new platforms.

In one example, Marine Systems Technicians can perform a 'virtual round' of the ship wearing virtual reality headsets.

"Normally it would take a fair bit of time to do this, but what we've done is to deliver it virtually and that has improved job readiness," says Robertson, who also had 15 years in the Navy as a Weapons Electrical Officer.

"People can go through that simulation and learn the different routes

HMAS *Perth* returns home to Fleet Base West from an extended period of maintenance and upgrades at the Australian Marine Complex at Henderson in Western Australia as part of the Anzac Midlife Capability Assurance Program.

IMAGE: CPOIS Damian Pawlenko

before they actually post to the ship, so that when they get there, they are familiar with what they have to do.

"We've even included some natural delays as they move from one part of the ship to another, so this makes it even more realistic."

KBR has a particular expertise in the area of technical training support services, and is heavily involved with technical trade training for Navy and leverages a relationship with TAFEs around Australia.

"We are a company that covers all aspects of training from the acquisition phase through to sustainment and much of the work done by Navy categories," says Robertson.

"We are involved in recruit training, new officer training, and right through to platform training."

KBR is leveraging its expertise in simulation to support Serco at the bridge simulation facilities at HMAS Watson in Sydney, and is working with Victoria's Deakin University in supporting a defence innovation hub for collective training for naval firefighting.

The firm works closely with academia to "join the dots between Navy, industry and academia," says Robertson

"All of this is built around our people, be they subject matter experts, educators, training developers or analysts," he says.

"Navy is more than a customer to us. It is a part of our lives for many of us and we are always thinking about what we can do in terms of the best level of service."

Another major industry partner for Navy is the Downer Group. Downer's construction and engineering expertise has built much of the infrastructure Australians use on a daily basis, and the company also has a long history of working with Navy.

This year marks 80 years since Downer built *Bathurst*-class frigates for the Navy at the height of World War II in 1942, and today the company is Australia's fourth largest Defence contractor.

Downer has built patrol boats and landing craft for the Navy and, from the 1970s, moved into asset services and infrastructure delivery and maintenance.

Andrew Harmer, National Maritime Director at Team Downer, explains that Downer's work with Navy comes through two streams. There is Team Downer which works as an MSP inside CASG's Maritime System Division (MSD) and Ships Division across a number of critical national programs while Downer Defence contracts across the Defence portfolio, including to Navy, in areas such as base and estate services facilities management.

Downer's acquisition of the Spotless Group forms part of its capability and offering in this area, and Downer Defence staff often also work alongside prime contractors on major projects.

Harmer's previous experience includes a role with the Defence Materiel Organisation, and he is well placed to understand and work alongside the uniformed workforce on Navy projects.

"We are the largest Australian prime in the defence space that is not a building company," he explains.

"With Team Downer, we are working above the line inside SPOs, CASG Branches, Divisions to augment the Defence workforce."

Team Downer was appointed as an MSP for CASG in 2018, and was then awarded an Integrated Work Package (IWP) to provide support to the Critical Systems Branch of Joint Systems Division.

Today, it manages a flexible workforce that integrates with the Commonwealth team — both Navy personnel and public servants — to boost capacity, augment capability and bring fresh ideas and solutions, often leveraging knowledge and people who have worked in other major areas of civilian industry such as mining and construction.

Team Downer also delivers vital maritime capability to CASG through IWPs for the MSD, Naval Construction Branch (NCB) and Maritime Integrated Warfare Systems Branch.

Team Downer has deep roots in Australian industry, and champions the SMEs it works with on a daily basis. In 2019/2020, Team Downer included SMEs in almost 70% of work, representing an investment of over $58 million.

The reach, says Harmer, is also a key part of enabling Australia's sovereign capability, the end goal of which is to enable Navy to fulfil its mission of fighting and winning at sea.

Team Downer's involvement with SPOs spans Navy's five major ports in Perth, Darwin, Cairns, Sydney and Adelaide, while other staff are also based in Canberra working on Navy projects.

One key project is the SEA 4000 Phase 6 program, which will modernise Navy's three *Hobart*-class guided missile destroyers.

"We've taken a blend of our maritime experience and blended a team who have previously worked on the Olympic Dam mine and we are scheduling the work to maximise the efficiency and the capability we can add."

Downer is also involved with the Midlife Capability Assurance Program for the 10 *Anzac*-class frigates at the Henderson yards in Western Australia.

This program is designed to ensure the capability of the class through to the arrival of the new *Hunter*-class frigates scheduled for 2030.

Other areas of involvement for Downer include the new Offshore Patrol Vessel (OPV) program, where Downer people are inspecting the welds on the new vessels

KBR members of the LHD Transition and Remediation Program Team that received a Chief of the Navy Commendation for their instrumental role in achieving Final Operational Capability for the *Canberra* Class.

Andrew Harmer, National Maritime Director at Team Downer

as they are constructed both in Adelaide and Perth. Downer people are working to support the work of the NCB of CASG.

"Where there is a ship being built we will have staff there supporting them," says Harmer.

"Once again, we are leveraging our industrial experience. Those welding inspectors working on the OPV program, many of them have been working on major liquefied natural gas projects up in Port Headland, now they are inspecting welds on OPVs."

Team Downer's focus is on supporting maritime and cross platform capability. We are committed to providing Defence with the right skillsets and personnel, including to the largest cohort of SMEs. Our current work across two CASG maritime divisions, involved in cross platform maritime acquisition and sustainment, provides support and strengthened integration in the delivery of frontline capability.

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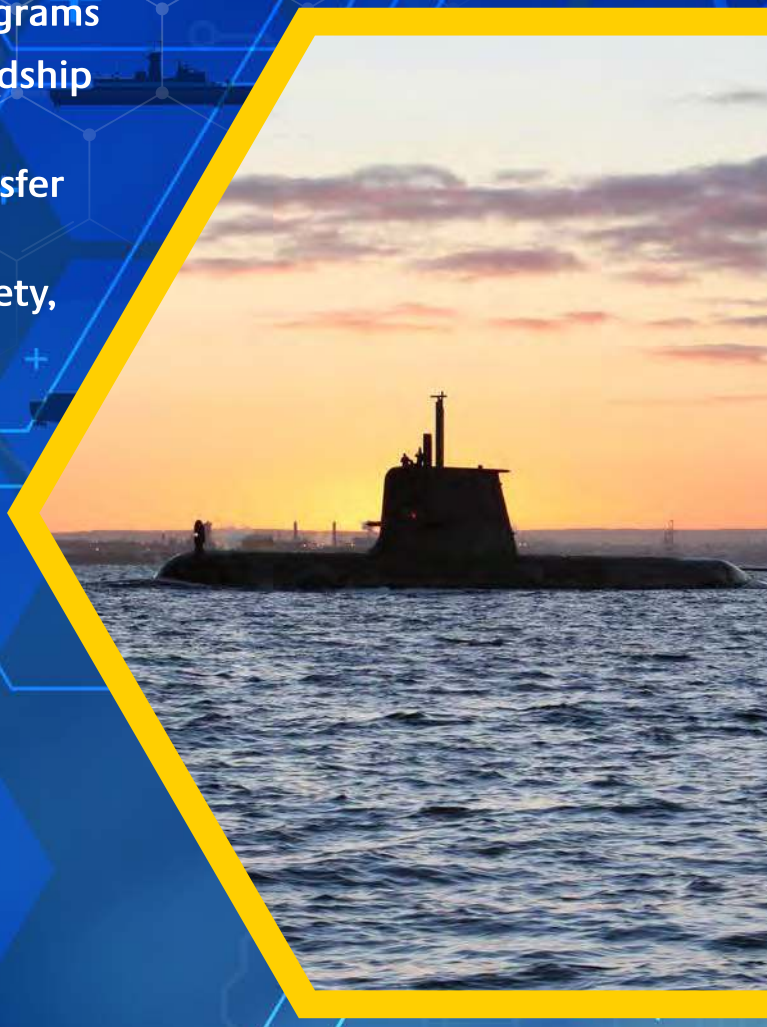

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Luerssen Australia shipbuilder Malte Hoffman secures the coin inside the mast at the OPV *Arafura* mast stepping ceremony held at Osborne Shipyard in South Australia.

RADM Wendy Malcolm

Plan Galileo. **New thinking for Navy sustainment**

Sustaining Navy's surface fleet requires a budget of around $1.5 billion a year, and is critical in maintaining the seaworthiness of the ships and ensuring that the Navy is best prepared to fight and win at sea. **By Lachlan Colquhoun**

As well as making sure we can keep the Navy agile we have been looking across the country and looking at what we need to do to make sure we have a coordinated and consistent approach...

Models of sustainment have evolved over the years, with the latest incarnation being Plan Galileo, an integrated methodology which takes a national approach with a target date of 2025 for full implementation.

In the past, Navy did much of the sustainment internally, but this changed as industry has become more involved as partners.

Sustainment has also historically taken a platform by platform approach, focusing on distinct classes of ships.

Plan Galileo, the model which will be used for all of the Navy's new ships, takes a different angle with a 'cradle to grave' lifecycle approach delivered from four new Regional Maintenance Centres (RMCs) in Sydney's Garden Island, Henderson in Western Australia, Darwin and in Cairns.

The goal is to build synergies, maximise the use of resources and incentivise capability development among industry partners, with a focus on the regional centres.

While much of the maintenance work necessarily takes an asset class specific approach in terms of what is needed to keep a ship in the water, Plan Galileo also takes a longer term view where sustainment resources can be pooled and developed to improve the sustainment capability in the long term.

Rear Admiral (RADM) Wendy Malcolm, now with CASG's Maritime Systems Division, is responsible for delivering Plan Galileo and is under no illusions about the magnitude of the task at hand as Australia embarks on an unprecedented shipbuilding plan.

"All this is coming at us at pace," she says.

"If you look at what is happening to our fleet over the next 20 to 30 years we are going to increase the tonnage of the Navy by more than 130%.

"And that means we'll have a drumbeat of a ship delivered on average every year for the next 20 to 30 years."

The new ships, says RADM Malcolm, will be heavier and more complex and this will require a different approach to sustainment, and an investment in the necessary infrastructure.

"As well as making sure we can keep the Navy agile we have been looking across the country and looking at what we need to do to make sure we have a coordinated and consistent approach," she says.

"This raises issues of what we need to do with our infrastructure, and how it needs to be bigger or different to what we have now so that we can

IMAGE: LSIS Shane Cameron

better provide the maintenance and assets to manage our ships to ensure that they are there when Navy needs them, and are reliable when they do."

Capability Life Cycle Management is at the core of Plan Galileo and this encapsulates a holistic approach in which every aspect of the ship's life and experience is integrated into the sustainment process.

Sustainment is not just about availability, but also capability. The new platforms are likely to have a lifespan across several decades and this would require not just ongoing maintenance but also several major refurbishments in that time.

"A key part of putting this is place are the Regional Maintenance Centres at our key home ports, with the aim of consolidating and evolving our maintenance and support requirements to provide long-term certainty," says RADM Malcolm.

"This will enable us to actually forecast and improve our use of resources and also upskill these resources over time."

Head of Maritime Systems RADM Wendy Malcolm RAN CSM (centre right), with staff members from Hydrographic Systems Program Office, Tropical Reef Shipyard (TRS) and BME NQ during her visit to the TRS shipbuilding facility, Cairns, QLD.

OPV *Arafura*'s mast is lifted into place on top of the ship's bridge after the official mast stepping ceremony held at Osborne Shipyard in South Australia.

Hobart-class destroyers join Plan Galileo

As Plan Galileo gains momentum, the Department of Defence opened a tender in October 2021 for a capability life cycle manager (CLCM) for Navy's three *Hobart*-class destroyers.

The tender followed the appointment of Raytheon as the CLCM for the *Arafura*-class offshore patrol boats, and marks a step forward in the fulfilment of the Future Maritime Sustainment Model under Plan Galileo.

The destroyers will be the first major Royal Australian Navy (RAN) platform to be appointed a CLCM.

Announcing the tender, Defence Industry Minister Melissa Price said, "This model builds on the success of our continuous naval shipbuilding initiative and has been designed to ensure we can continue to deliver a complex naval capability at sea that is reliable and fit-for-purpose.

"It includes performing asset management for the capability and supporting the upgrade of their combat management system."

Minister Price said that Australia's defence industry would act as a 'steward' for the Royal Australian Navy's *Hobart* class destroyers under the new approach to sustainment that will optimise the destroyers' capability and create hundreds of jobs in South Australia.

The three *Hobart*-class air warfare destroyers (AWD) are being built by the AWD Alliance for RAN under the AWD program, known as SEA 4000.

In December 2021, Lockheed Martin Australia was awarded a $33 million design contract to support the upgrade of the Aegis Combat System on the RAN's fleet of three *Hobart*-class destroyers.

This contract forms part of a rolling-wave of upgrades that ensures Australia's sea-based integrated air and missile defence capability has the technological edge to protect deployed naval forces.

Lockheed Martin Australia and New Zealand Chief Executive, Warren McDonald, welcomed the SEA 4000 Phase 6 CSD-A contract award. "As the manufacturer of Aegis, the world's most advanced combat system, Lockheed Martin Australia is proud to deliver and sustain capabilities that play a critical role in the defence of Australia's interests, as well as those of our allies in the Indo-Pacific," McDonald said.

"Lockheed Martin Australia looks forward to collaborating with the Royal Australian Navy, industry partners and the US Navy to ensure the successful upgrade and ongoing sustainment of Australia's Aegis Combat System."

Another dimension to the Plan Galileo approach is a commercial approach with aims to reduce duplication and administration, but also deliver consistency.

The first of the RMCs will be in Cairns and the first platform to adopt the strategy will be the *Arafura*-class Offshore Patrol Vessels (OPVs), the first of which will be welcomed into the Navy in 2022.

Cairns will initially sustain Navy's six new Evolved Cape-class patrol boats, which are being constructed in Perth and will be the bridge to the *Arafura* class.

The Cairns RMC will be supported by the Skilling Australia's Defence Industry Grants program, which provides businesses servicing the defence sector with upskilling and training opportunities.

It also aligns with the Australian Government's recently announced $1.5 billion Modern Manufacturing Strategy which will build resilient supply chains.

In May 2020, the Government announced new facilities to support the *Arafura*-class OPVs in Cairns, which is a $155 million investment.

"The upgrades at HMAS Cairns will create local jobs both during the construction phase and afterwards through ongoing sustainment," Prime Minister Scott Morrison said as he made the announcement.

"More jobs will be created through the supply chain and in off-site manufacturing. This investment will be a significant boost to the local Cairns economy as we recover from the COVID-19 pandemic."

Defence Industry Minister Melissa Price said the upgrade is part of the $2.1 billion Navy Capability Infrastructure Subprogram (NCIS) to deliver maritime and landside facilities around the country to support operation of Navy's new ships being delivered under the Government's Naval Shipbuilding Plan.

"Works will include demolition of the existing Navy wharf and construction of a new wharf in its place, and an upgrade of the existing explosive ordnance loading buoy in Trinity Inlet," Minister Price said.

"Landside operational support facilities will include a new office building, upgrades to maintenance and logistics facilities, and new storage facilities."

In developing the new RMCs, RADM Malcolm says the process will be a mixture of upgrading existing facilities and a greenfield approach where required, with the addition of new infrastructure.

"With regards to warships, a lot of the sustainment activity is about lifting them out of the water when required and for that you need ship lifts and docking facilities," says RADM Malcolm.

"For example, Defence is doing a lot of work in Garden Island in Sydney, with a new wharf recently completed and a scheduled large, proposed project to refurbish and modernise the Captain Cook Graving Dock as well as many of the working accommodation buildings and systems to ensure that it can continue to meet Defence's needs in the decades to come."

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Head of Maritime Systems RADM Wendy Malcolm, CSM (right) is given a guided tour of the Tropical Reef Shipyard in Cairns, Queensland, by General Manager Rob Downing.

IMAGE: LSIS Shane Cameron

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"In Western Australia, what we have is unique as a shipbuilding and sustainment hub at Henderson, and we are partnering with the State Government there to make the most of that facility moving forward and making sure it meets our needs as the home for the submarine fleet, but also where quite a lot of shipbuilding will be done."

The WA State Government is keen to develop defence industry in the state, and the upgrades to naval infrastructure are part of the State's ambition to double the value of the Department of Defence's annual contribution to the WA economy from $3 to $6 billion by 2030.

In September 2021, a joint venture between Perth-based companies Duratec and Ertech was awarded a $52 million contract to lead an extension and upgrade of the HMAS Stirling Oxley Wharf to service a growing naval fleet.

Works at HMAS Stirling will include the design and construction of the 138 metre wharf extension, with a 25 metre-wide wharf deck supported by tubular steel piles.

In making the announcement, Minister Price said the Duratec Ertech joint venture had been appointed head contractor for the project to extend the wharf in a project expected to support up to 75 construction jobs.

It shapes as a major win for local businesses, with those within 50km of HMAS Stirling to win 93% of all sub-contract packages to maximise opportunities for local industry.

The Duratec Ertech joint venture has set an Indigenous workforce target of at least 4% and an Indigenous owned enterprise subcontractor target of at least 4%.

The new construction works at Stirling will support the mooring and berthing of the new *Hunter*-class Frigates, *Arafura*-class OPVs and other Royal Australian Navy vessels, Minister Price said.

The Oxley Wharf project is part of the NCIS.

In Darwin and Cairns, CASG and Navy are also working with the State and Territory Governments to review the existing infrastructure to support the RMC in those locations. A new ship lift, for example, is under construction in Darwin by the Northern Territory Government that Defence maintenance activities will be able to utilise.

IMAGE: CPOIS Kelvin Hockey

Government partners with industry at Garden Island

The Department of Defence is seeking input from industry to support the ongoing management and operation of the Captain Cook graving dock at the Garden Island Defence Precinct in Sydney, a key strategic national asset which supports naval sustainment operations through the ability to dry dock Navy's largest ships.

Head Maritime Systems at the Department of Defence, Rear Admiral (RADM) Wendy Malcolm said a Request for Information (RFI) has been released to Australian industry in November 2021 as part of a full appraisal of the operation and support arrangements for the dock.

"As we plan for an evolving regional landscape and implement Plan Galileo — our national approach to sustaining our Navy's existing and future capabilities — it is appropriate to review the management of critical Defence assets such as the Captain Cook graving dock," RADM Malcolm says.

"Australian industry has an important role to play in ensuring we develop optimal future arrangements."

The Captain Cook graving dock plays an integral role in maintaining Australia's naval fleet and RADM Malcolm says Australian industry was encouraged to contribute their expertise to the Review.

The themes that emerge from the RFI will inform the future procurement strategy.

The current operations and support contract for the dock is due to expire in May 2024.

In June 2021, Navantia Australia installed a Through Life Support Facility at Garden Island, a multipurpose open architecture system that enables the testing and development of Integrated Platform Management System (IPMS) hardware and software to be conducted on shore.

It replicates the IPMS hardware and software installed on board the *Canberra*-class landing helicopter docks and *Supply*-class auxiliary oiler replenishment ships. This is a key enabler for the optimisation of maintenance and platform availability through the capture and analysis of real data from the ships and proactive obsolescence management.

Navantia Australia's Managing Director, Israel Lozano Barragán, said the installation of the Through Life Support Facility is another step forward in delivering Australian sovereign sustainment capability.

"The ability to maintain design integrity, configuration control, upgrades and modernisation of all Navantia designed ships and supplied systems and equipment, including the IPMS, in Australia is a key capability developed in Navantia Australia to support CASG and the Royal Australian Navy's fleet," says Lozano.

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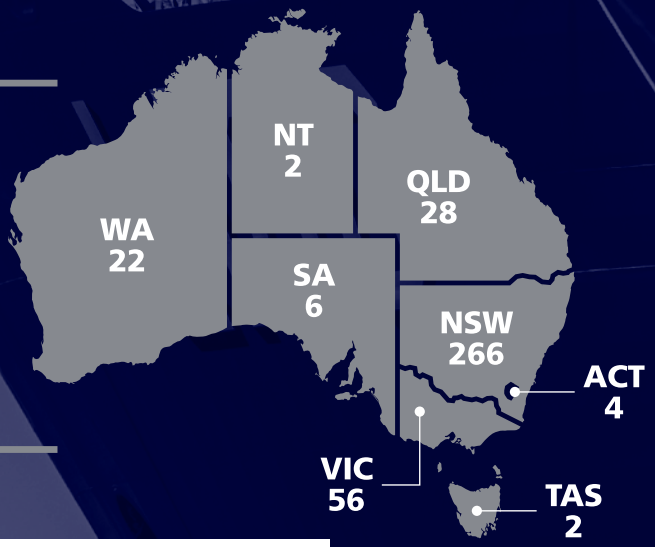

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"There is a patrol vessel focus in Cairns and Darwin but they are very strategic ports for our Navy in terms of where they are positioned in the Pacific, and it's a real mix across the country of Commonwealth sites and working with the next tier of government to deliver what we need over decades," RADM Malcolm says.

In all of this, says RADM Malcolm, industry is key and has been widely consulted and informed of the requirements. Industry has also given feedback and has been pushing hard for where it sees areas of potential improvement.

"Industry has said they really want to be a part of this sovereign capability, but we have to offer longevity and certainty in return," says RADM Malcolm.

"So we went out and did a lot of stakeholder engagement in those key areas with the primes, the original equipment manufacturers and the smaller companies, and we got a lot out of that and that will be reflected in the contracts and the statements of work around them.

"The first RMC contract has been announced for Cairns, and local providers have got involved and we think the Plan Galileo approach is also really going to help grow companies and capability in those regional areas."

While 2025 is the target date for Plan Galileo, RADM Malcom says there are interim requirements along with the way with the two lines of delivering being around the infrastructure and the RMCs.

"We are looking at the way we contract our supply chain so we also upskill our people, and it's also about coming up with the right logistics systems going forward which is an area we need to improve on and bring into the 21st century," says RADM Malcolm.

"I think we are also doing a better job on how we transition between acquisition and sustainment, and making sure that when we are delivering a new capability we are hand in hand and making sure that when those vessels hit the water and Navy takes them out to sea, they have the right supply chains and logistics behind them.

"It's quite an ambitious program over five years, and there are number of areas we are making excellent progress in how to make sure we meet our 2025 target."●

(l-r) Head of Maritime Systems RADM Wendy Malcolm CSM, and Secretary of the Department of Defence Mr Greg Moriarty, officially pen the Off-Shore Patrol Vessel Enterprise Office at the Henderson Shipyard in Western Australia.

IMAGE: LSIS Ernesto Sanchez

Raytheon Australia announced as *Arafura*-class OPV life cycle manager

Raytheon Australia has commenced work as the Capability Life Cycle Manager for the *Arafura*-class Offshore Patrol Vessels (OPVs).

As the OPV Capability Life Cycle Manager, Raytheon Australia will be involved in the implementation of the Royal Australian Navy's Plan Galileo and support the OPVs as they transition into service.

"Raytheon Australia will be leveraging our experience in complex program management for Australia's defence to provide specialist services to support the planning, assurance and optimisation of the through life sustainment of the OPVs," says Raytheon Australia's Managing Director, Michael Ward.

"This is not a traditional maritime sustainment role, rather it is the first step towards a nationally integrated sustainment environment for Australia and the implementation of the Royal Australian Navy's Plan Galileo," Ward says.

The first of the OPV vessels, HMAS *Arafura*, is set to enter service in 2022.

Raytheon Australia's in-country team will use its ready-now capability, mobilising a transition team in Adelaide, South Australia, to support the first two OPVs as they transition into service.

The core Capability Life Cycle Management team will be based in Henderson, Western Australia, to support the remaining 10 OPVs to be constructed there.

Raytheon Australia's appointment also enhances opportunities for Australian small and medium enterprises (SMEs) when delivering services under the new contract, making domestic sourcing recommendations and promoting local industry development.

In March 2021, Secretary of Defence, Mr Greg Moriarty, together with a large contingent of Defence senior leaders, launched the *Arafura*-class OPV *Enterprise* and opened the OPV System Program Office at the Henderson precinct.

The OPV *Enterprise* brings together Commonwealth and defence industry teams under one roof, to build and sustain the *Arafura*-class OPVs.

"It is great to see the co-location of Commonwealth shipbuilding and sustainment personnel and Luerssen, CIVMEC and Raytheon industry partners delivering outcomes for our Navy," Tony Dalton, Deputy Secretary National Naval Shipbuilding, says.

Head Maritime Systems, Rear Admiral Wendy Malcolm says the establishment of the OPV *Enterprise* represented an important milestone under the Continuous Shipbuilding Plan and marked a critical step towards the implementation of Plan Galileo

A global maritime capability delivered locally

From berth to dry-dock and stem to stern, Babcock Australasia brings together expertise and capability in engineering, design, systems integration, platform management, sustainment and stewardship, as well as resilient supply networks to deliver key support activities for the Australian and New Zealand navies.

Central to Babcock's operations is a commitment to building sovereign industry capability and its approach provides confidence and assurance for Australia and New Zealand-based suppliers.

"We focus on forging strategic partnerships with local industry that generate the development of additional skills, capacity, intellectual property, long-term jobs and broader economic benefits to the communities in which we operate," says Andy Davis, Babcock Australasia's Managing Director – Defence.

Sustaining Australia's warships

Babcock's naval warship sustainment operations is a prime example of continuously delivering Australia's sovereign industry capability.

Known for its long term, collaborative partnerships, Babcock formed Naval Ship Management (NSM), together with its joint venture partner, UGL, in 2011. From its humble beginnings as the maintenance, repair and overhaul (MRO) contractor for the *Anzac*-class frigates, NSM has grown into a Tier 1 naval sustainment prime contractor with almost 300 employees.

As the Asset Class Prime Contractor for the Royal Australian Navy's flagship capability, the *Canberra*-class landing helicopter docks (LHDs) and associated LHD landing craft, NSM's capabilities have expanded well beyond MRO, delivering Babcock's core strengths of digitally enabled asset management and engineering.

"One of the key promises we made as the LHD Asset Class Prime Contractor was to take immediate steps to reduce the reliance on international suppliers through 'Australianising' the supply chain," says Davis. "As a result of our Inclusive Prime model, I'm proud to say we're making good on that promise, with an ever increasing number of our suppliers on that program delivering directly from Australia."

Testament to its success, NSM, together with the Amphibious Combat and Sealift Systems Program Office, were named Australian Defence Magazine's 2021 Essington Lewis Awards winners for the 'Major Sustainment – over $20 million' category for the First of Class upgrade to HMAS *Canberra* as part of the LHD sustainment program.

In February 2022, Babcock acquired the remaining 50% shareholding in NSM from its long-term joint venture partner, to further strengthen the breadth of its maritime support to the Australian Defence Force maritime capability.

"This shareholding acquisition aligns with our strategy to be the number one warship sustainment company in the region," says Davis.

Babcock also operates New Zealand's largest marine engineering and maintenance support facility in Devonport, Auckland. As the Strategic

Maritime Partner to the New Zealand Defence Force (NZDF), Babcock provides complete asset management, engineering and assurance services to the entire Royal New Zealand Navy fleet.

"We-have a very strong partnership with the NZDF," says Davis. "Situated within the Devonport dockyard and Naval Base, and working alongside New Zealand Navy personnel, this close integration provides real benefits to delivery of the critical outcomes."

Sustaining critical systems for the *Collins*-class submarine

Utilising its local workforce in Osborne, South Australia and Henderson, Western Australia, as well as a wide range of suppliers across Australia, Babcock develops and retains critical sovereign capability in the sustainment of the *Collins*-class submarines.

As part of its long and successful partnership with Australian Submarine Corporation (ASC), Babcock is the designer, manufacturer and maintainer of the *Collins*-class submarine Weapons Discharge System and Submerged Signal Ejector. It is also the in-country repair agent for the air purification unit.

Employing 60 talented people on the Collins program, Babcock undertakes repair, refurbishment and replacement of key system components, and provides engineering capability for concessions, deviations and system improvements to support the submarine systems throughout their life cycle.

"We have an excellent working relationship with our customer, ASC, working collaboratively to identify and mitigate key risks and delivering value improvement opportunities to the *Collins*-class sustainment program," says Davis.

A highlight is the collegiate approach to engineering with Babcock engineers working side-by-side with ASC engineers on-site. This provides immediate access to key knowledge and experience of our systems, allowing instant feedback and further streamlining our mutual processes.

Looking to the future of the Collins platform, Babcock will leverage its extensive international experience in submarine Life of Type Extensions (LOTE).

"We're collaborating with ASC to assist with planning the strategic alignment to each phase of LOTE, ensuring the capability and technology will support the life extension of Collins across the next 20 years," says Davis.

Leading nuclear submarine safety and stewardship

As part of the Babcock International Group, Babcock Australasia brings technologies, innovations and expertise from across its global enterprise to build and grow Australia's sovereign industry capability.

With proven experience in the full life cycle of capability required, Babcock has supported the Royal Navy in its nuclear submarine design, acquisition, sustainment, disposal, training and regulatory compliance programs for more than 50 years. Operating the UK's only licensed facility for refitting, refuelling and defueling nuclear submarines, Babcock sustains 100% of the Royal Navy's nuclear-powered submarine fleet, including the delivery of through-life support of the Vanguard, Trafalgar and Astute classes, and now also LOTE of the Vanguard class.

Babcock also operates HMNB Clyde and HMNB Devonport — two of the UK's three naval bases, which comprise the operating ports of the Royal Navy's submarine fleet.

"Babcock has decades of experience in the safe operation and management of the ashore support infrastructure required to support a nuclear submarine fleet," says Davis. "We have a proud history of nuclear technical capability stewardship, safety leadership, engineering and infrastructure management."

International success with the Arrowhead 140 Frigate

Internationally, Babcock has also had huge success with its Arrowhead 140 Frigate after being awarded a contract with the UK Ministry of Defence as the new Type 31 Frigate for the Royal Navy. The symbolic first cut of steel for HMS *Venturer* was conducted at Babcock's new advanced manufacturing facility at Rosyth in Scotland, which includes panel lines with robotic welding capability, as well as other semi-automated manufacturing processes.

With a low cost, unique modular design and open architecture combat system, the Arrowhead 140 has significant interest from navies across the world and has already secured its first export contract with PT PAL Indonesia.

"This provides a great opportunity for Babcock in Australia and New Zealand to support the wider local region," says Davis. "It would be great to see Australasia become a regional hub for building, fitting out or supporting Arrowhead 140 and given the level of interest generated in the region, that is certainly a possibility we're exploring."

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IMAGE: POIS Yuri Ramsey

Future Navy Capability

Pandemic a speedbump not a roadblock. By Gregor Ferguson

COVID-19 has been a speedbump, rather than a roadblock, to transforming the Royal Australian Navy's Fleet into a more agile and potent naval force.

For Rear Admiral (RADM) Pete Quinn, Head of Navy Capability, the biggest impact on his work by far over the past two years has been the 2020 Defence Strategic Update (DSU) and Force Structure Plan (FSP).

The Government's historic announcement on 16 September 2021 that Australia would acquire and operate a fleet of nuclear-powered submarines has also been a significant change.

"The Defence Strategic Update, particularly, was a very significant document and a shift in Defence policy, the biggest shift in Defence policy for decades," RADM Quinn tells Navy OUTLOOK.

Head of Navy Capability RADM Pete Quinn

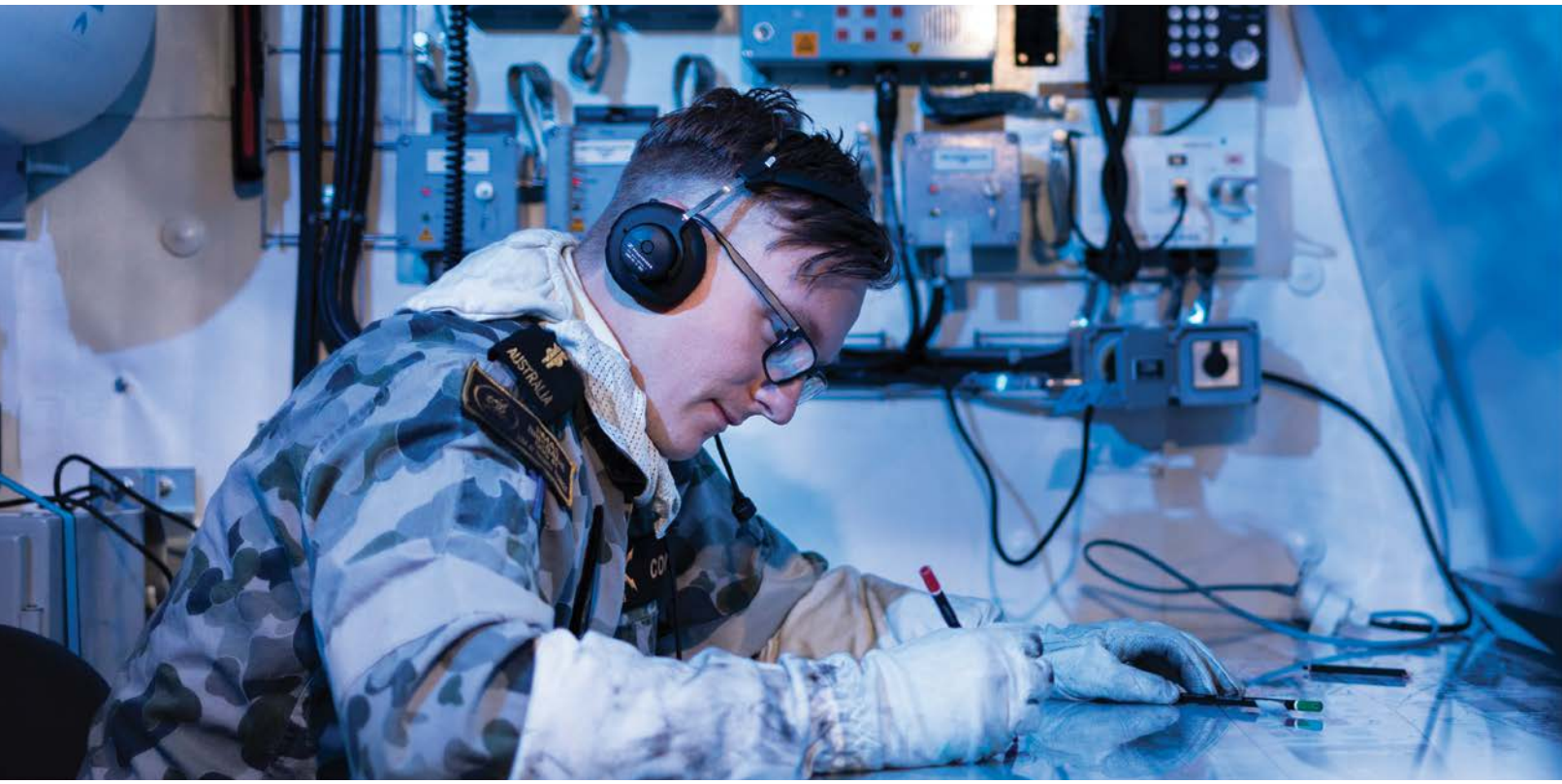


IMAGE: LSIS Daniel Goodman

The DSU identified a requirement for the Australian Defence Force to focus more closely on Australia's immediate region.

"It talked about an acceleration of trends which were predicted in the 2016 White Paper but since that time, we've seen even more acceleration and Australia is operating in a more complex and changed strategic environment."

The DSU identified a requirement for the Australian Defence Force to focus more closely on Australia's immediate region.

That region runs from the north-eastern Indian Ocean, through maritime Southeast Asia, down through Papua New Guinea and into the Southwest Pacific.

"We've been told to prepare for high-end warfighting as the primary preparedness for our Defence force," RADM Quinn says.

"We now have a new paradigm about how we will Shape, Deter and Respond in our region.

"We were told to develop more offensive capabilities — longer range capabilities that can hold adversaries at risk, at range — and we were told to do all these things more quickly."

The DSU was uncharacteristically blunt in its assessment for a Government paper; its companion, the FSP, set out how this would be achieved.

"The Force Structure Plan really did lay out a very significant investment in maritime forces — $75 billion worth of investment over the decade," says RADM Quinn.

"Importantly, all of the existing maritime programs were supported in the FSP and there were a number of others added in there: an Integrated Undersea Surveillance System; an expansion of our mine warfare and military survey capabilities, including up to eight OPV variants to support those capabilities; and an expansion of our maritime support helicopter fleet. There was also significant investment in guided weapons."

Despite the challenges of COVID-19, RADM Quinn says Navy has continued to 'Shape, Deter and Respond' to the evolving strategic environment.

"We've continued to deploy our fleet into the region for extended periods of time," he says.

"We're still averaging around 2,000 people and 20 ships at sea every day, with about three-quarters of those vessels assigned to Joint Operations Command."

Navy has undertaken major deployments, such as the Regional Presence Deployment and Indo-Pacific Endeavour 2021, and has participated in a range of maritime exercises with other nations.

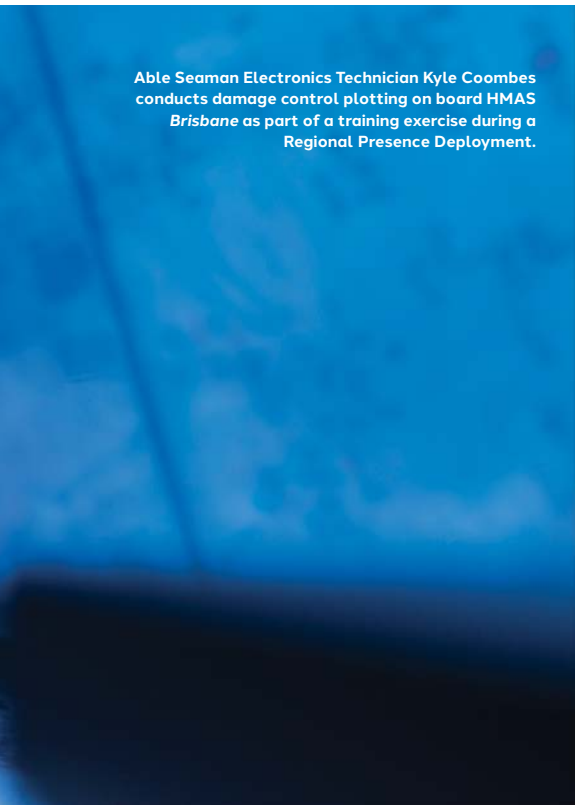
Navy also achieved significant capability milestones in 2021 despite the interruption of COVID lockdowns and border closures.

The three *Hobart*-class destroyers achieved Final Operational Capability when HMAS *Sydney* completed her combat system qualification trials.

The ship went on to conduct follow-on trials in Canada of her advanced, integrated sonar system.

HMAS *Supply* and her sister ship, HMAS *Stalwart*, were also accepted into the fleet in 2021.

Supply should achieve Initial Operational Capability before this edition of Navy OUTLOOK is published.



Able Seaman Electronics Technician Kyle Coombes conducts damage control plotting on board HMAS *Brisbane* as part of a training exercise during a Regional Presence Deployment.

"Those vessels are a real step-change from our previous capabilities," RADM Quinn says.

"They're much more advanced than our previous AOR, HMAS *Success*, and obviously a lot more flexible and capable than HMAS *Sirius*, which we will be decommissioning at the end of [2021].

"I would fully expect that [in 2022] we're going to see them starting to deploy into the region as a part of our Maritime Task Groups."

The Navy is also achieving other capability milestones, with its eight *ANZAC*-class frigates about halfway through their Midlife Capability Assurance Program.

This is a significant upgrade, with the original, rotating SPS-49 search radar being replaced by the latest version of the CEAFAR, the L-band CEAFAR 2 system.

The ships are also receiving a new communications system and undergoing significant platform upgrades as well so they remain operationally effective and relevant.

The Navy's Submarine Force has attracted significant media attention and commentary, acknowledges RADM Quinn.

He says while there is lots of interest in shipbuilding programs and sovereign defence industry development, the reality is fairly simple.

"Anyone that's heard me speak for the past four years will have heard me say that the *Collins*-class Life of Type Extension (LOTE) and the various upgrade programs for our destroyers and frigates are our most important programs," he says.

"The backbone of our capabilities for the next 15 to 20 years were always going to be our existing ships and submarines."

It is important not to conflate the two upgrade programs which the existing *Collins*-class boats will undergo.

"The key thing about LOTE is that it's not a capability upgrade as such, because we're doing that already," RADM Quinn says.

There are a number of projects underway, including upgrades for the sonar system.

This program, Project SEA 1439 Phase 6 is undertaking the replacement of the hull-mounted sonar arrays — the so-called 'wet end' — on the submarines, he says.

"We've already completed upgrading a couple of boats and that program is going very well."

The next step is to do the 'dry end' of the sonar, the onboard processors and displays.

Navy is also undertaking a continuous, spiral upgrade program of the submarines' combat system, the AN/ BYG-1, with the US Navy as part of the two services' long-established cooperation program.

There is also a spiral development program for the MK48 CBAS heavyweight torpedo system, which is also the subject of an ongoing cooperation program with the US Navy.

The submarines' highly classified electronic warfare systems are being continuously upgraded, along with their communications systems, including new SATCOM systems and advanced extremely high frequency capabilities.

"Those upgrades for the *Collins* are going well," RADM Quinn says

The LOTE program is focused on a different set of priorities — treating current and emerging obsolescence issues and replacing some of the systems that would usually not be replaced.

"We're going to replace the main motor, diesel engines, the components of the electrical distribution system that we need to address and, frankly, anything that we need to address from a through-life obsolescence perspective. They're pretty significant things," RADM Quinn says.

"We already have a program which is updating or completely replacing the Integrated Ship Control Management and Monitoring System that ties all those systems together."

Navy is also seeking to replace the *Collins*-class periscopes with optronics masts which do not require a hull penetration.

The *Collins* class have multiple masts, of which two are periscopes.

All of them penetrate the hull, creating the need for a watertight seal even under immense pressure at typical diving depths.

The periscopes go right to the keel of the submarine, form bulky central columns within the boat's control room and typically have only a single set of eyepieces each.

Optronic masts would eliminate the need for hull penetrations and free up a lot of space in the control room.

What a single officer can see through the periscope would now be visible simultaneously to an entire command team on a high-definition combat system screen instead.

"You have a whole bunch of different people looking at screens and it also means that, using advanced electro-optics, you can raise a mast, do a really, really quick scan to gather all of that information, and then you can look at it in slower time," says RADM Quinn.

The quicker you can do this, the stealthier the submarine.

Navy also has an ongoing Science and Technology (S&T) program with DST Group to support its submarines.

"We're confident that the work for the LOTE can fit into normal submarine maintenance periods.

"We've proven that we can do major capability upgrades to the boats in those periods."

And what about the new nuclear-powered submarines? The 150-strong Nuclear-Powered Submarine Taskforce, under Vice Admiral (VADM) Jonathan

IMAGE: LSIS Nadav Harel

The great thing is that we know that the US and the UK have fantastic nuclear submarine designs. They both have great combat systems, they both have great weapons and so they will be perfectly adequate capabilities for our Navy in the future,

Mead, was just two months into its 18-month task at the time of writing.

Navy and Defence leaders testifying at Senate Estimates hearings have made it very clear that whatever proven design the Government selects, based on the recommendations of the Nuclear-Powered Submarine Taskforce, Navy will accept that design and will not change it.

"The great thing is that we know that the US and the UK have fantastic nuclear submarine designs. They both have great combat systems, they both have great weapons and so they will be perfectly adequate capabilities for our Navy in the future," says RADM Quinn.

Acquiring a nuclear-powered submarine has been almost a no-brainer, in the minds of most commentators, though Australia has not been offered access to the technology until now.

The decision to acquire nuclear-powered submarines with their unlimited submerged range and high speeds is a game changer.

Back on the surface, work is progressing to deliver six new patrol boats, with the first to be accepted in early 2022.

"We're well and truly into the build of the Enhanced Cape-class patrol boats," says RADM Quinn.

"We had a couple of delays with the defective aluminium that came into the country, as media reported in March 2021. The great thing was that industry's quality control procedures identified the problem, we've removed all of that material from the boats and Austal's working hard to catch up to get those boats into service."

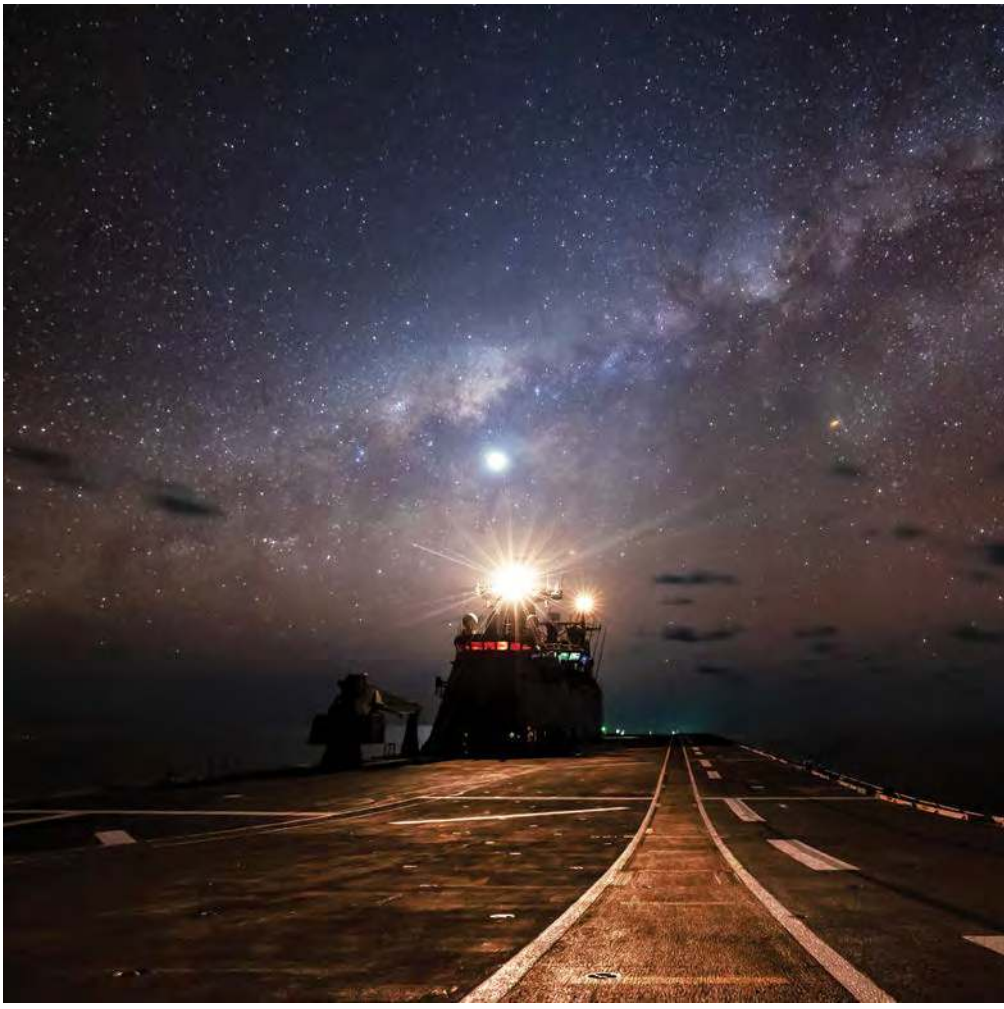
COVID-19 has caused disruptions to the program, particularly as border closures made it difficult for workers to enter Western Australia, RADM Quinn says.

At the same time, Western Australia's shipbuilding industry has been competing with the mining sector for workers.

"We have seen delays in the evolved Cape-class patrol boats. We've seen some delays in the *Arafuras* as well," RADM Quinn says.

The *Arafura*-class Offshore Patrol Vessel (OPV) build program is about six months behind schedule, he estimates, but the First of Class will be launched in December 2021 at the Osborne shipyard in Port Adelaide.

HMAS *Canberra* conducts a Live Fire Exercise while sailing back to Australian waters after the successful completion of Indo-Pacific Endeavour 21.



"They're progressing. A few labour shortages are impacting it somewhat, but our industrial partners are very focused on that program. It's a very important one for Navy," RADM Quinn says.

Chief of Navy, VADM Michael Noonan, tells Navy OUTLOOK: "We're now building a great boat. NUSHIP *Arafura* will be launched in Adelaide in December, and then that vessel will be operated and maintained here in Australia."

The first two of the 12 OPVs are being constructed in Port Adelaide, while ships 3 and 4 are now under construction at CIVMEC's facility at Henderson in Western Australia.

Among RADM Quinn's responsibilities is innovation. His command now includes the Warfare Innovation Navy (WIN) Branch, which has an explicit focus on innovation, both in hardware and process.

Like everybody else, he is awaiting the outcome of the recently announced review of Defence's innovation ecosystem, being conducted by David Peever.

Peever, who also conducted the Defence First Principles Review back in 2015, is due to complete his report by the end of 2021.

The whole purpose of Defence innovation is to deliver improved capability, whether it is measured as availability, efficiency or strike power. The review could have far-reaching effects depending on how it is implemented.

RADM Quinn cautions against anticipating its findings, but notes the review is focusing more on the 'architecture of innovation' rather than long-term, deep S&T.

"We've invested significantly and evolved how we do innovation in Navy over the past two years," RADM Quinn says.

"We didn't have a WIN Branch two years ago. We had a continuous improvement directorate that worked for the Deputy Chief of Navy (DCN).

"Due to all of the work we were doing, particularly in Robotic, Autonomous Systems and Artificial Intelligence (RAS-AI), the DCN of the day and I decided it was a better fit to move Warfare Innovation into Navy Capability, and to use the WIN Branch to join together our grassroots innovation with our bigger strategic innovation."

Navy's WIN Branch now has three directorates, and will potentially increase to four, says RADM Quinn.

More importantly, at the start of 2022, it will become a one-star command, a full Branch run by Commodore Darron Kavanagh who, for the past three years has been running CASG's Maritime Integrated Warfare Systems Branch.

In this role, says RADM Quinn, he has been responsible for all of the combat system work for surface ships as well as the RAS-AI aspects of Project SEA 1905.

RADM Quinn says Defence has invested heavily in its innovation activities over the past few years, and he believes the Peever Review is timely.

IMAGE: POIS Christopher Szumlanski

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"Now is the time to work out how all those things fit together and whether we are doing this in an efficient way. Do we have the speed and agility that you would hope that we'd have out of an innovation system? Do we actually have that system delivering results?"

In the meantime, Navy has had some great projects go through the Defence Innovation Hub and the Next Generation Technology Fund.

Navy has sponsored several successful projects through these mechanisms, such as the Ocius Bluebottle persistent unmanned surface vessel and the satellite communications terminals developed by EM Solutions, which have already been selected for export.

"Halfway through our innovation [program] you have three European navies actually select for purchase the system that we're developing. There's been some great successes with great Australian companies," RADM Quinn says.

However, he believes successful innovation will need better and more consistent funding.

"We need to get some more significant funding into some of the service organisations like WIN because most of the funding that I have for WIN comes out of Navy Minor projects and our core Navy budget.

"Now that they're actually delivering key results, we need to get more substantial investment in there so they can be more agile and move quicker. That's where I'm hoping we'll be able to head in the future."

One key result of the Navy's focus on innovation has been publication in 2020 of Navy's RAS-AI Strategy out to 2040.

Its implications are profound. It acknowledges the importance of RAS-AI to future naval operations and sets out how these technologies will be harnessed and acquired and put to work and will be examined in depth in separate articles in Navy OUTLOOK. ●

IMAGE: ABIS Leon Dafonte Fernandez

Sea-time onboard a full mission bridge simulator

There can be no better practical experience than onboard a real ship at sea where you experience and practise a wide range of seamanship skills with highly experienced mariners providing high quality supervision and mentoring.

However, not everyone is fortunate enough to get ideal sea time conditions filled with challenging experiences. For many, it can be hit and miss. The experience can swing from highly valuable at one end to mindless boredom at the other end.

Does time served at sea always ensure the range of experience that we require of mariners? If not, are there viable alternatives to complement sea time?

One highly promising candidate is the Full Mission Bridge Simulator. Boosted by significant technological advances in recent years, it has emerged as a powerful tool to complement sea time experience and help provide a level of consistency in testing seamanship skills and competence.

Where actual sea time may limit the types of seagoing challenges provided to new mariners, the Full Mission Bridge Simulator can broaden their experience by creating real-time seagoing activities and test their skills under a wide range of conditions.

Highly experienced seafarers requiring further sea time experience can also benefit. Take marine pilotage as an example. The traditional practice worldwide for pilots, regardless of their pilotage expertise and experience, is to do substantial on-water training and assessment trips before obtaining their pilotage license for a particular port.

Maritime simulation is now changing this landscape. Recently, simulation was adopted as a substitute to sea time in the Port of Brisbane. A newly appointed pilotage company was given approval to license new pilots using 100% simulation with no on-water experience required.

There is a lack of rigorous research comparing the effect of simulation versus sea time onboard ships on mariners' skills and competence. But given the significant advances in the accuracy, fidelity and immersiveness of full mission simulation today, perhaps it is time to properly evaluate how maritime bridge simulators can be better used to ensure consistency in seamanship skills and experiences, and to what extent they can realistically complement on-water time served.

To be a credible alternative, bridge simulation must provide an acceptable sea time experience. The simulation environment must be highly immersive both in the way the simulation technology is set up and the seagoing scenarios that are developed.

For example, the simulated ship should be a digital twin of the actual ship. It should behave like the actual ship, with realistic and accurate ship hydrodynamic behaviours. The bridge layout should feel like a ship's bridge with all the appropriate navigation, communication, instrumentation and ship controls.

To be truly immersive, the simulator must be able to create a simulated environment that behaves like the real environment. This means creating a 3D model of an operational area with full environmental effects, other marine traffic operating in the area, communications between various parties, and a wide range of activities that happen in the real world.

The maritime metaverse must effectively replicate the real world, with the ability to use real-time data and effects. Anything less would not be a credible substitute. ●


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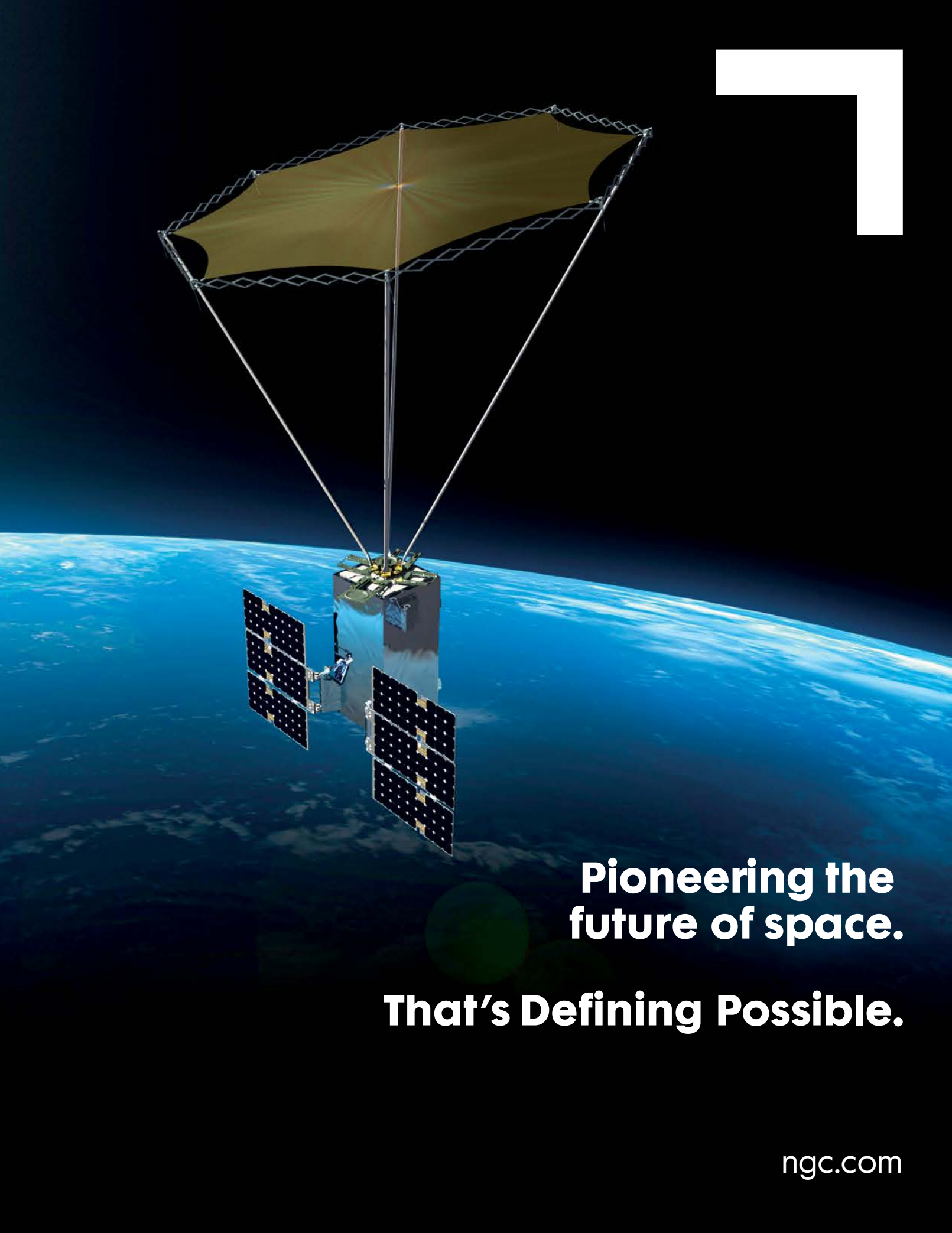
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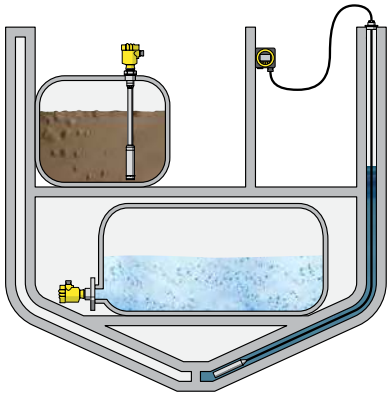

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Looking Forward

VEGA

The *Hunter*-class frigates – overcoming challenges to start construction

The Royal Australian Navy's (RAN's) nine planned *Hunter*-class frigates illustrate the challenges facing Australia's strategic planners and the increasing difficulties in rising to them. **By Gregor Ferguson**

In the 2030s, there will be more than 300 submarines in the waters of the Indo-Pacific. Australia must also contend with a rapidly changing geo-strategic environment, which will require the Australian Defence Force and RAN to have the capabilities to hold potential adversaries forces and infrastructure at risk, at a greater distance from our shores.

Building ships that can survive and fight successfully in such an environment is a challenge; building such ships affordably is even harder. This is the challenge faced by the RAN and its *Hunter*-class frigate program, and by industry.

The RAN needs advanced, versatile anti-submarine warfare (ASW) frigates which can also undertake anti-air and anti-surface warfare (AAW and ASuW) duties. To make its warship affordable, Australia needs a coherent national Naval Shipbuilding Program that can turn out such vessels and their successors, and submarines, to a high degree of quality at a sensible cost.

The *Hunter*-class frigates being acquired under Project SEA 5000 are based on the UK's *Glasgow*-class Type 26 ASW frigate and will be built by BAE Systems Maritime Australia at the Osborne shipyard in South Australia. The shipyard is being modernised extensively and BAE Systems is working closely with Adelaide-based Flinders University on developing Industry 4.0 manufacturing techniques at the university's Line Zero – Factory of the Future to make the yard safer and more efficient.

RADM Pete Quinn

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Photo courtesy BAE Systems

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· Royal Australian Navy's Hunter class frigates* · Canadian Surface Combatant* · Japanese Maritime Defense Force's 30FFM frigates
· Royal Navy's Type 26 Global Combat Ship and Queen Elizabeth class aircraft carriers · Republic of Korea Navy's Daegu class frigates and Ulsan class frigates
· United States Navy's DDG-1000 Zumwalt class destroyers and Littoral Combat Ship Freedom class · Italian Navy's Landing Helicopter Dock

*Type 26 Global Combat Ship design selected for Australia and Canada

Currently, the yard is constructing prototype hull blocks for the Type 26, rather than the *Hunter*-class at this stage, partly to learn new construction techniques and partly to demonstrate its prowess.

"We started prototyping in December [2020]," Head of Navy Capability Rear Admiral (RADM) Pete Quinn says. "We completed the construction yard down at Osborne South and this year we've been proving that production line, which is really an advanced Industry 4.0 … a significant amount of the welding is done by robots."

The manufacturing teams are learning plenty from the prototyping process. The process will see increasingly complex blocks constructed with the aim of proving all of the different manufacturing processes used in the shipyard. They are already achieving significant efficiency improvements, according to BAE Systems Maritime Australia Chief Craig Lockhart.

However, delays in the UK's Type 26 program, partly due to the COVID-19 pandemic, have had a knock-on effect on the Australian program. The design of common elements between the *Hunter*-class and Type 26, principally the hull and propulsion systems, are now sufficiently defined enabling the design of *Hunter*-specific elements to progress at full pace, including the new sensor mast, combat system installation and different families of missiles and guns. "We have started the design separation now. The first [design] packages have come across to Australia. But in total there's about an 18-month delay to the start of the construction of the Hunter," RADM Quinn says.

The Department of Defence advised the Government to make a deliberate decision to ensure the design of the *Hunter* class was at a very high level of maturity before construction commenced. It might have been possible to start construction work in 2022, but the risk of rework and the consequent slowing of production would have been too high. It would have impacted both the lead ship and probably some of her successors as well, RADM Quinn says.

Construction will start in 2024. "We're confident that we will have a very high maturity of the design and that will allow us to move efficiently through the build process," RADM Quinn says.

The Navy is reviewing the rate of production so that the last of the frigates are delivered as per the original schedule, despite construction starting later than planned. "Navy needs to get new warships, particularly something as capable as the *Hunter*-class, because of our changing strategic circumstances," RADM Quinn says. "So, we will be building the ships at a quicker drumbeat than initially anticipated but in line with what RAND reported as being within an efficient build rate. That's the plan."

"The Department of Defence advised the Government to make a deliberate decision to ensure the design of the Hunter class was at a very high level of maturity before construction commenced. It might have been possible to start construction work in 2022, but the risk of rework and the consequent slowing of production would have been too high.

Importantly, most of the weapons and equipment going into the *Hunter* class will be proven first on other ships. That includes the next-generation CEA CEAFAR2 radar arrays; SM-2 Block III and SM-6 missiles; future maritime strike weapons; Tomahawk strike missiles; MH-60 Romeo helicopters, unmanned air systems (UAS); the Australian interface built from the next generation Saab combat system; and the Aegis baseline 9 combat management system. They will all be de-risked to a significant extent before being applied to the *Hunter* class and RAN members will be trained to use them before the Hunter comes into service.

"We're not waiting for the Hunter," RADM Quinn says.

"We're proving these technologies and getting them into the Fleet, into the ANZACs, into the DDGs. And we've got significant further upgrades we're going to do to the ANZACs as well as very significant further upgrades we can do to the Hobart class," he says. "It's all about keeping those capabilities as relevant as possible for our rapidly changing strategic circumstances."

RADM Quinn rejected concerns commentators have expressed about the apparent weight gain of the *Hunter* class. One of the advantages of the high-tech design and construction tools the project is using is the ability to look at the *Hunter*-class design in detail in 3D.

"We are seeing elements of the design that would normally not be seen until the ship's been built, frankly."

When Navy saw that the increased weight of the Type 26 would also affect the *Hunter* class, it took immediate steps to preserve the through-life growth margins required and agreed to a minimum level with Government. The *Hunter*-class design is tracking above the 3.3 per cent figure released in 2021 by Ms Sheryl Lutz, CASG's First Assistant Secretary Ships.

Even the US Navy does not insist on a 10 per cent weight margin, RADM Quinn says. The new US FFG-62, based on the Fincantieri design offered for Project SEA 5000, has a target weight margin of 5 per cent. To get to 5% the ship's design is now 23 feet longer and its displacement is 500 tonnes larger than the initial design.

"The key point is this is normal for the design process for an advanced warship," RADM Quinn says.

The great thing about the *Hunter* class, he adds, is that unlike the ANZAC class and the FFG-7s, these ships are coming fitted for and with everything. The ANZACs came with virtually nothing except the Sea Sparrow missile system and a five-inch gun.

"We had to add helicopters, satellite communications capability, ESSM, Harpoon, sonar upgrades, advanced CEA radars and everything else," he tells Navy OUTLOOK. "We don't have to do that with the Hunter because all of those things are in the design already."

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The weight margin includes provision in the amidships mission bay for up to 80 tonnes of containerised equipment, complete with handling systems for anything from an additional aircraft or a UAS, to mine warfare equipment or special forces RHIBs [rigid-hulled inflatable boats], he says.

Mention of the Fincantieri design, and its subsequent selection by the US Navy, raises the issue of why the Type 26 was selected for the *Hunter* class. Why was the ASW capability of the Type 26 so important?

"For the same reason that getting nuclear submarines is important," RADM Quinn replies firmly, noting that our region will be home to more than 300 submarines in the 2030s.

Submarines offer both direct power from their torpedoes and missiles, and nightmarish uncertainty. They are extremely stealthy and so disproportionately difficult to detect and engage without very advanced ASW capabilities. The ADF operates or is acquiring extremely effective individual ASW systems like *Hunter*-class frigates, P-8 Poseidon aircraft and MH-60 Romeo helicopters.

But true ASW effectiveness demands an integrated system that blends these with Collins-class submarines and eventually nuclear-powered submarines, as well as systems like the Integrated Undersea Surveillance System that Navy plans to acquire under Project SEA 5012. This project will also include things like seabed sonar arrays and ships towing passive sonar arrays as well as the headquarters, data processing and integrated C4ISR systems that tie them all together. Other emerging technologies such as large or extra-large unmanned underwater vehicles (UUVs) may feature as well.

"The thing is that modern submarines are really hard to detect," RADM Quinn points out, which is why the Navy selected the British Type 26 design. The *Hunter* class will be extremely quiet thanks to its hull shape, propellers, propulsion arrangements and electric drive. It also needs to be big enough to carry sensors such as the high-power, low-frequency Type 2087 active sonar — you need equipment on that scale to detect modern submarines, he adds. "You don't detect submarines these days with a little towed array behind a UUV." ●

DATA SHEET – HUNTER-class Frigate

DISPLACEMENT	10,000 tonnes (full load)
LENGTH	149.9 metres
BEAM	20.8 metres
PROPULSION	Combined Diesel Electric or Gas (CODLOG)
SPEED	27+ knots (top speed)
RANGE	7000 nm (electric motor drive)
COMBAT SYSTEM	Aegis Baseline 9 with Saab Australian Interface based on Next Generation Combat System
SENSORS	• CEAFAR 2 Radar • S2150 Hull-Mounted Sonar • S2087 Towed Array and Variable Depth Sonar • Electro-Optical Sensors • Electro-Optical Sensors • Electronic Warfare Systems
WEAPONS	• Lightweight torpedoes • Mk45 Mod 4 5" Gun • SM2 Block III, SM-6 & ESSM Missiles • Tomahawk Tactical Land Attack Missiles (TLAM) • Advanced anti-ship missiles • Mk41 Vertical Launch System • 2 x 30 mm short-range gun • 2 x Close in Weapons Systems • Nulka Decoy System
AIRCRAFT	1 x MH-60R helicopter for ASW (armed with Mk54 ASW torpedo and Hellfire ASuW missile) and ISR. 1 x Maritime UAS for ISR, as required.
SHIP'S COMPANY	180, including embarked flight. Accommodation for up to 208.

Source: RAN

EM Solutions: the cutting edge of maritime communications

The challenges of providing secure, reliable offshore communications for maritime fleets are considerable – as well as incredibly complex.

The Australian technology company EM Solutions has been rising to meet these challenges since 1998, when the homegrown firm – now a globally recognised pioneer in the fields of microwave and on-the-move satellite systems – was founded in Queensland.

Ever since, the company has been working at the cutting edge of satellite communications (SATCOM), producing superior high-end technology products for a range of applications in the maritime and defence industries.

A case in point is EM Solutions' family of naval satellite terminals, which have earned an enviable reputation for their quality, reliability and affordability – and are currently serving with distinction in the Australian Navy and the Australian Border Force, as well as in various allied navies around the world.

Now, the Brisbane-headquartered company is unveiling the next generation terminal to follow its proven one-metre class 'Cobra' satellite terminal. The larger, two-metre class 'Fleet' terminal, which offers all the advantages of the much-admired Cobra, plus a range of enhanced capabilities that represent a generational leap in performance.

Best-practice design, capability and functionality

Designed in Australia under a contract with the Australian Defence Innovation Hub and engineered from high-end components, the Fleet satellite terminal looks set to reinforce EM Solutions' place at the top of its field.

The Fleet preserves everything that's made the Cobra a smash-hit and includes a range of new and improved features that address current maritime needs as well as anticipate future needs.

The notable upgrades include:

- **improved throughput performance**, courtesy of a larger antenna diameter and expanded RF subsystems
- the ability to **track satellites in multiple orbits** including LEO, HEO, MEO in addition to GEO
- **enhanced resilience and reliability**, with a decreased risk of single points of failure

Like the Cobra, the Fleet can function simultaneously in both X-band and military and commercial Ka- bands and is designed to the most rigourous environmental and performance conditions.

The new Fleet terminals also feature:

- closed-loop beacon and carrier signal processing tracking, which leads to industry-best pointing accuracy and increased availability
- the ability to acquire and track satellites in GPS-denied environments
- an exceptionally low re-acquire time following interruptions caused by blockages, thanks to the capacity to maintain pointing in the direction of the satellite even when the beacon is not visible
- fast, automated self-healing (via switching of satellites or frequency bands) in the event of rain fades or other outages
- simplified installation and maintenance processes
- low power requirements, improving affordability

Australian ingenuity, exported to the world

One great strength of EM Solutions' satellite terminals is their versatility. The company produces whole-of-fleet SATCOM solutions that are suitable for vessels large and small, and its terminals have been used on the whole gamut of naval vessels – from Anzac-class frigates to Cape-class patrol boats. They're also designed for easy integration with third-party technology, meaning they can be incorporated into existing setups with minimal fuss.

Judging by the company's order book, navies around the world are taking note. In a strong signal of the confidence EM Solutions inspires among its partners, the firm has already secured multiple orders for the Fleet system from NATO navies.

In the finely tuned world of offshore satellite communications, precision matters – and in the maritime space, the reliability of lines of communication can mean the difference between mission success and failure. The Fleet terminal can give ship operators the peace of mind that comes from knowing their communications system is truly best-in-class.

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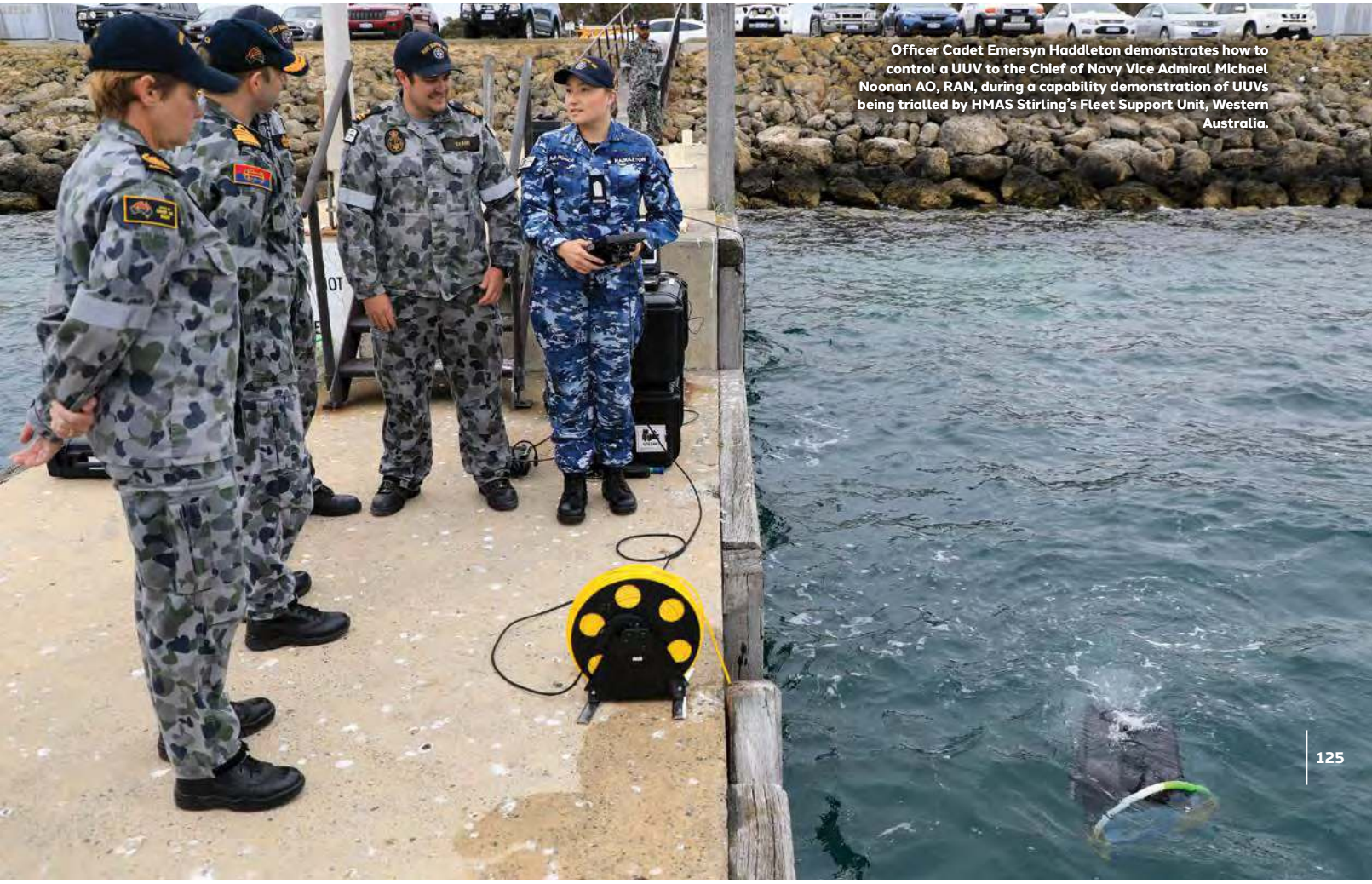


Officer Cadet Emersyn Haddleton demonstrates how to control a UUV to the Chief of Navy Vice Admiral Michael Noonan AO, RAN, during a capability demonstration of UUVs being trialled by HMAS Stirling's Fleet Support Unit, Western Australia.

Autonomous Systems

Surface and sub-surface

By Gregor Ferguson

The Royal Australian Navy has embarked on a significant technology journey. Unseen by some commentators, it is already fielding Robotic and Autonomous Systems (RAS) and has firm plans to acquire more, along with the artificial intelligence (AI) capabilities that make them relevant.

Its plan for doing so over the next couple of decades was unveiled late in 2020 with the publication by the Navy's new Warfare Innovation Branch of its RAS-AI Strategy 2040. The plan looks at technologies and mission capabilities that are available in three time horizons: those available today; technologies and capabilities that appear likely in the near term; and technologies that will likely require significant development work out to 2040.

The vision is straightforward. Exploiting its RAS-AI capabilities, Navy wants to strengthen its Force Protection, increase its Force Projection in Australia's maritime approaches, improve its joint integration through partnership, maximise its Force Potential, and ensure Australian Control. The design principles build on this by providing a framework for development using user centred design; decision support; joint integration; evergreening; Australian sovereign control; and made for Australia.

Most of these need no explanation, but the evergreening aspect is an acknowledgement that technological advantage will only ever be temporary. Capability acquisition programs must allow hardware and software to be developed and upgraded continuously so that equipment remains competitive. The corollary is that long-term industry teaming is essential for a high-technology refresh rate; hence, in part, the Peever Review of Defence's innovation ecosystem which Rear Admiral (RADM) Pete Quinn, the Head of Navy Capability, addresses on p.111.

So, seen through this much clearer RAS-AI lens, Navy has a number of key projects underway, or about to commence, which will employ RAS-AI to transform its combat capabilities.

IMAGE: POIS Bradley Darvill

Lieutenant Peter Evens demonstrates how to control a UUV to the Chief of Navy Vice Admiral Michael Noonan AO, RAN, during a capability demonstration of UUVs being trialled by HMAS Stirling's Fleet Support Unit, Western Australia.

IMAGE: POIS Bradley Darvill

Project SEA 1770 has delivered a Rapid Environmental Assessment capability to help provide a thorough understanding of the maritime operating environment and its likely impact on military operations, especially for amphibious operations.

It has already delivered a range of systems for assessing things like the weather, the nature and geography of the seabed, and so on. This includes technology developed originally for the scientific community such as the REMUS 100 Unmanned Underwater Vehicle (UUV), manufactured by Huntington Ingalls Industries (HII), Technical Solutions in the US.

Project SEA 1778 is delivering a deployable mine countermeasures (MCM) system principally to support an amphibious task group. It has been delayed somewhat by the effects of the COVID-19 pandemic in Europe and the US. The prime contractor is Thales Australia which has selected the General Dynamics autonomous Bluefin-9 UUV as the MCM system. Its mine-detection sonar is very good, says RADM Quinn, and will be boosted in 2022 when the larger, longer endurance, Bluefin-12 enters service. The SEA 1778 system also includes swimmer delivery systems and a remote mine detonation system to destroy mines once detected, RADM Quinn tells Navy OUTLOOK.

Project SEA 1905 scales up SEA 1778 very significantly, says RADM Quinn. It is designed to provide an MCM capability across a much bigger sea area. Much of the capability will be delivered by autonomous surface vessels up to 15 m in length carrying things like advanced side-scan sonars, and can launch and recover autonomous UUVs.

The project will see up to eight additional *Arafura*-class Offshore Patrol Vehicle (OPV) variants built to carry a new generation of autonomous and remotely controlled mine warfare and military survey equipment. While the ships are an important part of the overall system, says RADM Quinn, the heart of the system is the deployable mission systems, and especially the Mission Management System (MMS) that ties together all the different unmanned surface vessels (USVs), UUVs and unmanned aerial systems into a single system that can be operated either ashore or from aboard the eight SEA 1905 Mine Countermeasure and Military Support Vessels.

These will be a derivative of the Arafura-class OPV, he says. The new variant will retain a high level of commonality with the OPV, but it will be modified specifically to launch and recover autonomous mine warfare and survey systems and to carry the data handling and the C4ISR system associated with this advanced capability.

Navy issued an Invitation to Register Interest in 2021 and got a strong response from potential industry systems integrators, suppliers of MMSs and suppliers of potential UUVs and USVs.

One of the responses was from the Unmanned Systems Branch of HII, formerly a marine robotics company called Hydroid, which manufactures the world-leading REMUS family of UUVs. It has already built 600 REMUS UUVs and delivered two 100 series UUVs to Navy for SEA 1770 as well as others to

DST Group and the Australian Maritime College in Launceston, according to Duane Fotheringham, president of the HII Unmanned Systems Branch.

It is too early to talk about specifics for Project SEA 1905 and the Integrated Undersea Surveillance Project, SEA 5012, he says, but points out the REMUS 300, a modular, open architecture variant of the REMUS UUV series, is even more flexible. Noting the need for an evergreening approach. He and his Australian agent, Darren Burrowes of Newcastle-based BlueZone Group, argue that buying 'best of breed' platforms such as the REMUS 100, 300 and the larger 600 provides a solid baseline for development, enabling an Australian integrator to develop payloads that continuously employ evolving technology to meet ever-changing operational requirements.

Importantly, REMUS is a proven platform that has been in development for more than 20 years. The REMUS family has a common computing architecture and communications system, so a lot of technology does not need to be reinvented. Local firms like BlueZone Group and others can focus on developing and integrating new payloads as a sovereign capability.

HII recently acquired the autonomy business of Spatial Integrated Systems, Inc. specifically so that it could embed the swarming, collaborative and adaptive behaviours, along with autonomous health monitoring capabilities for REMUS that users are increasingly demanding.

Looking ahead to projects like SEA 5012, HII believes the REMUS family, including the 6000 series, which can go to depths of 6 km, could be appropriate. And so also could the company's Seaglider which is designed for long-duration missions lasting several months and fitted with passive acoustic sensors. HII has also developed undersea docking and undocking capabilities to help with recharging batteries and downloading sensor data without taking a UUV out of the water. This is now a proven capability, says Fotheringham. And the company also manufactures hull structures for another SEA 5012 contender — Boeing's ORCA extra-large UUV.

The company is investing heavily in both technology and infrastructure to design, build and sustain unmanned systems of all types. With evergreening and Navy's need for durable industry partnerships, says Fotheringham, "That experience is key — open architecture and supportability into the future is important."

To facilitate the fielding of these new and (for Navy) revolutionary capabilities, Navy is about to form a new group, the Maritime Deployable Robotic and Autonomous Systems Experimentation Unit. It will work in close cooperation with Warfare Innovation Navy Branch, DST Group, industry and the fleet to test these new systems, introduce them into service, develop tactics, techniques and procedures, and then integrate the new capabilities with the rest of the Navy.

"We're not just going to go out there and buy a bunch of robotic and autonomous systems; we're embarking on a continuous evolution program where we will continue to evolve those programs over time," says RADM Quinn. And his roadmap for doing this will be the RAS-AI Strategy 2040 and the supporting Navy RAS-AI Campaign Plan, that will be released in early 2022.

The big challenge, of course, will be Project SEA 5012, the Integrated Undersea Surveillance System Project designed to deliver very high levels of situational awareness to the Australian Defence Force about what is happening on and below the sea surface around Australia. Much of the technology development is being informed by DST Group's Persistent Undersea Surveillance STaR Shot and Navy is determined not to find itself being stovepiped and lacking a coherent approach.

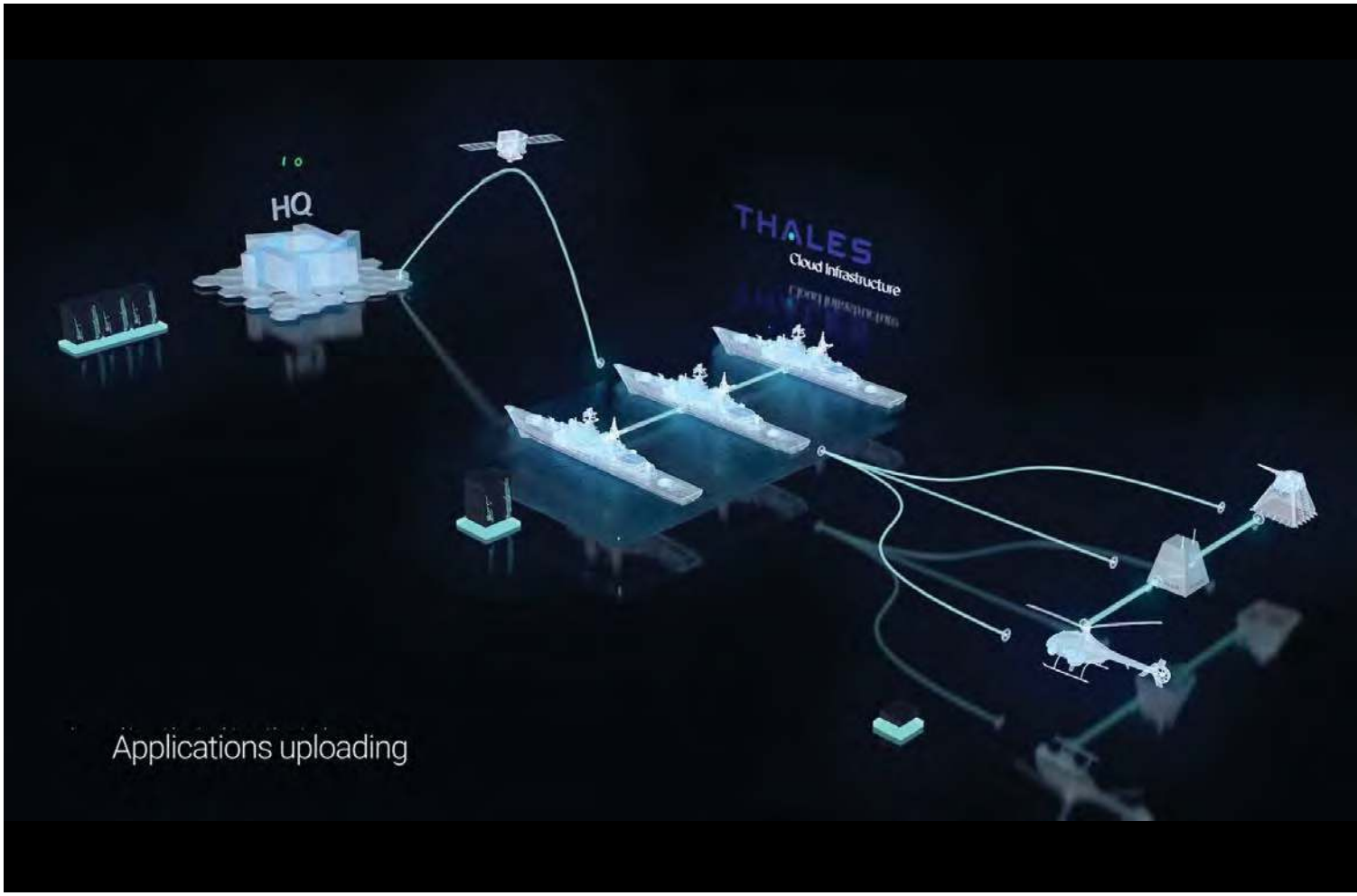
The Integrated Undersea Surveillance System program will likely include surface ships towing sonar arrays, some potentially optionally manned. It will also likely include a range of other USVs and UUVs, says RADM Quinn. But it goes well beyond the capabilities sought in SEA 1905 and SEA 1778. Navy wants to explore how it uses and scales up employment of robotic and autonomous systems and advanced AI that it will be employing for mine warfare and military survey. It will be working on core autonomy behaviours, the core robotic systems that users need to develop, and the power generation and energy storage capabilities required.

"If you develop those core underpinning technologies and continue to evolve them, we are expecting that those capabilities will spin out and we will start applying those technologies to other things like ASW, which SEA 5012 is focused on," he tells Navy OUTLOOK.

"We're collaborating on these things together, sharing information. Building capacity in Australian industry is the intent, and is continuously evolving."

As a pointer to how far Navy's own thinking has evolved, consider this: there is no longer a submarines branch in Navy Capability. It is now called the Undersea Combat and Surveillance Branch and it collaborates closely with the Surface Combat and Aviation Branch, Warfare Innovation Navy Branch, DST Group, CASG and the other services. It is this Branch that will be responsible for operating and working up Navy's autonomous and unmanned capabilities for persistent undersea surveillance. Make no mistake, Navy is in deadly earnest about exploiting what autonomous surface and undersea technology can help it achieve. ●

IMAGE:ABIS Steven Thomson



Improving decision making at sea

In combat, there is no theatre quite like the open sea. Ships may be hundreds, even thousands, of kilometres away from each other and their naval base which poses unique challenges.

These persistent challenges come as the Royal Australian Navy (RAN) is focused on growing in size; seeking to add nearly 5,000 new members by 2035. This is occurring while enabling faster decisions and operating at the tactical edge, or when personnel are most at risk — in the Navy's case, deep at sea. In addition to boosting communication capabilities within the RAN, leadership wants to improve interoperability with other parts of the military and its allies.

According to Andy Kirkpatrick, Director Digital Systems at Thales Australia and naval veteran, while soldiers in a land environment can count on multiple communication solutions to keep them connected to the strategic environment at all times, the Navy faces greater communication challenges while at sea.

"The Navy has one core IT/ communication system they use all of the time. They live and breathe on the same system across the different [security] classification levels at all

> The increasing sophistication of modern weapons and information systems is significantly shortening the decision cycle required to successfully defend against their threats. So, this is where being able to make those decisions much quicker and faster is essential. If you have decision superiority, you can gain information dominance

times, from unclassified all the way to secret and above, to do their job."

This causes a challenge because certain functions/departments of the same ship need to segment themselves securely, and yet still be connected to each other and the rest of the military enclaves.

"The Navy currently relies on a hub and spoke type connection. They communicate from a shore site to a satellite and out to a ship."

So how can new technologies, like the Thales Nexium Defence Cloud Edge (NDC Edge), help close the gap?

Boosting interoperability

Before a warfighter can make the right decisions, they need the right information — preferably from as many sources as possible. The unique interoperability challenges at sea make this difficult. Naval ships are more likely to be siloed from other combat forces.

The interoperability challenge becomes more pronounced when operating with allies, who may use different systems that make information sharing more complex. Lloyd Hewitt, Senior Business Program Manager, Defence & Intelligence, Microsoft Worldwide Public Sector, and Royal Navy (UK) and Australian Defence Force veteran, remembers a specific incident from his time in the military that struck a chord.

"I recall a six-month deployment where 27 ships from a range of NATO nations were operating together and the amount of resources we shared could be counted on one hand. Information sharing and the interoperability that it enables is at the heart of solving this problem."

This limited level of communication is far from optimal.

"The ideal is for a shared, common operating picture across the forces, where decisions at all levels are made on a shared understanding. To work in a multinational capacity, to integrate with legacy systems and be interoperable in all these different areas was super important," Hewitt added.

There is ample opportunity for the RAN to simulate scenarios with its allies. The most recent iteration of the TALISMAN SABRE 21, a joint exercise with the militaries of the US, Canada, Japan and South Korea, for example, saw the RAN perform multi-domain operations to test its capabilities. Such efforts could be improved upon further with new technology.

Improved decision making

With better interoperability and information comes more effective decision making. To succeed, a naval warfighter needs decision superiority, or the ability to make decisions and act on them faster than an adversary. Being able to quickly disseminate information is key to achieving this.

"The increasing sophistication of modern weapons and information systems is significantly shortening the decision cycle required to successfully defend against their threats. So, this is where being able to make those decisions much quicker and faster is essential. If you have decision superiority, you can gain information dominance," said Kirkpatrick.

In addition to ensuring that warfighters have all available information when making life or death decisions, systems like NDC Edge add new capabilities. Increasing amounts of data are needed to make smart decisions and, as a result, modern warfighting often operates at a pace faster than what human analysis and decisions can support unaided. As a result, sailors need access to new technology that can help them interpret actionable information and vast amounts of data at the edge. For example, when conducting mine countermeasure operations with autonomous underwater vehicles, Navy needs to be able to interpret information while at sea, due to reaction time and autonomy, and not have to rely on sending data back to shore.

Addressing the challenges of the sea with Nexium Defence Cloud Edge

The new NDC Edge platform, developed as part of a collaboration between Thales and Microsoft, aims to empower Navy with technology at the tactical edge that puts intelligence into context, informs decisions and connects military teams with relevant information.

Today, far too many military systems are developed and operated through an array of stovepiped solutions and programs. Their capabilities and associated platforms are not always fully integrated at either the intra- or multi-domain levels. NDC Edge moves away from stovepiped proprietary solutions and embraces an open, unified architecture philosophy that allows for easy capability insertions as technologies evolve so it remains evergreen.

With this open architecture approach, warfighters can seamlessly integrate additional hardware into the NDC Edge infrastructure or connect new sensors, and share resources throughout the Naval platform which increases capability at the tactical edge.

This solution was built to provide information processing and smart analytics at the Edge and give the warfighter the support they need, whether they are on land or the open sea.

The emphasis on improving the fluidity of communication (be that ship to shore or between battlegroup carriers) will improve Navy's ability to complete difficult missions. NDC Edge can be an important part of the solution.

Find out how Thales NDC Edge can increase mission effectiveness by visiting: NDC Edge (**https://www.thalesgroup.com/ndcedge**).

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Remote Pilot Warfare Officer, Acting Sub Lieutenant Nicholas Masini prepares a ScanEagle Unmanned Aircraft for training at HMAS Albatross, New South Wales.

IMAGE: LSIS Kayla Jackson

Navy embraces unmanned aircraft systems.

By Gregor Ferguson

"UASs are here to stay," a somewhat jaded Australian defence writer said about 20 years ago. "They just haven't arrived yet." In those days, the Royal Australian Navy was contemplating putting a UAS onto what became its *Hobart*-class DDGs. That is no longer the case. Navy is firmly embracing UASs, or unmanned aircraft systems, and has crafted an acquisition project that will deliver an operational unmanned Intelligence, Surveillance, Reconnaissance (ISR) system to Fleet units over the next couple of years with a technology refresh every five years or so.

Project SEA 129, Phase 5, Defence's Maritime UAS Continuous Development Program, aims to acquire up to 12 UAS flights in successive tranches with a rolling technology refresh plan over 30 years. A Request for Information (RFI), which closed in 2020 will be followed in 2022 by a Request for Tender (RFT).

In early 2021, five RFI respondents were selected to progress to the RFT stage: BAE Systems Australia, Insitu Pacific (a subsidiary of Boeing), Northrop Grumman Australia, Raytheon Australia and Textron Systems Australia (which manufactures the Aerosonde family of UASs).

It is understood Textron will offer the Aerosonde Mk4.7, Insitu will offer its ScanEagle and Integrator family of UASs and Raytheon will team with Schiebel to offer the Camcopter S-100. Northrop Grumman Australia will offer Leonardo's AWHero UAS while it is possible that BAE Systems will team with Saab to offer the Skeldar V-200 UAS. The Skeldar, AWHero and Camcopter are all Vertical Take-off and Landing (VTOL) UASs.

Heavy-lift Drone flying the Light Unmanned Ground Vehicle (UGV) Squad-Packable Utility Robot (SPUR L3025) into location during Exercise GENESIS as part of Autonomous Warrior 2020-4.

By incorporating new technology through block upgrades every five years, the program supports the development of Australia's unmanned aircraft system industry and provides the Navy with a leading edge maritime surveillance capability.

Importantly, while considered by many to be just remotely controlled 'drones', all of these UASs will have a high level of autonomy, enabling them to take off and land by themselves in often challenging wind and sea states, and select mission profiles best suited to their objectives. For Navy this new capability will be an important step.

The contract for Block 2 should be signed in in the second half of the 2020's, allowing Navy a few years to operate the first Block of eight UAS 'flights' in the Fleet and build both its own proficiency and its concept of operations. After five years it will be time for a technology refresh; hence, Block 2 and in the early 2030's Block 3, which will update all of the UAS components. The total value of SEA 129, Phase 5 is about $1.3 billion, so Navy is expecting to invest heavily in this capability.

"By incorporating new technology through block upgrades every five years, the program supports the development of Australia's unmanned aircraft system industry and provides the Navy with a leading edge maritime surveillance capability," Minister for Defence Industry Melissa Price said." This process will allow Australian businesses to be directly involved in providing greater situational awareness for the fleet, in particular the new *Arafura* Offshore Patrol Vessels, while strengthening long-term job growth and security."

The purpose of this new UAS capability is to increase the Intelligence, Surveillance, Reconnaissance and

Targeting (ISRT) capabilities of Navy's surface platforms, says Rear Admiral Pete Quinn, Head of Navy Capability.

The Block 1 capability will be embarked on the OPVs first to give those vessels a significant over-the-horizon surveillance capability and enhance the OPVs' situational awareness in the constabulary role, undertake ISR and Search and Rescue (SAR) operations and make boarding operations much safer by providing airborne overwatch. Secondary missions for the first and subsequent blocks will include humanitarian and disaster relief (HADR) operations, assisted evacuations and Task Group operations — force protection, contributing to the Recognised Maritime Picture, rapid environmental assessment and mine countermeasures.

"The UASs will be fitted with a variety of different sensors which we'll be able to change — electro-optical, ViDAR, RADAR, ESM and communications relay," says RADM Quinn. "Not necessarily all at once, but they're the sort of evolution that we will have on those platforms."

And unlike some previous acquisition projects which have seen the ADF specify a new capability in exquisite detail and then keep it in service until well past the stage of obsolescence, he says, "We're not just going out there, buying the system, and then using it for 15 years and then buying another system."

This project will embrace the Robotics, Autonomous Systems and Artificial Intelligence (RAS-AI) Strategy's concept of evergreening (see p.125). Defence will acquire a fleet of UASs and sensors in the first block that will help Navy learn how to operationalise the UASs and their sensors, and then specify different or upgraded aircraft and sensors for future blocks. This is the opportunity for Australian industry to develop improved or all-new air systems and payloads for the RAN and its allies, not just once but on a repetitive basis.

"In the first block we'll buy eight what we call 'flights' — eight mission 'bricks' that we'll use on the OPVs, but also our other aviation-capable ships, including our surface combatants. The follow-on block will grow that overall fleet to 12 flights that we'll use across the fleet."

The *Arafura*-class OPVs have a large, clear flight deck but no hangar. The command and control and support systems will be containerised and mounted below the flight deck. On other RAN ships there is far more space and also hangarage for the UASs themselves, and their command and control and engineering equipment.

The RAN has been experimenting with UASs over the past few years, most recently with the US-made Insitu Scan Eagle (shortlisted by Army for its own UAS program, LAND 129, Phase 3) and the Austrian-made Schiebel Camcopter S-100 under the Navy Minors project NMP1942 – these UASs have been operated by the RAN's 822X Squadron. And that has taught Navy many useful early lessons, says RADM Quinn, including about the value of VTOL UASs operating alongside a manned helicopter. "The great thing about VTOL systems is, in a single-hangar ship, you can fit the VTOL system and you also can fit a Romeo, whereas you can't actually fit the fixed wing systems because of all the catapult launchers and recovery systems, which take up a lot of room."

For the OPVs, the UAS fleet will be dispersed to four operating bases in Fleet Base West in Western Australia, Darwin, Cairns and Nowra. For its mature fleet of UASs, Navy's current vision is that these will be divided between the East and West Coast and embarked on surface ships as required. They will carry out ISRT, act as a communication relay, undertake battle damage assessment, conduct SAR operations and, importantly, undertake electronic warfare missions.

The Navy's NMP1942 trials have validated the Camcopter's strengths, believes Fabian Knechtl, Managing Director of Schiebel Pacific. It is simple and robust, a conventional design requiring no specialised launch or recovery equipment. It has the best performance for its size and weight of anything in its class, he says, with a 50 kg payload and up to 6 hours endurance carrying 34 kg – an external fuel tank increases this to 10 hours. Its heavy fuel S2 wankel rotary engine is designed and built in-house. Importantly, it can generate 1 kW of electrical power, meaning it can carry a radar which confers a genuine day and night capability.

The radar is belly mounted, but Knechtl will not disclose which sensor the company is using. He says that with the EO/IR is mounted under belly, we can combine it with a smaller EO/IR in the nose which can host anything up to 10 kg. The Camcopter is also equipped with a wide area motion imagery sensor developed by US company Overwatch Imaging with a maximum datalink range of 200 km.

The COVID-19 pandemic demonstrated the importance of a sovereign capability, so like all its rivals, Schiebel has been working on its Australian industry capability. It is contracted to deliver sovereign training and the first Australian S-100 maintenance course is already completed with further courses starting in 2022. He says, "We are committed to the Australian government's industry capability policy and serious about bringing a very big portion of our 'added value' to Australia, including production and supply chain, and in the future even R&D and engineering."

The Camcopter's highly developed flight control system provides high levels of autonomy for launch and recovery operations in high sea states. These are helped by its fixed main rotor system, says Knechtl, and the fact that its airframe is all-composite and titanium, so it is extremely resistant to saltwater corrosion which is important because the flight deck of a RAN *Arafura*-class OPV does not have a hangar for embarked UASs.

On Exercise TALISMAN SABRE 21, the Camcopter was used by the RAN and operated very successfully off HMAS *Ballarat* in its primary ISR role. The exercise was an opportunity to conduct Ship Helicopter Operating Limit trials with the RAN's AMAFTU flight trials unit, which has set the company up well for Project SEA 129, Phase 5.

Anti-submarine warfare will become a requirement in the future, believes Knechtl, and the Camcopter can carry and launch sonobuoys. Our system has a pretty wide field of applications.

We will not know until at least 2022 which UAS the Navy will buy, but we can be certain of one thing: it is serious about acquiring a seagoing UAS capability for its major surface ships. The UASs really are about to arrive. ●

IMAGE:ABIS Steven Thomson


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Successfully integrated with a number of current in-service combat systems and associated radar and electro-optic sensors, Millennium is proven and in service at sea today. The Millennium Gun and its complementary Ahead® air bursting ammunition would provide the lowest risk small calibre gun primary weapon system for the *Arafura*-class Offshore Patrol Vessel and SEA 1905 future mine countermeasures vessel, where it would deliver a significant organic self-protection capability against the pervasive and increasing regional threat.

The Millennium Gun system, in service with nations including Indonesia and Denmark, is currently designed and manufactured in Switzerland. Rheinmetall will transfer technology from Europe to its new state of the art manufacturing facility in Redbank Queensland.

Rheinmetall is already taking steps to localise the current supply chain through Australian SMEs in order to manufacture and sustain its Millennium 35mm Gun in Queensland, which will support the Commonwealth of Australia in delivering a sovereign single weapon system capability to meet the current needs of the Royal Australian Navy fleet; as well as future-proofing against emerging self-defence and mission requirements. Importantly, Millennium's unique Ahead® air burst ammunition is already being produced in Australia for export and will also deliver critical sovereign capacity for the Commonwealth.

Rheinmetall's new facility in Queensland is the cornerstone of the company's commitment to building Australian Industry Capability and is designed to produce military hardware for the Australian Defence Force and for export. Also known as MILVEHCOE (Military Vehicle Centre of Excellence), the facility is purpose-built for design manufacturing with test infrastructure including an EMC chamber, weapon system firing tunnel and prototyping workshop.

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