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APDR

ASIA-PACIFIC DEFENCE REPORTER

AUSTRALIAN DEFENCE IN A GLOBAL CONTEXT

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Cover description: An Australian Army soldier disembarks a United States Army Landing Craft Utility 2020 during Exercise Predator's Run in Darwin, Northern Territory. (DoD photo / Johnny Huang)

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Capability gaps emerging everywhere

Kym Bergmann // *Canberra*

Supposedly the ADF has to be ready to go to war at short notice – so why are Army's 59 M1AI main battle tanks being retired before replacements arrive? The newer M1A2s are due to enter service next year, so why not keep the existing fleet in place until then? This is just the most recent example of capability gaps emerging for no particular reason and they seem to be evidence of a basic lack of planning.

A better example – and one that we have done our best to highlight – was the appalling decision to destroy and bury Army's 45 Taipan helicopters, done in a mad rush in the final 3 months of last year. However, the replacement Black Hawks are arriving slowly, with 8 in country now and another 4 scheduled to arrive before the end of the year.

Unlike the MBTs, the Taipans were in almost constant use, and it is mind boggling that the entire fleet was scrapped, supposedly because the cost of running all 45 was unacceptably high. If that were the case, why not just operate a smaller number of them? The RAAF's F-35s are more expensive to maintain and slightly less reliable than advertised, but would anyone in their right mind recommend that they be scrapped? *APDR* lives in hope that someone will eventually be held accountable for the Taipan debacle.

The RAN is not travelling very well either with HMAS Anzac decommissioned earlier this year with no replacement planned until 2029 when the first of the new General Purpose Frigates is scheduled to arrive. There are some problems with that, most importantly because the designer of the new ships has not yet been selected – and that process will take another year to play out.

It has not been confirmed, but it looks highly likely that another one – and possibly two – Anzacs will have to be withdrawn from service in the next couple of years. The first of the Hobart class AWDs starts its midlife upgrade in 2026 – though even for that the RAN is dragging the chain finalising the scope of work. The ships will be taken out of service successively for what is expected to be a two-year period, but the length of time remains uncertain.

The condition of the Anzacs has been well known for years. Originally, they were to be replaced by nine Hunter class frigates, but that challenging project has been moving very slowly. There has been no official announcement, but Defence Minister Richard Marles has recently said that the first ship will come into service in 2034, which looks a bit later than expected.

Given that the selection of BAE Systems as prime contractor was announced in 2018 for a design based on the supposedly mature Type 26 for the Royal Navy, the program looks to be one of the slowest in the western world. Why this is the case isn't entirely clear, despite some reporting from the ANAO, and it seems to be caused by a large number of specific Australian modifications and some undeclared issues with the parent UK program.

However, the most significant capability gap of all could be a complete absence of submarines from the Australian inventory in the 2030s. Defence and the government have bet the house on second-hand nuclear powered Virginia class submarines arriving from 2032 – but no one in authority is prepared to answer the question of what happens if those deliveries are delayed? Or if they don't happen at all?

A school of thought is emerging that says it won't matter if Australia has no submarines of our own because the USN will have 4 or 5 Virginia SSNs permanently located at HMAS Stirling from 2027, to be possibly joined by a single RN Astute hunter-killer boat. The RAN was without submarines from the end of the first world war until the late 1960s and the new theory suggests we should cut our losses with AUKUS in a year or two and simply concentrate on making life as attractive for USN submariners as we possibly can.

In the lead up to World War 2 the US lend-lease scheme was fundamentally an exchange of second hand American military junk for British naval bases. Now a similar pattern is being played out with second hand SSNs being dangled in front of Australia in exchange for vastly expanded air bases across northern Australia; more heavy equipment for the Marines is to be stored in Queensland; and the aforementioned expansion of HMAS Stirling.

In international developments, the re-election of Donald Trump to the US Presidency is looking slightly less likely now that Joe Biden has decided to stand down. Karmala Harris is off to a flying start according to the opinion polls and if current trends continue should score a handy win. If so, a Democrat administration is far more likely to go with the foreign policy status quo than Trump would have been – meaning that the structure of AUKUS is probably safe for the moment, but ultimately there are no guarantees it will deliver.

We haven't said much about the Air Force because most programs have succeeded, albeit with some hiccups along the way. However, mention must be made of Project Peregrine, the four SIGINT aircraft that represent a new capability for the ADF – and a very welcome one given the growing need for critical EW and cyber capabilities. According to current budget papers the project is running two years late and the rumours are that's because the chosen platform is too small for all the equipment the RAAF wants to stuff into it. Whoops!

To circle back to the retiring M1A1s, for some unknown reason Defence isn't talking about where they are going. Hopefully to Ukraine, but that's probably wishful thinking on our part.

IN THE NEXT ISSUE

- **ADF simulation materplan**
- **Electronic warfare projects, land, sea & air**

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AUSTRALIA'S FIRST MQ-4C TRITON **31 July 2024**

The Albanese Government has unveiled Australia's first MQ-4C Triton Remotely Piloted Aircraft System – 'AUS 1' – to be operated by the Royal Australian Air Force (RAAF).

Revealed at RAAF Base Tindal by the Deputy Prime Minister, the MQ-4C Triton is a high-altitude, long-endurance aircraft that will provide persistent surveillance across Australia's maritime approaches. The aircraft will complement the ADF's crewed P-8A Poseidon fleet as a 'family of systems' to undertake enhanced intelligence, surveillance and reconnaissance in support of Defence operations.

The four MQ-4C Triton aircraft will be based at RAAF Base Tindal, Northern Territory and operated by the Air Force's reformed No. 9 Squadron, located at RAAF Base Edinburgh, South Australia.

The MQ-4C Triton project represents a $900 million investment in Australian industry for facilities construction, network integration, engineering, logistics, component manufacture and sustainment services.

As part of this investment, Defence has signed an interim sustainment support contract valued at approximately $220 million with Northrop Grumman Australia, creating 110 technical jobs for highly skilled workers in South Australia and in the Northern Territory as a result of the project.

The first Royal Australian Air Force MQ-4C Triton Remotely Piloted Aircraft System arrives in its new hangar at RAAF Base Tindal in the Northern Territory. (DoD photo / Andrew Eddie)

Deputy Prime Minister and Minister for Defence, the Hon Richard Marles MP said:

"This is another example of the Albanese Government demonstrating its commitment to national security with our ongoing investment in cutting-edge capabilities.

"This is about ensuring our Australian Defence Force is fit for purpose and equipped with suitable capabilities to meet the challenges it will face.

"We must continue to enhance our operations from Australia's northern bases, and the MQ-4C Triton is a tangible example of a capability that will assist us in achieving this task."

Minister for Defence Industry and Capability Delivery, the Hon Pat Conroy MP added:

"With the investment in the MQ-4C Triton fleet and the increased commitment to Defence more broadly, the Australian Government is delivering a generational uplift in the long-range capabilities the ADF needs to make Australians safer and to protect our national interests.

"The MQ-4C Triton will significantly enhance the security of Australia's maritime borders – a key priority supported by the Integrated Investment Program, and as outlined in the National Defence Strategy.

"The arrival of the Triton represents a significant milestone for Air Force and clearly demonstrates the success of the cooperative program with the United States Navy. Our partnership strengthens our ability in joint operations and is underpinned by the strong cooperation with defence industry to develop advanced capability."

According to the Chief of Air Force, Air Marshal Stephen Chappell:

"As a complement to our existing intelligence, surveillance and reconnaissance capabilities, the MQ-4C Triton will significantly enhance our ability to persistently patrol Australia's north and broader maritime approaches.

"The MQ-4C Triton will deliver unprecedented persistence and awareness over the maritime domain in support of the integrated, focused force.

"Uncrewed aerial systems offer enormous potential to capitalise on the opportunities provided by modern payloads and increased endurance."

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ANDURIL AUSTRALIA TO BUILD GHOST SHARK FACTORY IN AUSTRALIA

15 August 2024

Anduril Australia is building its first Australian manufacturing facility for Ghost Shark XL-AUVs. The factory will be capable of manufacturing large numbers of Ghost Sharks for the Royal Australian Navy (RAN) and its allies in the Asia Pacific, as well as the commercial Dive-XL variant.

Anduril's autonomous underwater vehicles are designed from the outset to be produced at-scale by incorporating a modular design. Then with advanced, scalable manufacturing techniques that enable rapid iteration based on specific customer needs, Ghost Shark will deliver a shift in maritime deterrence through affordable, autonomous mass. Chief Defence Scientist, Professor Tanya Monro AC stated that the "Ghost Shark has been specifically designed for manufacturability, mass production and flexibility to create supply chain resilience".

To accelerate production readiness of Ghost Shark, Defence and Anduril Australia have entered into a co-funded Early Works Contract. The Defence investment of A$20.1 million will be significantly exceeded by Anduril Australia as it invests in hiring, scaling the sovereign supply chain and building infrastructure to transition the Ghost Shark program from prototype to production that, subject to further government approval, will see the first production variant available by the end of 2025.

The Ghost Shark supply chain involves more than forty-two Australian companies and the Early Works Contract will facilitate investment into the Australian industry supply chain so it can grow and scale alongside Anduril Australia.

Minister for Defence Industry and Capability Delivery, the Hon Pat Conroy MP stated in his 5th August media release that "the Ghost Shark Early Works Contract provides a clear example of how the Albanese Government is working with Australian industry to accelerate the delivery of cutting-edge sovereign capability. Defence is incentivising industry to make substantial capital investments."

Ghost Shark is an Extra Large Autonomous Undersea Vehicle (XL-AUVs) that will provide Navy with a cost-effective, stealthy, long-range, trusted undersea capability that can conduct persistent and disruptive intelligence, surveillance, reconnaissance (ISR) and strike.

Developing, manufacturing, and fielding these systems at-scale within an operationally-relevant timeline will be essential to help in defending Australia's immense maritime boundaries. In April, the Hon Pat Conroy MP, revealed the first Ghost Shark prototype on Sydney Harbour, was one year ahead of schedule and on-budget.

The Ghost Shark is a collaboration between the Royal Australian Navy (RAN), Defence Science and Technology Group (DSTG), Advanced Strategic Capabilities Accelerator (ASCA), and Anduril Australia. The Head of ASCA, Professor Emily Hilder stated that "Ghost Shark is a powerful example of how ASCA can help accelerate capability to our warfighters, bringing together parts of the Defence enterprise as well as Anduril Australia, to help deliver an asymmetric advantage." The more than $180M program has been jointly funded by the Commonwealth and Anduril Australia.

Anduril has proven it is capable of agile, responsive manufacturing to support customer demand. The Australian facility joins Anduril's growing footprint of global factories. Most recently, Anduril announced the opening of its U.S Rhode Island production facility to enable Anduril to increase production to 200 Dive-LD's per year. In addition, Anduril announced a $75 million USD investment to increase manufacturing and production capacity for solid rocket motors in Mississippi.

David Goodrich OAM Executive Chairman and CEO, Anduril Australia said:

We are thrilled to announce Anduril's first Australian manufacturing facility for Ghost Shark XL-AUVs. We are excited about accelerating the delivery of Ghost Sharks at unprecedented speed in lock-step with our Defence and Australian defence industry supply chain partners.

The $20.1M Early Works Contract is a strong signal of Government support. It has prompted Anduril to make another significant investment, in the creation of a cutting-edge Australian manufacturing facility with state-of-the-art production systems to manufacture Ghost Sharks right here in Australia. This is the first uncrewed submarine manufactured at-scale by the Australian maritime defence technology industry.

From a strategic perspective, having a defence technology manufacturing base in the southern hemisphere delivers

Loitering Munitions – The Pivotal Role They Play in Today's Conflicts

Credit: IAI I HAROP - Long Range Loitering Munition

The world has heard much about Loitering Munitions (LMs), particularly in the context of today's conflicts. So what is all the hype about? What exactly makes these munitions so revolutionary, and why have they become so widely used?

The short answer is that there are two key factors that lead to LMs becoming widely adopted. The first is cost, often referred to as the "Economy of War". Building large arsenals with traditional weapons has imposed significant financial burdens on many countries, especially as conflicts persist in duration. Additionally, many countries face a "Guerilla" style enemy, making conventional weaponry ineffective and expensive. The advent of LMs has significantly lowered the cost-per-strike ratio, making them successful in neutralizing threats while keeping costs at bay.

The second factor is the need of the operator to achieve the operational goals. There is often much uncertainty in the field; where targets may be hiding, how quickly they move, in which direction, if the area is populated with innocent civilians and more. Having a loitering munition allows the mission operator to factor in and minimize these risks in real time.

Unlike traditional missiles which require precise targeting information before launch, loitering munitions may be deployed without prior knowledge of the target's location. This independence is crucial, particularly for forces operating in isolated environments with limited external intelligence. Like UAVs, loitering munitions can hover or 'loiter' over a designated area to autonomously search for, detect, and acquire targets. Similar to a missile, they detonate upon reaching the target. This capability ensures that the unit using the LM can conduct a closed-loop operation organically with real-time intelligence and strike capabilities. To achieve this, loitering munitions (LMs) may use a range of sensors, including acoustic, electro-optic, and anti-radiation. They may need to withstand adverse weather conditions and must be effective both day and night.

When discussing LMs, Israel Aerospace Industries (IAI) stands as the premiere example – the world leader and first inventor of the loitering munitions weapons category.

IAI has continued to innovate since the first introduction of an LM, the HARPY, in the 1980s. The HARPY was designed with a passive anti-radiation (AR) seeker and high-explosive warhead, dedicated to the Suppression or Destruction of Enemy Air Defense (SEAD / DEAD) missions. This capability is instrumental in replacing combat aircraft in dangerous missions.

The HAROP, an evolution of the HARPY, gained recognition for its effective role in combat, taking out a range of targets from tanks, to air defense arrays, to shallow hangar attacks. HAROP is an extended-range loitering munition, carrying an electro-optical sensor that enables precise area surveillance and target acquisition. It can remain airborne for extended periods, waiting for the perfect moment to strike. Alternatively, it can be redirected mid-flight to engage new targets, or the mission can be aborted. This "shoot first, seek later" capability makes HAROP an ideal weapon against high-value, time-sensitive targets such as enemy air defense systems, ships, speed boats, and strategic assets. HAROP has seen a 98% mission success rate all while facing extreme electronic countermeasures and harsh weather conditions.

Leading into the more tactical loitering munitions, IAI developed the MINI HARPY and the ROTEM. Building off of legacy AR and EO payloads, MINI HARPY combines both capabilities to be effective against medium-range threats in challenging weather conditions. MINI HARPY is easily fired out of canisters mounted to tactical military vehicles, civilian pickup trucks, or OPVs and patrol boats, and reaches a range of up to 100 kilometers.

As a favorite of the special forces, ROTEM is a Vertical Takeoff and Landing (VTOL) LM that has seen successful missions in combat zones since 2019. It is man-portable, carried in a backpack by a single soldier, and has an operational range of up to 10 kilometers. ROTEM provides affordable ISR capabilities and immediate strike potential, enhancing situational awareness and combat effectiveness for individual soldiers.

There's a compelling reason why militaries across the globe are bolstering their arsenals with loitering munitions. When choosing the right loitering munition for each scenario and operation, it is critical to work with teams that have extensive battlefield experience, and have operated systems in harsh environments, including sea conditions, high winds, and disrupted communication and GPS signals. These are the ultimate tests of how successful the loitering munition will be when facing threats on the field.

For more information schedule a meeting with our experts at Land Forces 2024 via: corpmkg@iai.co.il

The Australian Army has been operating 59 examples of the M1A1 AIM Abrams since the tank type was declared operational in 2007. (Gordon Arthur)

Australian Army cranks up the heavy metal

Gordon Arthur // *Christchurch*

After decades trundling around in 1960s-era M113 armoured personnel carriers, and ASLAVs dating from the 1990s, the Australian Army will soon field one of the world's most modern fleets of armoured fighting vehicles. Yes, armour is vulnerable to enemy measures such as antitank missiles and loitering munitions, but recent conflict in Gaza and Ukraine has underscored the importance of capable,

Australia is particularly concerned about the threat from China, and so some analysts argue that long-range fires is more important than armour. However, it would be foolish to think that China represents the only contingency that Australia will face in the coming 25 or so years.

Armour still forms an integral part of combined-arms warfare, and Lieutenant General Simon Stuart said several years ago: "If you look at our history, from the 1940s in Papua New Guinea and Malaya, the 1960s in South Vietnam, and more recently Australia has deployed with tanks as part of our combined-arms teams in the wars in Iraq and Afghanistan. While they weren't our tanks, we certainly operated as part of a coalition and have operated with other nations' tanks. They're an essential component of land operations and will continue to be in the future. Having tanks as part of a credible combined-arms fighting system means that we're relevant. Relevancy is a key component when it comes to generating strategic effects: shape, deter and respond."

If there is any question whether heavy armour is a thing of the past, a Defence spokesperson firmly told *APDR*, "The main battle tank and combat engineering vehicle are critical capabilities ensuring the Australian Army can secure and control strategic land positions and provide protection for the ADF." Furthermore, "There are no other current or emerging technologies – or combination of technologies – that can yet deliver the capability currently provided by a main battle tank (MBT) and, as proven with the current M1A1, they remain fully transportable by all joint transport assets capable of armoured vehicle movement within the ADF."

Although the Australian Army's armour ambitions took a serious hit in order to help pay for extraordinarily expensive nuclear-powered submarines, once its vehicle fleet is modernised, the force will still possess an impressively modern armada of M1A2 SEPv3 Abrams MBT, AS21 Redback infantry fighting vehicles (IFV), Boxer 8x8 Combat Reconnaissance Vehicles (CRV), combat engineering vehicles and AS9 Huntsman self-propelled howitzers (SPH). In this article, we provide a brief round-up of each program.

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This M1150 Assault Breacher Vehicle of the US Army was photographed in South Korea. Australia will receive 29 examples of the ABV. (Gordon Arthur)

Engineering a comeback with Abrams

Under the army's restructure announced in last year's Defence Strategic Review, the 3rd Brigade in Townsville will be the sole repository of Australia's heavy armour. Under the now-defunct Plan Beersheba, the three multirole brigades were each given a squadron of tanks from 2017. Now, as these brigades transition into new roles, equipment is being repositioned or consolidated.

Australia confirmed on 10 January 2022 that it was proceeding with the $3.5 billion Project Land 907 Phase 2 for 75 M1A2 SEPv3 Abrams tanks, and Project Land 8160 Phase 1 combat engineering vehicles, under a Foreign Military Sale. The latter consists of 29 M1150 Assault Breacher Vehicles (ABV), 17 M1074 Joint Assault Bridges (JAB) and six additional M88A2 armoured recovery vehicles. Defence later rolled both programs under the single title of Land 907.

At that time, Defence promised the first vehicles would reach Australia in 2024, and this schedule is on track. Indeed, American railway enthusiasts spotted no fewer than 27 Abrams on flatcars rolling through Oxnard, California on 21 June. They were being transported to Port Hueneme for loading onto a commercial cargo ship. By the time this magazine edition is published, they should have arrived in Melbourne and then been trucked to Bandiana and Puckapunyal.

This first batch of M1A2s was painted in the typical three-colour AusCam scheme, emblazoned with black kangaroos, and boasting Kongsberg's Common Remotely Operated Weapon Station Low Profile. The US Defense Security Cooperation Agency (DSCA) notification of April 2021 mentioned a "unique armoured package", presumably due to Australia's distaste for non-depleted uranium. Rafael's Trophy active protection system is a future possibility, since the US Army has integrated and procured Trophy on its own Abrams.

There has been a paucity of updates on Land 907 Phase 2 from Defence, but the 2024-25 budget confirmed: "During 2024-25, the project will continue with full rate of production for the MBTs and combat engineering vehicles, and undertake detailed preparation for the delivery of the vehicles in partnership with the US government. This includes planning for introduction into service, enduring support of the capabilities, and establishment of contracts with Australian industry for training systems and engineering and logistics support."

This acquisition sees Australia's tank fleet grow from 59 to 75 vehicles, with one source telling *APDR* the increase was necessary "in order to right size the fleet and allow for a local and national repair pool". A larger fleet reduces wear and tear on individual tanks, and makes sustainment more cost-effective.

On 29 July, an ADF news story revealed the last M1A1 AIM Abrams had rolled out of 7th Brigade in Brisbane, marking the end of the 2nd/14th Light Horse Regiment's involvement with MBTs. Lieutenant Colonel Tim Hurley, the regiment's CO, said, "While as a unit commander I'd love to have a tank squadron at my fingertips, it makes absolute sense to consolidate army's tank capability. It allows army to become a focused force, and it significantly reduces the sustainment overheads for the main battle tank capability."

Hurley added, "I think the vast majority of our tank crews are keen to get their hands on the best tank on the planet – the M1A2 SEPv3 – and as such will happily move to Townsville or Puckapunyal to keep doing what they love. Centralising in Townsville will also give the tank fraternity some critical mass, which will afford them more depth in terms of experience, instructors, maintainers and commanders."

After its introduction at the School of Armour later this year, Defence said the new M1A2 SEPv3 MBTs would reach Lavarack Barracks in Townsville in 2025. Global Defence Solutions is manufacturing twelve 20-foot containers containing Abrams immersive tactical trainers. The first was due for delivery in March, and the last by January 2025.

The fate of the old M1A1 Abrams fleet is unclear, although Vasyl Myroshnychenko, Ukraine's Ambassador to Australia, said, "If there are any ASLAVs which you don't need anymore, they're still good and they could be used in Ukraine. We'll welcome that, right? We've previously been in discussions about M1 Abrams tanks if they could be supplied. So this is all kind of part of the discussions, but it's still up to the government to decide what they can supply at any stage."

Constituting a brand new capability for army combat engineers, Australia's ABVs and JABs fulfil a requirement for assault breaching and bridge-laying. Australia originally listed a desire for armoured engineer vehicles too, but no such equipment was mentioned in the 2021 DSCA notification. Instead, Australian ABVs are expected to come with a front-mounted excavator arm and loader bucket that are easily exchanged using a standard interface kit. Pearson Engineering demonstrated both these attachments in a risk reduction activity in 2018. Thus fitted, Australian ABVs are more capable than their American counterparts. Being able to perform a wider range of missions is useful for vehicles operating in a dispersed manner.

The spokesperson told *APDR* that initial delivery of the ABVs and JABs is expected in Q1 of 2025. Rather than being distributed across the army's three combat engineer regiments, Defence said they would be operated by the 3rd Brigade and School of Armour in Puckpaunyal.

Thanks to social media posts, members of the

The Australian Army will end up with 19 M88A2 armoured recovery vehicles from BAE Systems, after six extra vehicles were ordered. (Gordon Arthur)

Townsville-based 3rd Combat Engineer Regiment are known to be training in the USA, including operating Mine Clearing Line Charge (MICLIC) systems aboard the ABV.

As these extra Abrams enter service, plus the AS9 and Redback, the M88A2 HERCULES will be more in demand. The six extra recovery vehicles will bring Australia's total of M88A2s to 19.

Redback with a bite

As one of the main casualties of the Defence Strategic Review, IFV numbers under Project Land 400 Phase 3 were slashed from 450 down to 129, sufficient to equip just a single mechanised battalion in the 3rd Brigade. Nonetheless, these Redbacks are still the army's most expensive buy ever, with approved expenditure of $6.856 billion. Hanwha's AS21 was contracted in December 2023, and the latest budget stated, "During 2024-25, the project will progress various design reviews and testing activities in preparation for build in Australia."

Two variants of this top-tier vehicle are being procured – an IFV and a command and control/joint fires type – both armed with Northrop Grumman's Mk44S Bushmaster II 30mm cannon. Vehicles will be manufactured at Hanwha's Armoured Vehicle Centre of Excellence (H-ACE) located at Avalon, Geelong.

A Hanwha Defence Australia (HDA) spokesperson told *APDR* that the 32,000m² H-ACE would "open in August 2024, ready for production on the Huntsman program by the end of the year. The facility was handed over from our construction partner Built to HDA 2.5 months early. Planning for stage 2 of the facility for the Redback production line will be completed shortly."

Since the 2023 contract award, HDA said "a number of work packages have been awarded, and further packages will be awarded over the remainder of the year". The spokesperson said the project "encompasses a significant Australia industry capability package," though details are yet to be published. Elphinstone will produce the steel hull structures in Tasmania before they move to H-ACE for assembly.

HDA will conduct an AS21 preliminary design review in Q3 and, to meet an accelerated schedule, Hanwha's Changwon factory in South Korea is manufacturing the first eight vehicles. These initial vehicles , additional to the 129 Redbacks on order, will assist testing activities to ensure compliance with required specifications. Under the accelerated schedule – sped up by two years – the first Australian-assembled Redbacks should be delivered in early 2027 and the final examples by the end of 2028.

Defence believes the 42-tonne Redback "is the most modern and capable infantry fighting vehicle available, offering world-leading capability in terms of firepower, protection and mobility". Furthermore, it "has future growth potential to maintain its capability edge against evolving threats". HDA elaborated, "The Redback's turret seamlessly integrates the latest in sensors, weapons and active protection systems – all designed in from the start and not added on later. The Iron Fist active protection system was successfully demonstrated in late 2020. Spike LR2 missiles were successfully fired from a Redback vehicle in early 2021."

The company also highlighted the IFV's Soucy rubber tracks; a suspension system that does away with torsion bars and thus improves blast mitigation; and the use of Bisalloy steel. The same steel is also used on K9s for international customers.

With Australian production to last a relatively short period, HDA told *APDR* that "we are working with our parent company Hanwha Aerospace to

Hanwha Defence Australia is manufacturing 129 AS21 Redback infantry fighting vehicles at its brand new H-ACE facility in Geelong. (ADF)

bring the Redback to other global markets, with several current and future programs in Europe and the Middle East on the horizon".

Ahead of the Redback's arrival, Australia has already donated 56 M113AS4s to Ukraine.

This is a Boxer with the Lance turret mounting Rheinmetall's MK30-2 ABM cannon. The Lance turret is fitted to 133 of Australia's 211 Boxer vehicles. (ADF)

Boxer in the ring

In March 2023, Rheinmetall Defence Australia commenced construction of the first locally built Boxer 8x8 CRV Block II. It is part of the 211-vehicle Project Land 400 Phase 2 order sealed on 9 August 2018 to replace the ASLAV fleet. Rheinmetall initiated this work with a striking the arc ceremony for the first weld at its Military Vehicle Centre of Excellence (MILVEHCOE) in Ipswich, Queensland.

Rheinmetall completed delivery of a first batch of 25 Boxer CRVs to the Brisbane-based 2nd/14th Light Horse Regiment in May 2021. The army will eventually receive five Boxer variants (Reconnaissance; Joint Fires and Surveillance; Multipurpose; Command; and Repair and Recovery) by 2027, plus twelve mission modules that permit rapid re-roling from one variant to another. The Defence spokesperson noted, "The non-turreted variants are progressing through design milestones to support production and delivery within the wider project schedule," with delivery to commence next year.

The latest budget declared, "During 2024-25, the project will progress various design reviews and testing activities for Joint Fires and Surveillance, Command, Repair and Recovery variants, while production activities for the Reconnaissance variant will continue. The project will also commence delivery of the remaining 186 Block II vehicles." In fact, the first CRV Block II with Lance 2.0 turret was delivered to the army in June, with the army saying this turret is much improved compared to the Block I turret.

Defence admitted, "Rheinmetall Defence Australia continues to see impacts from global events, including continuing volatility of the global supply chain. Through close collaboration with RDA, delays to Land 400 Phase 2 interim milestones are being intensively managed to ensure the delivery of this key capability for army."

A remarkable success for Rheinmetall Defence Australia was scored on 21 March via a deal for up to 103 Boxer "Schwerer Waffenträger Infanterie" (heavy weapon carrier vehicles) for the Bundeswehr. Based on the CRV Block II with Lance 2.0 turret, Boxer drive modules and turrets are being built at MILVEHCOE in Redbank, Queensland, with first delivery expected next year. Worth €2.7 billion ($4.46 billion), this contract represents Australia's largest ever defence export agreement.

Incidentally, an initial 20 Schwerer Waffenträger Infanterie are being manufactured by Rheinmetall in Germany, and the company reported on 2 May that it had handed over the first prototype to the German Army. These Boxers will replace the Wiesel in German Army service.

APDR approached Rheinmetall Defence Australia for further information about Boxer production for Australia and Germany, but the company failed to respond by the publishing deadline.

Huntsman takes aim

Moving on to artillery, Australia will induct its first ever SPHs when it takes receipt of 30 AS9 155mm howitzers and 15 AS10 ammunition resupply vehicles under Project Land 8116 Phase 1. This acquisition has an approved budget of $1.329 billion. A contract was signed with Hanwha Defense Australia on 13 December 2021 and, at the time, it was Australia's largest ever defence contract with Asia. In fact, Australia could have fielded SPHs much sooner, but in 2012 the establishment appeared to get xenophobic cold feet and cancelled plans to adopt the K9.

The artillery contract includes weapon locating radars too. The ability to shoot and scoot, something difficult to do with unprotected M777 towed howitzers, will revolutionise the Australia Army's indirect fire.

As mentioned previously, these artillery vehicles will also be manufactured at H-ACE. Computer-generated images show that the AS9 possesses applique armour on the hull front and sides, plus a remote-controlled weapon station on the turret. Australia's penchant for extra armour means the Huntsman could weigh as much as 53 tonnes, instead of a regular K9's 47 tonnes.

The majority of detailed design activities successfully concluded in Q3 of last year, and Hanwha told *APDR*, "The project is progressing on track with the schedule previously outlined by Defence." As part of several months of live-firing tests, a demonstration firing of a K9 to showcase it to project stakeholders occurred at the Proof & Experimental Establishment in Port Wakefield on 21 November 2023.

Hanwha Aerospace is building the first two AS9s and a single AS10 in South Korea; the first AS9 entered production at Changwon Plant 3 on 28 March. This trio is presumed to now be finished, ready to enter a verification and validation phase in both South Korea and Australia. After arriving on Australian shores around December, it is understood they should reach the hands of the Australian Army in Q3 of 2025.

Defence confirmed to *APDR* that work on steel hulls and turrets for Batch 2, comprising the first six Australian-produced AS9s and three AS10s, started at Elphinstone in January. Their final production and assembly is scheduled to kick off in the final quarter of this year, with first rollout before the end of 2026.

The contract covered an option for a second regiment of artillery vehicles later this decade, as recommended in the 2020 Force Structure Plan. However, like the AS21 Redback, that ambition fell victim to cuts heralded by the Defence Strategic Review, as savings needed to be found to pay for submarines. Despite the lessons being learned from Ukraine about the importance of artillery, the army opted to add more HIMARS rather than tube artillery.

H-ACE is not just of benefit to Australia, for it offers strategic value to Hanwha with a secondary line of supply back to South Korea, giving the company greater resilience. HDA further noted, "The Australian operation will also help Hanwha fulfil contracts in other parts of the world, and deliver capacity to engage with Five Eyes nations."

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TAKING RESPONSIBILITY IN A CHANGING WORLD

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Army rotary-winged aviation emerging from a period of turmoil

Andrew McLaughlin // **Sydney**

The Australian Army is currently mid-way through massive transition of and upgrades to its structure, basing, and equipment.

Australian Army MRH 90 Taipans from the 5th Aviation Regiment fly in formation deploying soldiers from the 3rd Brigade to Jungle Training Wing, Tully, Queensland during Exercise Kalimantan. (DoD photo / Guy Sadler)

In 2021 Army Aviation Command was established under the command of MAJGEN Stephen Jobson.

MAJGEN Jobson has been an Army Aviation Officer since 1989, and has achieved captaincy qualifications on AS350B Squirrel, S-70A-9 Black Hawk, US Army UH-60L Black Hawk, and MRH-90 Taipan helicopters.

He has commanded Army's 6 Aviation Regiment (6Avn) and 16 Aviation Brigade, Chief of Operations of NATO's Resolute Support Mission in Afghanistan, and as the Director General of the Army Aviation Command implementation team.

He has also commanded ADF Task Forces and Groups in support of the 1997 Papua New Guinea drought, the 2005 Pakistan earthquake, and the 2011 Queensland floods.

Then Chief of Army LTGEN Rick Burr said the alignment of Army's aviation capability under its own command had been outlined in the 2020 Defence Strategic Update, and would optimise Army Aviation to better support land, amphibious and special operations.

"The Command will improve resilience and adaptability and ensure Army's training system is agile and contemporary," he said in December 2021.

"It provides a single point of entry and coordination for industry, for air worthiness, air assurance for safety and to make sure we are delivering the capabilities that we need for our army."

Air worthiness has certainly been an issue for Army – witness the early demise of the MRH 90 Taipan fleet due to Army's inability to properly integrate it into its own airworthiness system, but more on that later.

JHS

New Army pilots undertake initial flying training with the RAAF's 1FTS at RAAF East Sale in Victoria where they learn to fly the fixed-wing Pilatus PC-21.

While RAAF and RAN pilots then proceed to the Wings Course at 2FTS at RAAF Pearce near Perth, Army pilot candidates transition straight to the Joint Helicopter School (formerly the Helicopter Aircrew Training Scheme – HATS) with the Navy's 723SQN at HMAS Albatross near Nowra where they learn to operate the Airbus H135T2 helicopter.

The divergence in helicopter training pathways between Army and Navy pilots is because Army pilots will graduate as co-pilots in a two-pilot operating environment, while Navy pilots train to conduct embarked single-pilot, multi-crew captains on Navy's MH 60R Romeo Seahawk.

Upon graduation from the rotary wing course, aircrew then convert to their operational Army helicopter, with an initial training period at Oakey in Queensland or, in the case of the CH-47F, at Townsville.

The MRH 90 Taipan saga

Following last year's grounding and subsequent with on service of the Army's 47 NHI/Airbus MRH 90 Taipans, the service is currently without an operational medium-lift troop helicopter capability.

The tale of the MRH 90 in Australian service is a sorry one. Initially selected ahead of the UH-60M Black Hawk back in 2004, 43 Taipans were assembled at Eurocopter's (later Airbus) Pinkenba facility at Brisbane Airport.

The MRH 90's selection has been partly attributed to the local assembly and sustainment opportunities, and the jobs it would bring.

But it has also been widely reported that the decision was made against the Army's advice, which had recommended Black Hawks. As a

consequence of this, Defence sources have told of a "Black Hawk mafia" which had been working away within the Army to undermine the Taipan throughout its brief service life.

But MRH 90 availability had been an ongoing issue for the Army (and the six airframes operated by the Navy) since it entered service in 2007.

Production and integration delays hampered the entry into service, with a commercial agreement being reached for Airbus to supply an additional 47th helicopter at no cost to the ADF as part of a settlement. These delays required the older S-70A/9 Black Hawks to be extended in service for an additional two years to 2021.

Corresponding delays with deliveries to other customers meant the Australian Army effectively became the global fleet leader for the aircraft, meaning solutions for some technical issues had to be found locally as there was no global knowledge from other operators that could be leveraged.

Some of these technical issues throughout the aircraft's service life included the aircraft's composite cabin floor which could be easily damaged, a fragile rear ramp, poor door gun placement which hindered troop egress, and the positioning of the rappelling hook. When embarked on the LHDs, there were also problems with the rotor head in crosswinds.

The previously-mentioned air worthiness issues could be partly attributable to difficulties in maintaining configuration management through the more than 40 different sub-variants of the baseline NH 90 helicopter, which is built on several different final assembly lines.

This resulted in at least one grounding in Australia due to the inability to determine the provenance of refurbished components, and the failure of Airbus's and Army's maintenance systems to be integrated.

Another grounding was attributed to a tail rotor delamination in July 2019 while a Taipan was enroute to fly then Chief of Defence Force GEN Angus Campbell from Brisbane out to an LHD waiting offshore. The delamination reportedly occurred after Army delayed a mandated replacement of the component on some of the fleet.

The Army suffering two Taipan crashes in 2023 – one of them tragically with the loss of four lives – but initial reports have indicated that neither could be directly attributed to a fault with the aircraft.

A March 2023 ditching of a Taipan in Jervis Bay while conducting special operations training was attributed to an engine failure. But unofficial reports have suggested the pilot flying the twin-engine helicopter shut down the wrong engine, leading to the ditching instead of being able to fly away and recover the aircraft.

The July 2023 fatal accident which occurred during Exercise Talisman Saber occurred at night and in bad weather, and it has been reported that the aircraft was functional when it hit the water and broke up at high speed.

But by that stage, the fate of the MRH 90 had already been sealed, with the previous Morrison Government announcing in December 2021 that the aircraft would be withdrawn from service in 2024/25 – a decade earlier than planned – in favour of 40 Sikorsky UH-60M Black Hawks.

A Tiger Armed Reconnaissance Helicopter from the Australian Army's 1st Aviation Regiment provides fire support during a maritime gunnery training activity whilst on Indo-Pacific Endeavour 2022. (DoD photo / Brent Moloney)

While the grounding following the second crash was appropriate, the same can't be said for the decision to subsequently immediately withdraw the aircraft from service and break them up for spares.

Politically, it was likely seen as unacceptable to sell or donate the airframes to another operator, as the Australian taxpayer would have been justified in wondering why Australia couldn't make them work when someone else could.

The Government's initial inability or unwillingness to explain the early withdrawal dragged out for months while deliveries of new Black Hawks were rushed, and it quickly got to the point where enough of the Airbus and Army workforce had been disbanded or redeployed that it was no longer viable to resurrect the MRH 90 even if there had been a desire to do so.

Black Hawk

The Black Hawk is no stranger to Australian skies, with the original fleet of Sikorsky S-70A-9s entering service in the late 1980s and serving until 2021.

And despite losing out to the MRH 90 in 2004, the latest UH-60M model has endured and won its way into Army service.

In mid-2020 the then Government's Force Structure Plan (FSP) outlined a plan to acquire a new 'Next Gen Rotorcraft' from 2034. But ongoing availability issues with the MRH 90 saw that plan pushed to the right and the Taipan's withdrawal brought forward.

Initial enquiries into the pricing and availability of Black Hawks were reportedly made in mid-2020, while a plan to acquire about 18 smaller helicopters under the planned Project LAND 2097 Phase 4 special forces light helicopter program – for which the Bell 429 had reportedly been selected – were quietly shelved.

Then Defence Minister Peter Dutton announced at the S-70A-9's retirement in December 2021 that new Black Hawk's would be acquired to replace the Taipans from 2024, and the US State Department approved the sale of 40 Black Hawks to Australia in August 2022.

Under Project LAND 4507 Phase 1, in January 2023 the Labor Government ratified its predecessor's decision to buy the Black Hawks.

At that announcement, Defence Minister Richard Marles said, "The reason we've decided to go with the Black Hawks and to transition away from the Taipans is because really, over the course of the last decade, we've struggled in terms of

getting the hours out of the Taipans that we would want, both with maintenance and having spare parts available.

"We're confident that the Black Hawks are a platform that we're familiar with," he added. "We have a really good proven track record in terms of their reliability and getting hours out of them."

The first two aircraft were delivered via USAF C-17 transport to RAAF Richmond in July 2023 – just two days after the fatal MRH 90 crash – where they were reassembled and flown to their new base at nearby Holsworthy.

While the UH-60M shares the familiar configuration of the venerable S-70A Black Hawk, most of its systems and structure have been substantially enhanced.

It shares the Rockwell Collins Common Avionics Architecture System (CAAS) with the CH-47F and MH-47G Chinook, has greater fuel capacity, has a revised airframe structure with greater use of composites and fewer parts, new rotor blades, and more powerful GE T700 engines.

Australia's Black Hawks will also be equipped with a Fast Rope Insertion Extraction System (FRIES) and External Gun Mount Systems, both of which were reportedly unable to be successfully integrated with MRH 90s, while provision has also reportedly been made for the future installation of a FLIR and radar.

At time of writing there were seven Black Hawks working up at Holsworthy's 6Avn, while crews and engineers are also being trained at the US Army's school at Fort Novosel (formerly Fort Rucker) in the US state of Alabama.

ARH Tiger

Another sorry tale for Army is that of the Eurocopter/Airbus Tiger Armed Reconnaissance Helicopter (ARH).

Designed to replace unarmed Bell Kiowa helicopters and the UH-1H 'Bushranger' gunships, the ARH is a fast and nimble machine which is armed with a chin mounted cannon, guided and unguided rockets, and Hellfire anti-armour missiles.

The ARH was selected in 1999 ahead of the Boeing AH-64D Apache. At the time the Apache was considered to be too big and expensive for the role and, like the MRH 90, Eurocopter said it would assemble and sustain the Tigers at its Brisbane Airport facility.

But also like the Taipan, the ARH has suffered from technical shortcomings, groundings, and poor availability in Army service, although these have improved significantly in the past half-decade.

The ARH is one of four versions of the Tiger in service, with the most similar being France's HAP (Hélicoptère d'Appui Protection} variant. But again, like the Taipan, Australia has been a global fleet leader for many years, and has had to solve technical issues due to insufficient global knowledge.

In July 2019 the Commonwealth released an RFI for submissions from industry for 29 new helicopters to replace the 22 Tigers at an estimated cost of $2.9bn. The RFI specified that 24 aircraft will be operational at a single location, and five airframes will be assigned to training at Oakey.

The RFI said the new helicopters will "deliver armed reconnaissance efforts in close and deep contested battlespace", and called for an IOC of one squadron of 12 aircraft by 2026, and FOC in 2028.

Instead of replacing the Tigers, Airbus offered to substantially upgrade the 22 in-service machines and acquire an additional seven airframes – likely from stored French Army stocks – and fit enhanced systems equivalent to the then-proposed European Mk-III configuration.

Airbus said the upgrade work could be performed in Australia, and that the whole fleet could be done for about $1.5 billion.

But it wasn't to be. The Commonwealth treated Airbus's bid as an unsolicited proposal, and instead ordered 29 Boeing AH-64E Apache Guardians.

Enter the Apache

The irony of the Tiger being replaced by the aircraft it originally beat can't be lost of those who have also watched the Taipan-Black Hawk story unfold.

In a surprise to no one, the AH-64E was announced as the Tiger's replacement in January 2021 under Project LAND 4503, beating out Bell's rival AH-1Z Cobra 'Viper'.

"This new ARH capability will strengthen Australia's armed reconnaissance force to better shape our strategic environment and deter actions against our national interest," then Defence Minister Linda Reynolds said in January 2021.

"The Apache Guardian is the most lethal, most survivable and lowest risk option, meeting all of Defence's capability, through-life support, security, and certification requirements. By pursuing a proven and low-risk system offered by the Apache, Defence will avoid the ongoing cost and schedule risk typically associated with developmental platforms."

The US State Department approved the sale of the AH-64E to Australia in June 2021, at a project cost of more than $4.5bn.

The approval notification said the sale would include six spare T700-GE- 701D engines, the AN/ASQ-170 Modernised Target Acquisition and Designation Sight/AN/AAR-11 Modernised Pilot Night Vision Sensor (M-TADS/PNVS), and communications and navigation systems including Manned-Unmanned Teaming-2 (MUMT-X) video receivers and Air-Air-Ground kits.

A Government release in the final days of the Morrison Government claimed the Apache deal had been "finalised", and also revealed the project cost had risen to $5.5bn. It also said the Apaches would be based at Townsville instead of the Tigers' current Darwin base, and that $500m would be spent on upgrading the facilities at Townsville to support the new machines.

But the Australian Apaches didn't actually go on contract with the US until a March 2023 deal was reached for 184 AH-64Es for the US Army, of which Australia's 29 machines were included.

The first Australian Apaches are scheduled for delivery in 2025.

The one constant

The one constant in Australian Army aviation over the past decade has been the CH-47 Chinook.

Following extensive operations in Afghanistan in which they excelled, the Army's six remaining CH-47Ds were replaced with seven CH-47F 'Foxtrot' models under Project AIR 9000 Phase 5C.

The aircraft were ordered in March 2010, the first two aircraft arrived nearly a year late in May 2015, but the remaining five quickly followed by September of that year. They are based at C Squadron, 5Avn at Townsville, and IOC was achieved in April 2016.

An additional three Chinooks were ordered in March 2016 with funding from a Defence underspend, and these were delivered from US Army delivery slots in June of that year.

In March 2021 a sale of four more CH-47Fs was approved by the US State Department, with the first two being delivered just 10 weeks later, again from US Army slots. It was reported at the time that the additional aircraft were sought due to the ongoing low availability of the MRH 90 Taipan.

The final two followed in June 2022, taking the total fleet to 14, but Defence sources have indicated that one or two of these aircraft may be held in a rotating storage to conserve airframe life and to free up personnel for other Army aviation projects such as Black Hawk and Apache.


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United States Army 17th Field Artillery Brigade High Mobility Artillery Rocket Systems (HIMARS) during the Exercise Talisman Sabre 2023 firepower demonstration at Shoalwater Bay Training Area, Queensland. (Photo credit: CPL Jacob Joseph, ADF)

Australia on track to receive HIMARS in 2025

Kym Bergmann // *Canberra*

Made by Lockheed Martin, the M142 High Mobility Rocket Artillery System (HIMARS) has seen a further boost in its appeal following the illegal Russian invasion of Ukraine in February 2022. Unusually, Australia had taken little interest in rocket artillery until the 2016 Defence White Paper, but now munitions for the system will play a leading role under the government's Guided Weapons & Explosive Ordnance (GWEO) Enterprise which currently boasts 900 personnel.

With 42 systems on order, Australia will be a significant HIMARS user, with deliveries starting in the first quarter of 2025 and continuing for several years. The standard round fired is the GMLRS (Guided Multiple Launch Rocket System), which has a 90kg explosive warhead and a range exceeding 70km. A standard launcher has six tubes and munitions can be ripple-fired in a matter of seconds.

This is the simplest and least expensive rounds fired by HIMARS and they have been used by Ukraine to great effect against hundreds – possibly thousands – of Russian targets during the last two years. They navigate to a fixed point using a combination of GPS and inertial measurement giving them the capability to reach targets with great accuracy, especially if they aren't being jammed and the weather is good.

In addition, HIMARS can fire Extended-Range GMLRS – which can hit targets at twice the distance of the basic round. This missile is undergoing testing and on March 7 Lockheed Martin announced:

"The U.S. Army successfully demonstrated Lockheed Martin's (NYSE: LMT) next-generation Extended-Range GMLRS (ER GMLRS) against a target set at White Sands Missile Range, New Mexico.

"Fired from the U.S. Army's HIMARS® launcher, two ER GMLRS rockets achieved flight trajectory, range and accuracy from launch to impact. The rockets also engaged a target set meeting criteria for missile performance.

"The Army's success in this operational test further demonstrates the readiness of ER GMLRS and overall capability of our family of munitions," said Jay Price, vice president for Precision Fires at Lockheed Martin. "Our capabilities provide range options, affordability and of course the continued precision of this enhanced system."

The launchers can also fire a single much heavier MGM-140 ATACMS (Army Tactical Missile System) with a 630mm diameter rocket compared with 227mm for GMLRS, and a range of 300km.

Ukraine has been lobbying the US to be allowed to fire ATACMS into the territory of Russia and there is some evidence that they have recently been successfully used, particularly against airfields well behind the front lines.

ATACMS with their Cold War vintage are being phased out in favour of PrSM (Precision Strike Missile) that have a formidable 500km range and moving target capability. They are also a candidate for eventual manufacturing in Australia, but only after a GMLRS production line has been satisfactorily established.

The first candidate for local manufacture under the GWEO is GMLRS and Lockheed Martin Australia is looking to begin doing so in 2025 at a facility at the large Defence Establishment munitions facility in Orchard Hills on the outskirts of Sydney. Australians have been training in the US and the company has been recruiting staff with an initial focus mainly on assembly and transitioning later to greater use of locally produced components.

As well as technical preparations, the company has also had to go through some legal and regulatory hoops with a critical agreement signed in March between itself, the US Army and Defence about Australian assembly. A Memorandum of Understanding is to be in place by the end of the year to allow production – announced in 2023 – to begin on schedule. The process of getting tooling and test equipment in place is well underway.

At the moment, the only place in the world were GMLRS are produced is at the Lockheed Martin facility in Camden, Arkansas, which *APDR* visited in 2022. It is on the site of a major munitions facility - mainly for USN production - dating from the Second World War, though with significant investments in modern plant and machinery. At the time, production was set at 10,000 per year.

With a surge in demand caused mainly by Russia's aggression, Australia is set to become a second source of supply of these weapons, initially using imported components. In a phrase commonly used with all GWEO activities, this is in the form of a crawl-walk-run approach as Australian suppliers qualify as suppliers of everything from rocket motors, actuators and warheads. This is to develop a system where local parts are fully interchangeable with those from the US.

As is the case with other guided weapons, the demands of Australian military users are quite small compared with those of many other countries and local production needs to be linked into global supply chains to make it worthwhile.

A GMLRS is fired from Lockheed Martin's HIMARS launcher. (Photo credit: US Army)

In turn, this is dependent on receiving full US certification, which is quite a high bar to achieve.

Regarding PrSM, of which two can be carried by each HIMARS launcher, local manufacture is a medium-term prospect and will be dependent on the success of GMLRS production. In March the US DoD awarded Lockheed Martin a fourth contract for more early batches of the missiles to keep up with demand.

Even further ahead is the possibility of local production of hypersonic weapons.

The company is expecting to make some further announcements around the time of the Land Forces conference about local production. LMA has a huge database of Australia industry through a number of previous projects. These are – most notably – the F-35 but also JP 9102 military SATCOM and AIR 6500, the emerging Joint Air Battle Management System.

The Australian Army will acquire 42 examples of the M142 HIMARS, each of which can fire up to six GMLRS rockets at a time. (Gordon Arthur)

GWEO progressively builds land capabilities

Gordon Arthur // ***Christchurch***

Without a continual supply of ammunition and missiles, even the most advanced weapons and sensors in the world quickly become useless. Furthermore, replenishing ammunition stockpiles may prove difficult, or impossible, during a conflict if an armed force relies on overseas supply chains. These truths are acknowledged by Australian defence planners, for they were catalysts for creating the Guided Weapons and Explosive Ordnance (GWEO) Enterprise that currently boasts 900 personnel.

Criticisms...

However, not everybody is impressed by the pace or decisions being made by GWEO, which formally stood up on 8 May 2023 with Air Marshal Leon Phillips at the helm. The GWEO Group is underpinned by $16-$21 billion in domestic-manufacturing investment over a decade.

In an interview with *Asia-Pacific Defence Reporter*, Travis Reddy, CEO of DefendTex, posed the question, "In the event of high-intensity conflict, will Australia as a nation have the ability to manufacture the ordnance that it needs to keep the ADF capable of conducting its mission? The overwhelming answer is no."

Similarly, Grant Sanderson, CEO of EOS Defence Systems, tweeted in mid-July: "The assumption that the [Defence] Dept. understands the economics of wartime usage rates and the criticality of having a local production capability is a bold one. Even though there's a perfect template unfolding in Ukraine of how challenging getting an effective supply can be, the current approach is operational and strategic dissonance writ large. It's fine to buy launchers and radars, etc. but without a readily available, constant and steady stream of munitions, as demonstrated around Kyiv, they're just additional targets."

APDR also canvassed Malcolm Davis, Senior Analyst at the Australian Strategic Policy Institute (ASPI), about GWEO. "At the moment, it seems to be moving very much at a snail's pace on a small scale, a very hesitant approach on the part of government, which I don't understand given the very adverse strategic outlook we're facing," he remarked.

Some critics complain a peacetime mind-set pervades the establishment. Davis noted, "There needs to be recognition that we might have two, maybe three, years to prepare for a major war. So what can we do in the next 2-3 years in terms of mass production of capabilities? That's going to take some risks, it's going to take a bit of vision … My concern is that those decisions won't be made, and we'll end up going into a next war in 2027 or 2028 with what we've got and not much to show for GWEO."

Advocating sovereign development of autonomous systems, drones and loitering munitions, Davis said lessons from Ukraine should be absorbed. "We should actually be looking at how we can develop the long-range strike capabilities that can support the needs of the ADF, the needs of our allies and partners, and offer us an export capability as well. Once again, there seems to be this lack of boldness and vision on the part of the government just to even think beyond the most minimalist application of GWEO in the near term."

Returning to DefendTex, it was seeking a $70 million Export Finance Australia loan to push through an acquisition of Avibras. This Brazilian company, though strapped for cash, has extensive experience producing munitions and guided weapons. Reddy highlighted how all of Avibras' experience and intellectual property would be a boon to Australia. "We know that within 24 months we'd achieve full-rate production in Australia: the full IP suite, the seeker, propulsion system, the whole box and dice," he enthused.

Reddy said acquisition of Avibras represented a "very cheap" insurance policy for Australia, offering a parallel avenue to GWEO's current reliance on the USA to expand its sovereign munitions capacity. "That would be the pragmatic approach to ensuring we get the best of both worlds. So if the world goes to hell in a handbasket tomorrow, we've got something we can respond with." Yet Reddy complained, "There's no valid plan B, there's no backup plan."

Frustrated by the government's lacklustre response to his loan request, the DefendTex CEO complained, "It's very evident they're not interested in developing a true, sovereign alternative … There's no one on the other end of the line. I've tried to meet with the minister and I get an email saying he's too busy." Gaining no governmental support, DefendTex's exclusive negotiation period with Avibras was set to expire after July. Somewhat ironically, the Chinese giant Norinco was reportedly next in queue to acquire Avibras.

The GMLRS from Lockheed Martin has a range of 70km, whereas the extended-range version pictured here can fly 150km. (Lockheed Martin)

…and achievements

The author's request for an interview with GWEO's head Leon Phillips to garner a response to these criticisms was declined. Nonetheless, a Defence spokesperson did tell APDR that, "As the GWEO Group grows, new branches may need to be established to deliver some of our new programmes, while also better aligning some of the existing functions."

Not everyone is bashing GWEO either. Ben James, CEO of Nioa Australia-New Zealand, told *APDR*, "I think the GWEO Group has done a very good job. They've made it clear where their immediate priorities lie…" Indeed, the first four items clearly identified for Australian production are the Guided Multiple Launch Rocket System (GMLRS), Evolved SeaSparrow Missile, Naval Strike Missile and 155mm ammunition. James said GWEO's leaders "were very open in the way they engaged with industry".

The USA is playing a critical role in helping Australia expand its weapons manufacturing base, and Raytheon Australia and Lockheed Martin Australia were appointed strategic partners in 2022. Phillips earlier explained to *APDR*: "The strategic partners and their US parent companies are working with Defence to explore opportunities for greater partnerships and, to this end, are developing detailed, costed plans for manufacturing guided weapons and their components in Australia."

Phillips said "cooperation is under way, and an initial batch of GMLRS will be manufactured in Australia by 2025". Defence further told APDR, "The GWEO Enterprise is acquiring a range of land-based weapons including HIMARS, munitions and other support systems. Defence is also acquiring the Precision Strike Missile (PrSM) through a cooperative programme with the US Army."

GMLRS and beyond

GMLRS is the first "sovereign" production beneficiary, even if not every part of these rockets will be made in country. Lockheed Martin Australia announced receipt of a $37.4 million GMLRS contract in January. Defence elaborated: "Local manufacturing of GMLRS is on track to begin in 2025. We'll start with the assembly of missile components imported from the USA. As we seek to expand volume of production, we'll work with our strategic partner, Lockheed Martin Australia, to qualify Australian small-to-medium businesses for integration into the supply chain, progressively increasing Australian-made components."

Further, "Assembling GMLRS missiles represents a critical first step towards delivering a guided-weapons manufacturing capability in Australia on the pathway to manufacturing more complex weapons."

James Heading, Director of Programs, Strategic Capabilities Office at Lockheed Martin Australia's Missiles and Fire Control, echoed this. He said the 70km-range rocket is a good starting point,

"the first contract where we'll have Australian hands touching American hardware and start actually getting through the production cycle". The USA has already manufactured 75,000+ GMLRS, and the first Australian engineers will head there later this year for training.

The Australian Army will begin receiving its 42 HIMARS next year, but Heading noted, "To create a viable manufacturing capability in Australia, we cannot rely solely upon local defence consumption. Hence, any weapons made in Australia must be exportable and hence interchangeable with their US counterparts.

This picture shows M107 155mm high-explosive rounds used by Australian M777s. Manufactured at Maryborough, the M795 round will supersede it. (Gordon Arthur)

Australian companies – and their supply chains – will need to conform to the same rigorous standards as US manufacturers."

A joint statement issued by the Australia-US Ministerial Consultations (AUSMIN) on 7 August confirmed Australia's "intent to produce viable volumes of GMLRS for global consumption, and welcomed efforts to finalise, by December 2024, the MoU to enable the co-assembly of GMLRS, with follow on mechanisms for co-production in the future."

Lockheed Martin Australia has already commenced a contract for fit-out of a guided-weapons production facility to produce GMLRS all-up rounds and launch pod containers. This new facility, ready later this decade, will have growth capacity to manufacture other weapons too.

And what future weapons are destined for Australia? AUSMIN's statement said Australia is seeking a sovereign solid rocket motor capability and manufacture of tactical training rounds. It also revealed Australia and the USA will finalise a PrSM MoU on cooperative production, sustainment and follow-on development by December 2024. Furthermore, a joint program office will be established to advance PrSM cooperative activities in 2025.

Heading agreed with such a move: "The logical progression for the next generation of long-range precision strike capability would be manufacture of the [150km-range] Extended-Range GMLRS and then the PrSM." Canberra has already invested $70 million in Increment 2 of the PrSM's development, a weapon with enhanced seeker and increased lethality and range. In mid-January, Minister for Defence Industry Pat Conroy confirmed Australia had joined the PrSM Increments 3 and 4 development programme to extend its range to 1,000km.

Heading believes "the contract to commence GMLRS manufacturing will provide a mechanism for swift knowledge and technology transfer, and serve as a risk mitigator and pathfinder to future manufacture in Australia of the Lockheed Martin suite of guided weapons". He shared, "If we can build a GMLRS rocket motor in Australia, there's no reason why we can't use the same technology and the same skills to build other rocket motors. That's what GWEO is about. It gives industry the chance to step up and learn to deliver meaningful capabilities for a range of systems."

Lockheed Martin Australia pointed out, "Establishment of the GWEO Enterprise, in the initial phases, will be reliant on support and assistance from the US – but, in the longer term, success will be measured by its self-reliance and sustainability in Australia, specifically the realisation of a sustainable domestic manufacturing." Thus, AUSMIN's statement said the two nations would develop a "multi-service informed roadmap for expanded production and sustainment activities".

Some argue that technology transfer is happening too slowly. Heading acknowledged that seekers and guidance control systems are some of the USA's most protected and complex technologies. Additionally, "The bureaucracy involved and administration required to transfer these more complex components and technologies for manufacture in Australia would slow down the process of establishing many other more tangible capabilities, and compromise delivery deadlines for 2025."

This is why, the executive pointed out, "In line with the Guided Weapons Production Capability risk reduction activity, it makes sense to utilise new and existing supply chains in the short term to achieve the best chance of a successful outcome for Australian government objectives under the GWEO Enterprise." Furthermore, "In the short term, it doesn't mean we're going to manufacture all missile components and parts in Australia to achieve supply chain resilience, but there does need to be a supply solution for them all – that might mean stockpiling components and parts because they're difficult to get release of, or difficult to manufacture in the short term."

Heading further explained, "Lockheed Martin Australia will be dependent on the existing US supply chains in the initial delivery phase until such time as we can prove ourselves in the technologies for the systems and the subsequent handling of sensitive and classified information and materials. Once we have some runs on the board, and missiles in the cupboard, and have proven our industry professionalism and expertise, then we'll be able to progress to more complex components and technologies – and an extended range of missiles."

Heading said Australia must build its sovereign industrial capability "in a methodical way that doesn't burn goodwill or waste effort trying to chase one particular component, where we can chase literally hundreds in the same timeframe".

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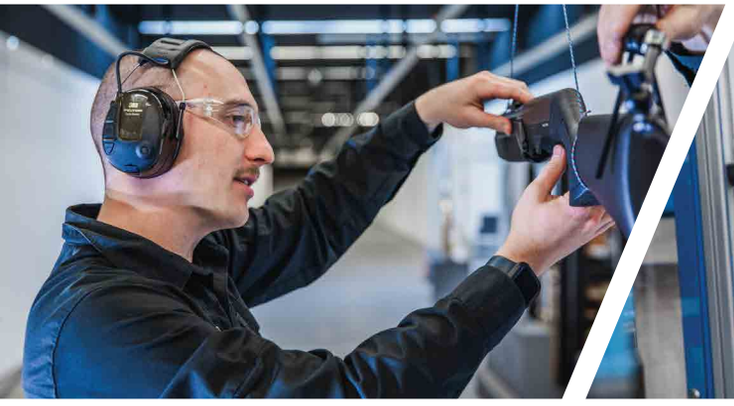




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A Thales Australia employee examines munitions partway through the manufacturing process at the Benalla production line in Victoria. (ADF)

GWEO's current roadmap requires time to bed down sovereign manufacturing capabilities. Yet time may be the one element Australia does not have, as many analysts point to the second half of this decade as presenting the gravest risk of Chinese aggression against Taiwan.

As Reddy warned, "If push comes to shove, can America supply Australia? That requires that air and sea lanes are open so that seekers can reach us. It requires a supply chain in America, which ultimately relies on electronic components out of Taiwan, and requires America to have enough spare ordnance that it doesn't need for itself, and that it deems our needs to be the next highest priority." DefendTex's CEO called such thinking naïve, and certainly not sovereign.

Other land launch pads

While the init of GWEO is long-range strike capabilities, there are opportunities for other weapons in the land domain to be manufactured in Australia. Rafael's Spike LR2 antitank missile is one contender, but things have been eerily silent since Rafael Australia announced in August 2023 it had "finalised a substantial acquisition contract" for the Spike LR2. That $50+ million order is understood to comprise around 200 missiles.

Defence said the first Spike LR2s should be delivered "early" in 2024, but the first tranche will reportedly only be delivered in "the coming months". These will be used for verification and validation activities through till early 2025, whilst the remaining missiles will reach the army next year to equip 121 Boxer 8x8 vehicles. Further Spikes are needed for the AS21 Redback fleet and for the Land 300 dismounted requirement.

Rafael Australia declined to comment to APDR about the status of Spike deliveries or sovereign manufacturing. It has a joint venture with the Varley Group called Varley Rafael Australia (VRA), which is "optimally placed to enhance the ADF's 'speed to capability' acquisition, and pursue opportunities to stand up domestic manufacture of selected defence capabilities in Australia," Dr. Ran Gozali, Rafael's Executive Vice President, GM Land & Naval Division, said last August.

VRA first proposed domestic Spike manufacture years ago. In November 2021, for example, VRA signed an MoU with Thales Australia to explore production of Spike missiles for "accelerated delivery". The partners stated they would review the possibility of manufacturing rocket propulsion systems, warheads, hot integration and domestic storage requirements.

Nioa, whose subsidiary the Australian Missile Corporation is a GWEO enterprise partner, is another company closely entwined in land programmes. James, Nioa's Australia- New Zealand CEO introduced earlier, said his company has multiple touchpoints into the GWEO Group. One is a strategic partnership with US firm Aerojet Rocketdyne as announced last November. "We're proposing a model on how Australia might move to a sovereign solid rocket motor and warhead capability," James told APDR. In fact, he expects a limited tender related to sovereign production of motors to be released before year's end.

Another major connection for Nioa in the land arena is the Benalla government-owned, contractor-operated munitions facility in Victoria. As a strategic munitions partner, Nioa's long-term tenancy at Benalla has seen it occupy 100 acres of production space and support buildings. It has also privately invested $12+ million to install medium-calibre and 120mm ammunition production lines. Benalla started producing 30mm training ammunition for the army last year, plus it has completed export orders. James said this ammunition is critical for the army's Boxers, Redbacks and Abrams.

James believes the Benalla facility has tremendous potential. Nioa acquired 130 adjacent hectares of freehold industrial-zoned land, and this "huge amount of space" could be used to locate a solid rocket motor facility, for instance. James said Nioa has proposed various business cases to GWEO, including this one. Furthermore, ammonium perchlorate is a key ingredient for solid rocket motors, and Nioa is looking at opportunities there too.

Another of Nioa's links to GWEO is its joint venture with Rheinmetall at the Maryborough munitions facility. It produces 155mm ammunition, and the M795 high-explosive round's introduction into service will be completed before year's end for use by the M777 and, later, the Huntsman. James revealed the Assegai's supply chain comes from South Africa and Europe for items like fuses, shell bodies and propelling charges. "We can forge those shells at Maryborough," he said, as well as make fuses and propelling charges, "but we haven't an order yet from the ADF to do so." Maryborough's output is being procured by Germany, plus Nioa has responded to a US tender to forge 155mm shells.

The recent AUSMIN meeting said Australia will fast-track manufacture of M795 rounds "to enable US certification of Australian-manufactured munitions and Australia's deeper integration into the US defence enterprise and global energetics supply chain".

Last year, Nioa took up a tenancy in Picatinny Arsenal in New Jersey, which James said will help Australia keep in "lockstep with our most important partner". More recently, Nioa announced establishment of an office in Bristol in the UK. This illustrates growing convergence among the AUKUS partners. "I don't think we're ever going to get to a viable business model just from Australian demand alone. All our conversations with Aerojet, with MBDA, are very much about getting back into their supply chains to meet that global demand, and try and do that in an AUKUS, or at least a Five Eyes, sort of manner."

GWEO also proclaimed success in reopening the Point Wilson Wharf in Victoria last October, following remediation work. This wharf allows safe, large-scale imports of explosive ordnance.

Also in October 2023, the government announced $220 million of investment in the two Thales Australia-run munitions factories at Mulwala and Benalla. The former makes propellants and explosives, and Thales Australia said investment there in large-scale preparation and explosive mixing equipment would enable a 500% increase in the size of rocket motors that can be manufactured. This will permit more advanced weapons, even hypersonic ones, to be produced there. APDR approached Thales Australia for more information about its connections to GWEO, but the company failed to respond.

In summing up Australia's approach to gaining sovereign munitions capabilities, James said it is folly for Australia "to charge off down a path that's only going to put further pressure on US supply chains," so investment and production capacity has to be done collectively. Using the examples of Ukraine, Gaza and the Red Sea, which illustrate how conflicts can metastasise quickly, James said a "binary, contractual, transactional" approach is insufficient, and that agility and flexibility are key.

Kongsberg Defence Australia General Manager, **John Fry**, in conversation with *APDR* Editor, **Kym Bergmann**

John Fry, General Manager, Kongsberg Australia

Kym: Let's start with ground-based air defence and your role in NASAMS and LAND 19 Phase 7B?

John Fry: From a Kongsberg perspective, we're done – all of our deliveries have been completed. The last NASAMS Fire Distribution Centre (FDC) was delivered in April – and that means we are now into the support contract phase. We were responsible for the FDCs, the canister launchers, and the classroom trainers and that work has been completed.

Kym: How much of the Kongsberg work was done in Australia and how much came from Norway?

John Fry: For the FDCs, almost all of the hardware work was done in Australia. Very few items such as computers and screens came from mandated international suppliers, but essentially everything else was manufactured, assembled, integrated and tested locally. That was the same for the classroom trainers.

Regarding the canister launchers, they came from Norway due to the relatively modest quantity which didn't support economical manufacture in Australia. However, there were a number of engineering changes that we implemented here. We also did final integration activities here – including the installation of the launcher kits.

The launcher kits came from Raytheon, the missile manufacturer, comprising the launch rails plus the computing equipment that communicates with AMRAAM and AIM-9X Block 2.

Kym: Is that basically taking everything that's on an aircraft pylon and putting it in the canister?

John Fry: Yes, pretty much. When you look at the NASAMS canister launcher, the canisters are permanent, but you can slide the launch rail out to load the missile and then slide it back in place. But yes, essentially it's the upside-down rail that you can see on an aircraft.

All of the Kongsberg Defence Australia work has been carried out at Mawson Lakes in Adelaide. For the NASAMS activities, we have been co-located in Raytheon Australia's building, which made sense for that program. That's mainly because Kongsberg provides the FDC, which is the central component of the system operation.

We have now moved into our own building in the same area. From now on, most of our sustainment work for NASAMS will be done from there.

Kym: Now that deliveries have been completed does it mean your workforce has been reduced?

John Fry: No, it's actually worked out quite well for us. Some have moved to NASAMS support, but most of the team have now moved over to Project SEA 1300, the Naval Strike Missile (NSM) program. Our technicians have been supporting ship installations as well as preparing to commence local production of ship installed equipment for future use. The equipment for the first ships will be done from our existing supply chain while we finalise the Australian arrangements.

We've just had a successful firing of an NSM at RIMPAC from HMAS Sydney. In addition, we are also integrating NSM on the Anzac frigates – which is an ongoing activity.

Kym: Is it as simple as taking the old Harpoon launchers off and replacing them with NSMs?

John Fry: From the perspective of what happens on the ship's deck, yes the footprint of an NSM launcher is smaller than that of Harpoon. But then there's also the matter of removing some subsystems and replacing them with Kongsberg equipment.

SEA 1300 is a progressive installation across the destroyers and frigates, which gives a steady drumbeat of work. The National Defence Strategy also stated that NSM will also be installed on the Hunter class, and it will be interesting to see what goes on the new General Purpose Frigates under SEA 3000.

I know the current position for the General Purpose Frigates is no change, but I would hope that NSM will be considered for those platforms.

Kym: Hopefully sanity will prevail.

John Fry: The great thing about NSM is you can put it on just about any ship because it doesn't require a lot of space. As NSM is deck launched, you don't need VLS cells so that's another advantage and they could go on whichever frigate we end up acquiring.

By that stage, we will have Australian production of Ship Installed Equipment. We already have Marand building the launcher frames and we are getting ready to start work ourselves on producing the next tranche of Ship Installed Equipment. From next year, the majority of ship hardware will be provided by local suppliers.

SEA 1300 is a progressive installation across the destroyers and frigates, which gives a steady drumbeat of work. The National Defence Strategy also stated that NSM will also be installed on the Hunter class, and it will be interesting to see what goes on the new General Purpose Frigates under SEA 3000.

We will also commence production of locally manufactured launchers which are part of the all up round, also known as the Launcher Missile Module. The Launcher Missile Modules are bolted directly onto the launcher frame. Kongsberg Defence Australia will assemble the launchers and then incorporate the missiles themselves, which will come from Norway. We will install them in the launchers, perform final testing, and then deliver them to the customer.

Kym: Any feedback about the RIMPAC firing?

John Fry: From the Kongsberg perspective it's been a quick process with the contract signed in December 2022 – so for Navy to be able to do a live fire exercise after only 18 months is an achievement. There was a lot of work leading up to that in both Norway and Australia, including a lot of testing. Integrating it onto a ship also means you have to work collaboratively with other parts of CASG, Navy, and industry partners on the platform side including Navantia, Thales and Raytheon.

I'm pleased that Defence have chosen to highlight the firing because it's been 18 months of hard work, and everyone should be proud of the result.

Kym: How are things going with StrikeMaster – the offer of NSMs launched from Bushmaster utility for long range coastal defence?

John Fry: It's very much a live proposal and we are making more people aware of the capability. I think the case for acquiring it is even more compelling now than when we launched it almost exactly two years ago at Land Forces 2022.

Firstly, the requirement is now funded - we were happy to see a second regiment of Long Range Fires being added to the 2024 Integrated Investment Program. The first regiment will operate HIMARS and the second will focus on maritime strike – though there have been no decisions about what that capability will look like.

We believe the KONGSBERG NSM Coastal Defence System with the StrikeMaster launcher represents a quick way of introducing a new land based maritime strike capability into service. The StrikeMaster launcher employs a twin-pack of NSM, and it will largely be produced in Australia, using a missile that is now in ADF service. Because of the arrangements already in place that I mentioned for SEA 1300, we could add the production of StrikeMaster launchers very easily. On top of that, the NASAMS CDS C2 architecture is common with NASAMS, so we can leverage our established FDC production activities for the C2 element.

This is a mature capability – the KONGSBERG NSM Coastal Defence System has been operational for some time in Europe. The biggest user of the NSM will actually be the US Marine Corps in a land-based maritime strike role. They use it as part of their NMESIS program from a smaller vehicle – a modified JLTV – that is remotely controlled. However, we believe there are some significant advantages to using a larger, crewed vehicle in the utility form of the proven and fielded Bushmaster system, and this aligns better with our force structure.

Asian AFVs seize their opportunity

Gordon Arthur // ***Christchurch***

The debate over whether the main battle tank's day is over has been pretty much silenced by recent conflicts in Ukraine and the urban terrain of Gaza. Europe, Russia and the USA have traditionally dominated the production of armoured fighting vehicles (AFV), but there has been a surge in sales from Asian manufacturers.

The K9 155mm self-propelled howitzer from Hanwha Aerospace has done extraordinarily well on the international market in recent years. (Gordon Arthur)

Armoured vehicles have always found favour with Asian armies, and the region has a vibrant AFV industrial base – particularly China, India, Indonesia, Japan, North Korea, Pakistan, Singapore, South Korea and Taiwan. However, when it comes to AFV exports, two countries stand out for different reasons: China offers relatively low-cost vehicles with little concern over who the customer is; while South Korea's ability to quickly produce reliable, NATO-standard vehicles has helped it corner a large market.

Korean kudos

To give an example, Hanwha Aerospace takes just 15 days to manufacture a K9 155mm self-propelled howitzer (SPH) at Plant 3 in Changwon, South Korea. A third production line was due to open in April, giving Hanwha an annual production capacity of up to 240 K9s. Such efficiency and scale is unheard of for European or American OEMs. The K9 can justifiably claim to be the world's most popular SPH, racking up customers in Australia, Egypt, Estonia, Finland, India, Norway, Poland, Romania, South Korea and Turkey so far.

Simultaneously, Hanwha is establishing K9 assembly lines in Australia, Egypt and Poland. Indeed, this willingness to transfer technology increases the attractiveness of South Korean products. Egypt's K9 contract in February 2022, for example, is divided into four stages. The first phase sees delivery of South Korean-assembled vehicles, stage 2 is knocked-down kits shipped to Egypt for assembly by a state-run factory, the third phase adds locally produced parts to knocked-down kits, and the final stage will see localisation levels reach 30%.

Hanwha is not resting on its laurels either. With the South Korean armed forces confronted by manpower shortages due to an ageing population, Seoul is relying on technology to maintain a qualitative edge over its northern nemesis. Development of Hanwha Aerospace's upgraded K9A2 with fully automated ammunition handling (and therefore a reduced crew) should conclude by 2026, whilst the optionally manned K9A3 is slated for fielding later in the 2030s.

A Hanwha Aerospace spokesperson said the company's success is due to several factors. One is localisation, as the company can meet customer needs quickly with various production options, including liberal technology transfer. Second is the quality and technology of Korean products, and a third factor is the ability to meet exacting delivery schedules thanks to hot production lines. The latter is aided by a symbiotic relation between the government and industry, where equipment can be diverted from local orders to export clients.

Elsewhere in South Korea, Hyundai Rotem, fresh from a large sale of its K2 MBT to Poland, is working on a 55-tonne next-generation main battle tank (MBT). Tom Kim, Hyundai Rotem's Manager of Global Defence Sales & Marketing Team, told *APDR* that the futuristic tank could see one of its three crewmembers potentially operating a second tank through manned-unmanned teaming. The proposed design boasts a 130mm main gun, remote-controlled weapon station (RWS) on the turret roof, antitank missiles in a retractable launcher, active protection system (APS) and counter-unmanned aerial system (C-UAS) to defeat loitering munitions. The proposed tank also has

its own UAV for independent reconnaissance. Propulsion would initially come from a diesel-electric hybrid unit, though the ultimate goal is hydrogen power.

In April, Hyundai Rotem announced a US$60 million contract to sell 30 K808 8x8 armoured vehicles to Peru, with all to be delivered by 2025. Significantly, this represented South Korea's first AFV sale to Latin America, and it came as part of a strategic agreement with Peru for other vehicle opportunities too.

South Korean defence exports reached nearly US$14 billion last year thanks to an expanded number of customers, although this amount was down from 2022's record US$17.3 billion in sales. Yet the desirable jewel in the crown for South Korea is the Five Eyes market. Hanwha has already gained a substantial foot in the door with AS21 Redback and AS9 Huntsman sales to Australia, but Seoul would like to greatly build upon that. South Korea's ambitions are unbridled, with President Yoon Suk Yeol voicing a goal of becoming the world's fourth-largest weapons supplier behind only the USA, Russia and France.

Undoubtedly, the quality of South Korean AFVs far surpasses that of their North Korean counterparts. North Korea is not sitting idle, however, as a Pyongyang parade in October 2020 saw the debut of a prototype MBT that superficially resembles the Russian T-14 Armata, a Stryker 8x8 Mobile Gun System lookalike, and 8x8 and 6x6 antitank missile vehicles.

South Korea's K2 is the newest main battle tank from Hyundai Rotem, plus the preceding K1A1 is seen in the background of this photo. (Gordon Arthur)

Chinese products come with attractive pricing – but often at the cost of quality and after-sales support – and so they are attractive to non-aligned states, and countries with dubious human rights records it must be said, in Africa and Asia in particular.

Chinese achievements

China has carved out a niche for itself in the AFV export market too. However, it has done so using very different methodologies than South Korea. Chinese products come with attractive pricing – but often at the cost of quality and after-sales support – and so they are attractive to non-aligned states, and countries with dubious human rights records it must be said, in Africa and Asia in particular.

Pakistan is China's premier client for military equipment. On 6 March, Pakistan's state-owned Heavy Industries Taxila (HIT) rolled out the first "pilot" of the Haider MBT, a license-produced version of Norinco's VT4. Islamabad is understood to have 570 Haider MBTs on order, with the first 176 VT4s having come directly from China beginning in 2020. HIT will assemble a further 284 Haiders using Chinese semi-knocked-down kits, before Pakistan fully assembles another 110 Haiders utilising transfer of technology. For example, HIT claims 97% of 1,129 parts for the 125mm smoothbore gun are manufactured domestically. Turret and hull plates are welded and fabricated by HIT too.

Bangladesh is another repeat customer of Chinese-built equipment. The Bangladesh Army was the first export customer for the VT5 light tank, the first units arriving in late 2022. This sale of 44 VT5s was concluded in December 2019, but COVID-19 delayed delivery. Thailand is another loyal customer of Chinese merchandise, and in recent years it acquired VN1 8x8 armoured personnel carriers (APC), VT4 tanks and VN16 amphibious assault vehicles.

According to the Stockholm International Peace Research Institute (SIPRI), other customers for Chinese-manufactured armoured vehicles in the past twelve years include: Afghanistan, Algeria, Angola, the Bahamas, Belarus, Benin, Bolivia, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Djibouti, Equatorial Guinea, Ethiopia, Gabon, Ghana, Guinea, Ivory Coast, Kenya, Laos, Mali, Mozambique, Myanmar, Namibia, Nepal, Niger, Nigeria, Papua New Guinea, Senegal, Sierra Leone, Somalia, Sudan, Tajikistan, Tanzania, Uganda, Venezuela, Zambia and Zimbabwe. As this list shows, by specialising in selling low-cost, no-frills AFVs, China targets a completely different clientele to South Korea or other Western nations.

Elsewhere in Asia

Japan has a very capable industrial base, and Mitsubishi Heavy Industries (MHI) is the country's primary AFV manufacturer. MHI currently produces the Type 10 tank and Type 16 8x8 Mobile Combat Vehicle for the Japan Ground Self-Defense Force. However, JGSDF production has always been hamstrung by small annual orders and, historically, no possibility of any military exports because of its pacifist constitution. Although Tokyo has eased export restrictions, Japan is yet to achieve the overseas breakthroughs that South Korea regularly does.

The problematic case of Japanese defence production is typified by the JGSDF program to replace the Type 96 8x8 APCs once manufactured by Komatsu. Citing low profit margins, Komatsu decided to completely pull out of the defence

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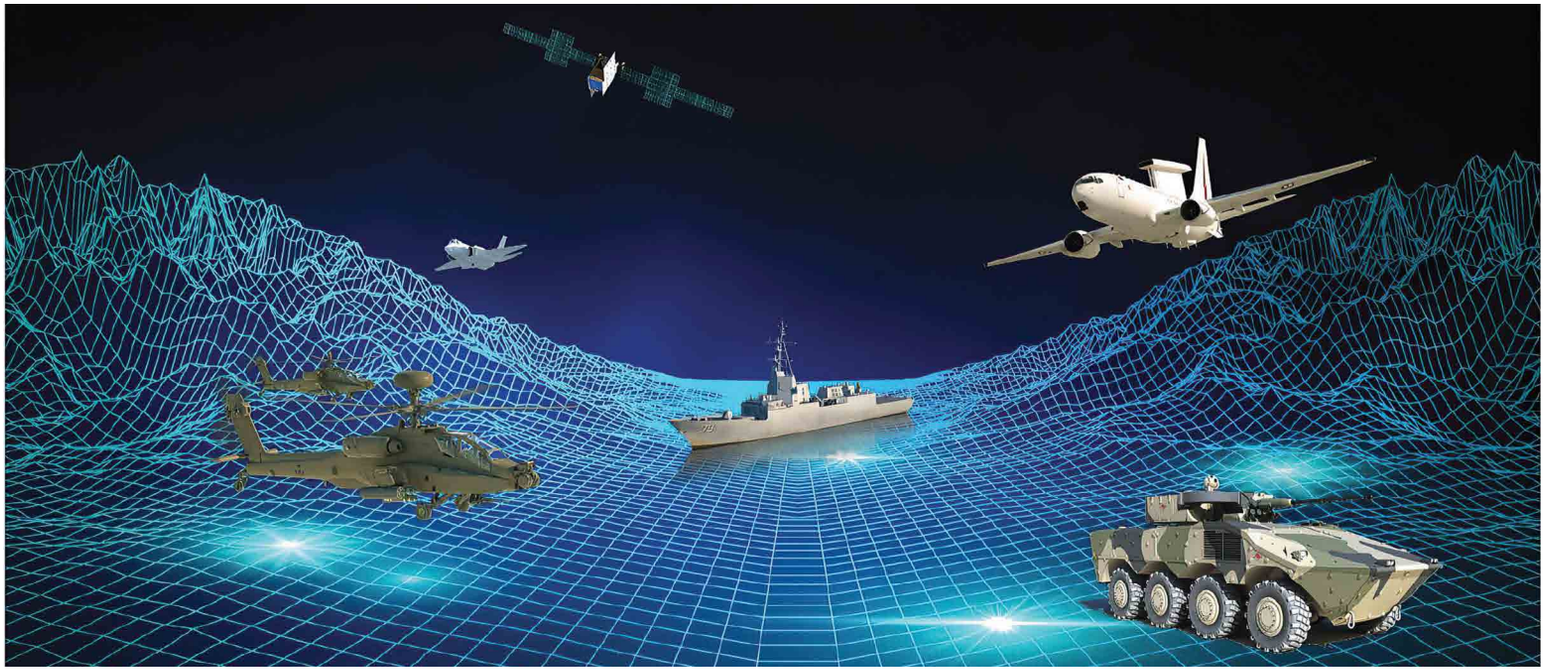

Connecting the Integrated Force

Boeing Defence Australia (BDA) is leaning forward to address the future Command, Control, Communications and Computing (C4) needs of the integrated force, using flexible, open architectures to enable the rapid development of a common network across the Australian Defence Force (ADF).

BDA's Battlespace Communications System Enterprise maximises the Australian Government's investment in individual systems through shared hardware, software, training and support, providing better integration, increased resilience, agility and situational awareness.

Proven, reliable technology

"BDA has demonstrated pedigree in designing, developing and evolving complex defence communications systems in Australia," said Murray Brabrook, BDA Joint Systems director.

"The Battlespace Communications System Enterprise brings together our strong portfolio of military network programs and Australia's largest defence network and communications workforce to develop next generation C4 systems at the speed of relevance."

The system is underpinned by Project Currawong's Joint Black Core Network – the networking backbone that provides resilient, assured communications to the ADF. Coupled with its sophisticated mission management system, BDA's proven technology connects command and control elements, sensors and effectors across the battlespace.

"But the network won't remain static," Brabrook said. "Boeing is investing in technology to take the network into the future and provide the agility to integrate new products and technology as they are introduced by Defence.

"The next-generation network technology will enable the ADF to remain dispersed, mobile and connected.

"We are designing it to operate at much larger scale as it converges with tactical networks and integrates with unattended and autonomous systems. Management of this large-scale network will be automated, providing simplicity at the point of use."

Key features of the system include distributed networking with no single point-of-failure, awareness of the electromagnetic spectrum, and the ability to prioritise data by mission criticality.

Breadth of capability

BDA's Currawong battlespace communications technology was developed entirely in Australia and demonstrates local industry's capacity to develop world-leading C4 capability.

BDA's Australian workforce covers the full range of disciplines including engineering, program management, cyber security, supplier management, and global trade controls to deliver Defence's complex network requirements.

"We employ some of the best and brightest minds who are committed to ensuring our communications systems adapt to keep pace with technology and the rapidly changing threat environment. Importantly, they also have the foresight to deliver minimum viable capability with a successful methodology for iterative upgrades in line with Defence's speed to capability objectives," Brabrook said.

BDA's ability to deliver under an iterative development model was proven with Project Currawong under LAND 2072 Phase 2B, and the ongoing Capability Enhancement contract enables BDA to continue to innovate well after the final Currawong release was delivered.

"Add that reachback to the global resources of The Boeing Company, a supply chain of more than 200 Australian businesses, and a highly collaborative customer relationship and we have a strong, established ecosystem to deliver enduring sovereign C4 solutions," Brabrook said.

"We stand ready to work alongside the Commonwealth of Australia and the ADF to deliver network and communications solutions across maritime, land, air, space and cyber domains."

The VT4 main battle tank from Norinco in China has achieved export sales to Nigeria, Pakistan and Thailand to date. (Gordon Arthur)

sector in 2019, and this contributed to the JGSDF choosing a foreign design – Patria's AMVxp – as its APC replacement. Under a licensing agreement signed in August 2023, Japan Steel Works is now manufacturing the AMVs, with 26 procured in FY2024. Similarly, the JGSDF's Komatsu-built 4x4 Light Armored Vehicles will be replaced by a foreign platform, with Thales Australia's Hawkei and GDLS's Eagle V currently slugging it out for a contract.

Taiwan is cognisant of the need to produce AFVs domestically, and the obvious example is the 8x8 Cloud Leopard, of which 683 were produced from 2011-23. In June, Taiwan unveiled a prototype 105mm gun-armed version too, though the military wants modifications before committing to series production. Nonetheless, for heavier vehicles, Taiwan was forced to turn to the USA and it is awaiting a first batch of M1A2T Abrams tanks this year. All 108 should arrive by 2026.

The anguished story of Indian attempts to produce AFVs could fill an entire *APDR* magazine.

The anguished story of Indian attempts to produce AFVs could fill an entire *APDR* magazine. Apart from licensed production of Russian T-72 and T-90 tanks, India's greatest "success" so far is the Arjun MBT, which took not years, but decades, to fructify. After production of 128 Arjuns, another 118 Arjun Mk 1A versions were ordered in 2021. However, production has hit a snag because the desired MTU engines are no longer produced.

Fortunately, the developmental Zorawar light tank is showing promise, with a prototype unveiled on 6 July just 2.5 years after development commenced. The unprecedented speed of its progress may be due to the fact that a private company – Larsen & Toubro (L&T) – is collaborating with the Defence Research and Development Organisation (DRDO). The Indian Army is grappling with an urgent need for light tanks to operate in mountainous areas adjacent to the Chinese border.

Delhi requires 315 such light tanks, and the DRDO reckons the first will be ready in 2027 after an extensive testing program. Indian projects are renowned for being late, so this date should be regarded tentatively. However, Rahul Bhonsle, Director of Delhi-based Security Risks Consultancy, assessed, "In this case there's greater confidence, as L&T has a good record of delivery. It delivered K9 Vajra guns ahead of schedule … Much will depend on how the trials go, and the army continuing steadfast with laid-down general staff qualitative requirements."

The amphibious Zorawar's development is boosted by the fact that it borrows foreign technology such as a Cockerill 3105 turrets from Belgium, and a foreign engine.

Indian Army AFV needs remain great, though. In April 2023, the MoD issued approval to proceed with its Future Ready Combat Vehicle (FRCV) program to replace ageing T-72M1 tanks. The medium-weight FRCV may be developed via the strategic partnership model, where a private company works with the public sector. An initial procurement phase amounts to 590 FRCVs, but 1,500+ could eventually be required. The MoD has ambitiously specified a tank with all the bells and whistles, such as APS, modular armour, 360° see-through vision system, integrated UAVs and tactical Wi-Fi. India issued RfIs for the FRCV in 2015, 2017 and 2021, but with little tangible progress to date.

On 22 December 2022, an acceptance of necessity was issued for 480 examples of the Futuristic Infantry Combat Vehicle (Tracked) to begin replacing BMP-2 IFVs. This effort to obtain up to 2,000 IFVs actually kicked off in 2009, so progress is painfully slow and no competing prototypes have been unveiled yet.

Tata received small contracts for its 8x8 WhAP, with a handful delivered to the army in 2022 and some given to paramilitary forces. However, the army reportedly has reservations about the WhAP's suitability, and it is reportedly interested in the Stryker instead.

Elsewhere in Asia, the Philippines was spurred into action by five months of brutal fighting in Marawi in 2017, which showed up armour and combat engineering capabilities in the Philippine Army. Correspondingly, in 2020-21 the army ordered 18 Sabrah ASCOD 2 light tanks, ten Pandur II 105mm 8x8 fire support vehicles and 28 Iveco VBTP-MR Guarani 6x6 APCs via Elbit Systems. COVID-19 caused delays, but the army inducted the first nine 30-tonne Sabrahs and five Guaranis on 5 March.

Finally, Indonesia has a grand vision of becoming an AFV-manufacturing player too, initially building skills through licensing agreements with overseas partners. The Harimau medium tank illustrates this, the design emanating from FNSS in Turkey. On 28 February, state-owned PT Pindad handed over the first ten locally finished Harimaus to the army. The initial Harimau production contract, signed in April 2019, covered 18 tanks.

PT Pindad is also assembling 23 Pandur II 8x8

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China has sold the WZ551 6x6 family of armoured personnel carriers to a multitude of countries, particularly those in Africa. (Gordon Arthur)

vehicles, after it signed a licensing agreement with Excalibur Group in April 2019. PT Pindad's own stable of products include the Anoa 6x6 APC and Badak 6x6 fire support vehicle; these continue in production, with twelve and six respectively delivered to the Indonesian Army earlier this year.

Russia, embroiled in a self-inflicted morass after foolishly invading Ukraine, has its hands full replacing catastrophic AFV losses. Longstanding Asian customers of Russian AFVs include India, Indonesia and Vietnam, but new sales seem improbable right now.

Regional technologies arise

There is a constant tug-of-war cycle between threats to AFVs and their countermeasures. Combat in Afghanistan and Iraq, where rocket-propelled grenades were a danger, gave rise to bar/slat armour that was reportedly about 60% effective. Latterly, cope cages have grown more common in combat zones as a response to the threat of loitering munitions and warhead-equipped UAVs.

The expense of hard-kill APS will restrict its application only to more affluent militaries in Asia-Pacific, with Rafael's Trophy among the most popular globally. A Rafael spokesperson told *APDR* that Trophy's development started in 1995, and three generations of technology demonstrator systems were tested before there was sufficient confidence to start full-scale development of the first operational version in 2007. Israel first deployed it on Merkava 4M tanks in 2010, and Rafael claims 1,700+ Trophy orders so far. Nobody in the Asia-Pacific has acquired Trophy yet, but Hyundai Rotem signed a memorandum of understanding for its integration on K2 export tanks last October.

Combat in Afghanistan and Iraq, where rocket-propelled grenades were a danger, gave rise to bar/slat armour that was reportedly about 60% effective. Latterly, cope cages have grown more common in combat zones as a response to the threat of loitering munitions and warhead-equipped UAVs.

Rafael claims that Trophy defeats all shaped-charge antitank threats with a kill performance of 90+%, though a medium-weight system does add about 500kg in mass to an AFV. Rafael's spokesperson noted: "The ongoing conflicts in Ukraine and Gaza clearly demonstrate that APS is a game-changer for armoured vehicles, enabling them to perform critical missions while manoeuvring in dense, urban, hostile environments." Yet APS needs to offer better protection against aerial threats too. Rafael acknowledged: "Active protection systems need to evolve in order to meet evolving threats such as attack drones and precise artillery shells. The Trophy system is evolving in accordance with a funded, multi-year development roadmap that is generating incremental enhanced capabilities."

One solution against aerial threats is an RWS, and regional companies are amongst the vanguard. Australia's EOS Defence Systems, for example, released its Slinger C-UAS system last year. Matt Jones, the company's former Executive Vice-President, said the Slinger was a response to international demand for advanced C-UAS technologies. "We have applied the hard-won lessons from the battlefields, including Ukraine, to our Slinger system, ensuring it will give real edge to those looking to hit back against the growing threat of drones." Slinger features a radar, electro-optic/infrared sensor, 30mm cannon and proprietary stabilisation and pointing technology. As well as AFVs, it can be mounted on light vehicles such as pickups.

Although directed-energy and high-power microwave weapons are in their infancy, EOS Defence Systems unveiled a T2000-DE turret in 2021. Sanderson, the company's CEO, explained, "All APS suffer from targets that are coming directly from overhead. You end up with a doughnut of protection around a vehicle, with a significant hole at the top." The T2000-DE turret plugs that hole with a 35kW laser connected to a 360° radar and electro-optic sensor that can blind or destroy UAVs at greater ranges than ballistic weapons.

Another advantage of lasers is that they can quickly change targets during swarm attacks without needing to reload. Directed-energy systems are still relatively large and heavy, plus they suffer from high acquisition costs and require considerable onboard power. For these reasons, they will only be incorporated into specialist C-UAS force protection vehicles.

New forms of propulsion – such as hybrid-electric and even hydrogen – are also being explored in Asia-Pacific. Thales Australia debuted its all-electric Bushmaster 4x4 vehicle in 2022, this ePMV employs 3ME Technology batteries and two hybrid electric drives that produce 140kW. The existing diesel engine acts as a range extender, and the Bushmaster's optimised power management system gives an estimated

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range of 200-300km and 24-36 hours of silent watch on battery power. The ADF lists the following benefits of AFV electrification: superior signature management; instantaneous acceleration; deep-water fording; superior robotic and autonomous connectivity; simplified maintenance; resilience to battle damage; reduced demand on supply chain; favourable to evolutionary development; increased fighting compartment volume; and power for subsystems (e.g. directed-energy weapons).

Singapore, despite being only a small nation, can lay claim to producing some of Asia's most advanced digitised vehicles. ST Engineering's newest platform is the 29.5-tonne Hunter IFV that the Singapore Army began operating in 2019. Boasting Rafael's Samson unmanned turret; a 13-camera, 360°-surveillance system; open architecture to mitigate obsolescence issues; a vehicle health and monitoring system; and the Army Tactical Engagement and Information System, ST Engineering describes the Hunter as "the world's first fully digitised AFV". Future Hunters may integrate technologies such as UAVs and unmanned ground vehicles, as well as a see-through armour system where images are projected onto crewmen's goggles.

Two of Mitsubishi Heavy Industries main AFVs are seen in this photo – a Type 10 tank in the background and a Type 16 MCV in the foreground. (Gordon Arthur)

The war in Ukraine has revealed how far AFV production capacity in Europe and North America has slumped.

Conclusion

The war in Ukraine has revealed how far AFV production capacity in Europe and North America has slumped. Whilst there is no argument that these continents produce top-drawer platforms – such as the Leopard 2 tank – they cannot do so quickly or cheaply. Furthermore, with Russian attention diverted by its bloody war against Ukraine and its inability to supply traditional customers, this has provided plentiful opportunities for Asian manufacturers to step in. This is something that those companies with the requisite capability, nouse, ambition and capacity are eagerly doing. Regional AFV manufacturers – such as South Korean K9 and K2 sales to Poland, or Australian-manufactured Boxers being sold to Germany – illustrate how the balance of the international market is changing.

India continues to license produce the T-90S tank from Russia, as the indigenous Arjun cannot really be described as a roaring success. (Gordon Arthur)

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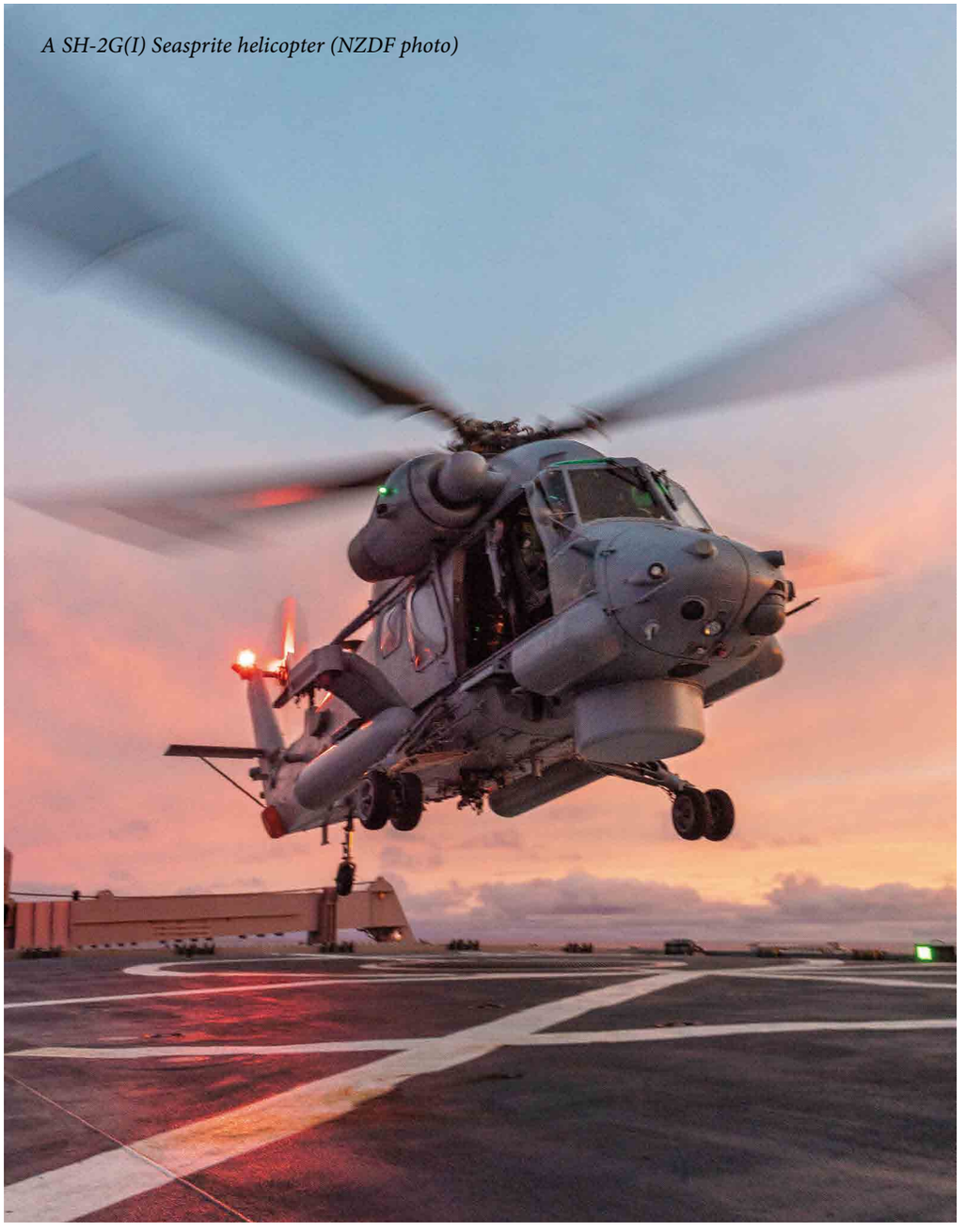
New Zealand's Seasprite story and the replacement options

Tim Fish // ***Auckland***

Procurement of the New Zealand Defence Force (NZDF) Seasprite helicopter fleet was intended only as a temporary fix to its rotorcraft capability shortfall. Now there is an urgent need for a new replacement platform that will resolve some of long-standing issues with the Royal New Zealand Navy's (RNZN's) rotary wing force.



A SH-2G(I) Seasprite helicopter (NZDF photo)

The NZDF's No.6 Squadron (6Sqn), which operates the RNZN's fleet of Seasprite helicopters is located at RNZAF Base Auckland in Whenuapai. The original fleet of eight SH-2G(I) operational Seasprite helicopters has now been whittled down to five.

According to the NZDF the decision was taken in mid-2023 to reduce the size of the operational fleet as a way of improving overall availability. The average availability of aircraft in across the fleet of eight Seasprite helicopters was as low as 17% during 2022 and 19% in 2023. This is a dramatic fall from 38% availability of eight aircraft in 2019.

A NZDF spokesperson told *APDR* that overall rates of availability have dropped due to parts availability, lack of personnel and increasing unplanned maintenance demands.

"However, the required rate is also tied to Navy demand, which has reduced since 2019 due to hollowness in the workforce, including in the technical workforce. This means that fewer aviation-capable ships have deployed to sea concurrently over the past five years," the NZDF spokesperson said.

The lack of aviation-capable ships during this time is because both the RNZN's frigates, HMNZS Te Kaha and HMNZS Te Mana, until recently had been completing a Frigate Systems Upgrade program. Furthermore, both Offshore Patrol Vessels, HMNZS Wellington and HMNZS Otago, have been mothballed due to lack of crew and put into long-term custody and care of naval maintenance contractor Babcock.

This has left just the tanker HMNZS Aotearoa, multipurpose support ship HMNZS Canterbury and the diving and hydrographic vessel HMNZS Manawanui capable of supporting helicopter operations. Since 2023 the pair of frigates have returned to operations. However, this

trend appears to be improving with three ships deploying in 2024, with each embarking helicopters.

More with less

The NZDF spokesperson said that higher rates of availability could be achieved with fewer platforms "by lowering the fleet's time-based maintenance overhead and increasing the pool of spare parts, thereby better meeting government-directed outputs."

The spokesperson added that a five-aircraft fleet is designed to provide three aircraft for operational use at any one time with the remaining two in depot-level maintenance.

"At some points during the past 18 months, overlaps in depot-level maintenance have resulted in periods where only two aircraft were available, but conversely there have been periods where four aircraft have been available," the NZDF spokesperson added.

This effort is being done under the Seasprite Sustainment Work Program after it was acknowledged that falling fleet-wide availability rates could not be reversed due to high rates of attrition with essential personnel leaving the NZDF that could not be replaced.

The latest statistics from the NZDF show that from January-April 2024 more than 90% of planned flights were completed "with the remainder cancelled for reasons of crew availability, aircraft serviceability or weather." This was achieved using four aircraft including one embarked on the RNZN's tanker, HMNZS Aotearoa.

Ten SH-2G(I) helicopters were delivered in 2016 under the Maritime Helicopter Replacement Project (MHCP), but only eight were used operationally with the remaining two airframes used for spare parts, testing and training. These helicopters were originally purchased from the US by Australia and destined for service in the Royal Australian Navy (RAN) but never entered after the program was cancelled in 2008.

Expanding capability

The eight SH-2G(I) were introduced as a replacement for five SH-2G(NZ) helicopters that had been in-service since 2001. Increasing the number of operational aircraft in the fleet by three platforms represented a significant uplift in naval aviation capability. Before the SH-2G(NZ) helicopters the RNZN operated four SH-2F helicopters from 1997 as an interim capability as it retired its Westland Wasp helicopters that had been in-service since the 1960s.

But since 2017 the SH-2G(I) Seasprite fleet has rarely met its allocated flying hours. That said, across a fleet of eight aircraft the actual flying hours achieved for each year from 2017-2020 exceeded 1,000. But from 2021 onwards this started to fall with 897 hours recorded against a budgeted 1,165 in 2021 and 809 against an expected 1,069 in 2022. This fell at a faster pace in 2023 wit just 673 hours against a reduced allocation of 969 and in 2024 just 429 against an allocation of 850.

According to the NZDF spokesperson the allocated hours for FY2023/24 are 790 and at the start of May 2024 a total of 644.7 hours of a planned 670 have been achieved with the remaining 120 to be flown during May and June as *APDR* went to press.

HMNZS Otago and a SH-2G(I) Seasprite helicopter (NZDF photo)

Rapid replacement

The selection of the SH-2G(I) for the MHCP made sense at the time as the platform to replace the SH-2G(NZ) fleet. This is because the RNZN was familiar with the earlier variants of the helicopter and alternatives such as the SH-60 Seahawk were too large to operate from the OPVs.

But with both the OPVs out of service and plans afoot to replace most of the existing fleet over the next decade with new ships it means that the RNZN has more options.

The replacement of the SH-2G(I) Seasprites is being conducted under the Maritime Helicopter Replacement (MHR) program that was given a budget of NZ$1 billion under the MoD's Defence Capability Plan (DCP) in 2019. It will be the first time that the NZDF will procure a completely new aircraft and the helicopters will be in-service for at least 25 years.

A market research study was completed in 2023 following a Request for Information (RFI) released in April that year to better inform the MoD about medium helicopter replacement platforms and a number of industry contenders have emerged to offer solutions. Further details are likely to emerge in the next Defence Capability Plan due to be released later in 2024.

Early contenders include the MH-60R Seahawk from Lockheed Martin subsidiary Sikorsky and the AW159 Wildcat from Anglo-Italian company Leonardo Helicopters. In May 2023, Airbus Helicopters confirmed that it was offering the NH90 NATO Frigate Helicopter variant and RSG AeroDesign is also offering the Bell 412 MMH (Multi-Mission Helicopter).

All the different platforms have their pros and cons. The main sales pitch from Lockheed Martin is that its MH-60R is in use by New Zealand's close allies in the region, Australia and the US. Given the growing need to align capabilities with allies to enhance interoperability there is a strong argument for the MH-60R, which is also widely used by other operators globally providing

a long-term and secure supply chain.

The NZDF wants to avoid operating an 'orphan' fleet of aircraft, by which is meant that they are the only operators of a platform with a limited or non-existent supply chain to support them.

Contenders' ready

A spokesperson from Sikorsky told *APDR* that there are more than 330 MH-60R Seahawk helicopters fielded globally with over 1 million flight hours recorded. The spokesperson added that the MH-60R has a low cost per flight hour of US$5,000-6,000 and has "an active roadmap that addresses capabilities and obsolescence to keep the aircraft relevant into the 2050s."

French NH90 NFH (Photo credit: NHI)

Meanwhile the AW159 has an international fleet of 72 aircraft worldwide and has accumulated over 100,000 flight hours. The UK operates the majority of these with 62 (the Royal Navy operates 34 and the British Army 28). Meanwhile the Republic of Korea has eight and the Philippines Navy has two. Whilst there is more potential this is fewer than its rival platforms thus representing some long-term risk.

However, Aaron Lewis, Campaign Director at Leonardo Helicopters told *APDR*: "The global fleet is over 70 aircraft, and the AW159 shares components with other platforms, including its predecessor the Lynx, of which over 450 units were built."

He added: "The helicopter has low operating costs and requires fewer operators and maintainers compared to rival platforms. Compared to larger platforms, AW159s power to weight ratio is high. This means that the aircraft is highly manoeuvrable and agile – this is extremely important when trying to land the helicopter on a ship which is rolling and pitching in heavy seas."

Leonardo already has a presence with the NZDF supporting the Royal New Zealand Air Force's (RNZAF's) 3 Squadron (3SQN) with its five A109 Light Utility Helicopter fleet. This offers significant advantages as the company can rationalise support arrangements across helicopter fleets. However, 3SQN is based at RNZAF Base Ohakea, whereas 6SQN is located at Base Auckland. It is not clear if the NZDF would countenance supporting their replacement naval helicopter from Ohakea.

"To support the long-term use of the Wildcat, Leonardo will offer to establish the Wildcat Support Centre in New Zealand. This onshore facility ensures early delivery of the capability and allows the NZDF to operate and evolve the aircraft autonomously, if needed," Lewis said.

For the uncrewed element of the MHR program Leonardo is offering the AWHero, which has achieved military certification and demonstrated its capabilities in multi-national naval exercises. The AW159 can fit onto existing RNZN ships without modification. Lewis said "this leaves room for the cohabitation of an uncrewed system in the same hangar which will significantly further the overall capabilities and effectiveness in prosecuting missions at sea."

He added: "The relatively low number of maintainers and crew required presents less of a 'hotel' burden upon the ship."

The Airbus Helicopters' NH90 NFH is an offer with different advantages. 3SQN already operates eight NH90 Tactical Transport Helicopter (TTH) variants out of RNZAF Base Ohakea and it is the other main helicopter used by the NZDF, which has been in-service since 2015. It means Airbus Helicopters will be able to utilise its existing international NH90 supply chain and other support networks in New Zealand.

Romain Trapp, executive vice president of customer support and services at Airbus Helicopters told *APDR*: "If we can support the NFH from Ohakea, we can probably do that and it would be a cost saving for the taxpayer. If there is a requirement to build a facility in Whenuapai then that can be done also."

Trapp explained that the NH90 is built in different variants but "80% of the aircraft parts are common. The parts that were recently acquired by New Zealand from Australia following the drawdown of the TTH will also fit the NFH."

Common cause

This level of commonality between the platforms is one of the major reasons for the Airbus NH90 NFH offer.

Trapp said as well as parts there are other benefits "in terms of training and logistics support where there are lots of savings for the NZDF if [NZDF] uses both the NFH and TTH version."

He added: "The NFH and TTH are very similar platforms, they can be maintained by the same people, they can even be flown by the same people."

He also claimed that the NH90 is truly multirole with the ability perform full anti-submarine warfare and anti-surface warfare roles and can be rapidly adapted for other roles as well.

"It takes five hours for a team of three people to reconfigure the aircraft into a search and rescue, medivac, transport or HADR platform, which are critical missions that need to be performed by the NZDF," Trapp added.

According to Trapp the NFH offers more capability in the same footprint compared to its rivals. "Depending on which platform you

compare it with the NFH has between 25-50% more range, cabin size and volume and can transport more people," he said.

"Range is important because of the size of New Zealand and it has a full de-icing capability, which is critical for when the aircraft operates in Antarctica," Trapp added. He also cited the interoperability of the NFH with NATO allies.

Airbus has a presence at four locations in New Zealand. In Ohakea, as well the embedded deeper maintenance support for the NH90 it also provides the T6 trainer maintenance and technical support under contract to Textron. It has an embedded maintenance, spares and MS&L support at Base Auckland for the C-130H and Seasprites. There are also a repair works in Blenheim and other civilian offices elsewhere in Auckland that support over 300 other Airbus civilian helicopters

However, the downsides are that neighbouring Australia has recently destroyed its fleet of NH90 TTH Taipan helicopters and replaced them with the UH-60M Blackhawk. The NH90 has suffered with availability issues due to the lack of spares and the speed to getting repairs completed. This has also led Norway to abandon its fleet of NH90s. Whilst 3SQN has been successful until recently in its effort to get high levels of serviceability across its fleet, they will have to balance any concerns about spares with the opportunity to rationalise their two main helicopter fleets into one platform.

Lastly the Bell 412EPX is a new naval combat helicopter offering from RSG but using a very popular and cost-effective platform. The 'EPX' designation is the naval configuration that was exported to the Royal Moroccan Navy in 2023. There are over a dozen different variants of the 412 in service with over 40 different countries offering a huge operator and support network.

A spokesperson from RSG told *APDR* that the offer of the Bell 412EPX was because of "its lower procurement and operating costs as well as high availability (+96%) and global support structure." The 412EPX is commercially based but with an integrated mission system to allow the use of anti-surface warfare and anti-submarine warfare systems. This includes dipping sonar and processors, radar, Magnetic Anomaly Detectors, EOIR sensors, ESM, defensive aids, data links, specialist operator consoles, and ship operation equipment. The aircraft can also be used in the SAR, MEDIVAC, HADR and utility roles with the ability to add hoists, medical equipment, ropes and other equipment for different cabin configurations.

When the NZ MoD makes its final decision on its choice of platform it will have to get the right balance of cost, capability and supportability. This will ensure that the RNZN will have a new maritime helicopter for the next 25 years that will be able to deliver the rotary element of the NCF without limitation in availability and avoid past issues of operating orphan fleets of second-hand aircraft.

HMAS Arunta's flight deck team conduct deck-landing qualifications with the embarked MH-60 Romeo helicopter 'VENOM' during the ship's return to Australia. (Dod photo / Jarrod Mulvihill)

USS California (SSN 781) pulls into Submarine Base New London in Gronton, Conn., July 12, 2024, returning from national tasking. (U.S. Navy photo by John Narewski)

Nuclear-powered submarines and "additional political commitments"

Kym Bergmann // *Canberra*

On 7 August, US President Joe Biden's letter to Congress updating arrangements for AUKUS Pillar One was made public, with a lot of it being standard phraseology regarding technology transfer. But, rather ominously, in the fifth paragraph of the update it referred to the three partner countries entering into additional political commitments in support of the deal.

The problem with this is that when asked by the Australian media, the first response of Prime Minister Anthony Albanese indicated that he had no idea what these were. The situation was not improved when on 12 August, supporting legislation was tabled in Canberra showing – amongst other things – that either the US or UK could pull out of the deal for no reason and with a notification period of one year.

This is despite the fact that both of those countries are in the process of receiving a $4.7 billion gift from Australian taxpayers to subsidise their already massively profitable submarine building companies. We already know from earlier analysis that in an extraordinary lapse of judgement none of this money is refundable, no matter the circumstances – such as the failure to ever deliver an actual submarine.

This is what happens when national security professionals are allowed to run amok with taxpayer's money and zero government supervision. *APDR* has made frequent – and totally unsuccessful attempts – to find out on what basis the $9.4 billion was calculated, who authorised it and what is the schedule of the spend. All requests for enlightenment have been

studiously ignored.

The letter to Congress also states:

"The Agreement also enables the sale of special nuclear material contained in complete, welded power units, and other material as needed for such naval nuclear propulsion plants. Equipment transferred in accordance with the Agreement could include equipment needed for the research, development, or design of naval nuclear propulsion plants, including their manufacture, operation, maintenance, regulation, and disposal, and could also include training, services, and program support associated with such equipment."

This presumably relates to the new British-constructed AUKUS submarines since those from the US – both second hand and new Virginia class SSNs – will come off the existing Electric Boat production line with their S9G reactors already installed.

Getting back to the issue of what the additional political commitments might be, there has been speculation – including from former Prime Minister Paul Keating – that these might involve Australia going to war against China in the event of their invasion of Taiwan. In doing so, he tackles – and inaccurately – to Taiwan as a piece of Chinese real estate. In a tit-for-tat exchange, this was condemned by former US House Speaker Nancy Pelosi only for Keating to return fire accusing her of provoking China by a high-profile visit to Taipei in August 2022.

As entertaining as all of this is, it illustrates a continuing lack of clarity around the circumstances of a future Chinese invasion. There are two fundamentally different scenarios. The first is a unilateral, unprovoked attack ordered by Beijing to reconquer what it claims is a "renegade province." In such a case the US, Japan – and probably allied nations such as Australia and South Korea – would react with military intervention.

However, what seems to stress Chinese leaders is the possibility of Taiwan unilaterally declaring independence, especially if this is motivated by the belief that it will automatically be guaranteed outside military support. This is why for several decades most nations, including Australia, have maintained a position of strategic ambiguity – in other words, not pledging support for Taiwan in all circumstances to minimise the chances of a provocation.

Opinion polls show a similar pattern in Taiwan itself. When young people are asked if they are prepared to fight a Chinese invasion, the "yes" answer is consistently higher than 80%. However, if they are asked the following question about what would happen if China invaded after a Taiwanese declaration of independence, the willingness of people to put their lives on the line dramatically reduces to less than 50%.

The Virginia-class fast-attack submarine USS Colorado (SSN 788) arrives at Joint Base Pearl Harbor-Hickam during its change of homeport, April 17, 2024. (U.S. Navy photo by Chief Mass Communication Specialist Amy Biller)

There are two questions for Australian policy makers: a) how would Australia react to a cross straights attack by China on Taiwan; and b) would this response be the same if the crisis had been precipitated by Taiwanese actions? One suspects that people are taking positions on this without clarifying exactly what they mean.

Getting back to AUKUS Pillar One, on 7 August one of the most senior US national security journalists, David Sanger, spoke at the National Press Club about his latest book: "New Cold Wars: China's Rise, Russia's Invasion and the Struggle to Defend the West." https://www.youtube.com/watch?v=BOMAKfu59PQ&t=3203s.

He is a multiple Pulitzer Prize winner and has unrivalled access to the US national security system at the highest levels. Asked by *APDR* if a future US President will agree to the sale to Australia no matter the circumstances of nuclear-powered submarines, he said possibly – but also possibly not, especially if such a sale were to detract from the strength of the USN.

However, he elaborated that even if Australia received the submarines, they might not be the best long-term option:

"When AUKUS was signed, the concept was that future conflicts with China, or other adversaries, would be fought with the kind of submarines that we have been using now for 30 or 40 years. Even the submarines you would get would be a combination of new and refurbished.

"And yet, when you talk to the people who are interested in advanced weaponry in the Pentagon, they are talking about a submarine fleet that looks nothing like what we have today. It would be almost entirely unmanned. It would be submarines that sit on the floor of the Taiwan Strait, ready to pop up, either in surveillance mode or attack mode if there were a move against Taiwan.

"They would be much less vulnerable to being detected. There's a lot of concern in the Pentagon right now that AI tools, combined with undersea sonar, will get rid of a lot of the protection that submarines have now against being protected – and the US is quite concerned about being able to protect its own nuclear-armed submarines.

"So, my bigger worry is not that you won't get supplied with them. My bigger worry is that if you do get supplied with them, you might feel like you have the submarines imagined for a conflict 30 years ago instead of the submarines you need - which may largely be an unmanned fleet."

ROKS Chungnam, FFX Batch-III Launching ceremony, April 2023 (HHI image)

ROK government commits to delivering Australian frigates by 2029

Kym Bergmann // ***Perth***

In a sign of just how seriously South Korea is about forming closer defence links with Australia, the government has committed to meeting the ambitious delivery schedule of the first RAN ship in the water by 2029. The offer was explained to *APDR* on 25 July by Rear Admiral Hyun-Seung Shin, ROK Navy Director General, Naval Ship Program Department.

There are two Korean companies shortlisted for the SEA 3000 General Purpose Frigate program, Hyundai Heavy Industries (HHI) and Hanwha Ocean (HO). The other bidders come from Germany, Japan and Spain. If either of the Korean companies are selected, the ROK government in the form of the Defense Acquisition Program Administration (DAPA) will guarantee that the first ship is in the water by 2029 and the next two by 2030.

Attending the IODS conference in Perth, RADM Shin said that if the RAN wants even faster delivery of the frigates, all three could potentially be in the water by 2029. This would be followed by full ROK support of the Australian build in Henderson of the remaining eight ships.

He said that ROKN frigates are constructed to world beating standards with an emphasis on survivability following the 2010 sinking of the corvette ROKN Cheonan by a North Korean submarine with 46 sailors tragically being killed. He also explained that the ROKN is extremely familiar with US weapons, having used them extensively, and would fully support their integration onto the Australian ships.

RADM Shin summarised the position of the ROKN:

"The Australian General Purpose frigate has two key aspects. The first is to have the delivery of high-performance frigates in the 2029-32 timeframe. The other aspect is to support the Australian shipyard in the local build of the remaining eight ships.

"I have suggested that by 2029 DAPA can guarantee that the lead ship – the first in the series – will be delivered to Australia. For ships number two and three, we can deliver those by 2030 at the latest.

"Also, on the request of the Australian government, we have the capacity to speed up the process and deliver all three ships by 2029."

He continued to explain that for the first three Korean-built frigates it will be possible for Australians to be involved in the construction and learn everything needed for the future support of the ships. For the second stage – moving the project to an Australian shipyard – ROK personnel will move there to assist the build.

He expressed confidence in the ability of Korean industry to transfer technology, pointing out that Hyundai Heavy Industries and Hanwha Ocean have already successfully done so at an international level. Even though it is not a maritime project, Hanwha has been successful in bids to supply the Army with Huntsman Self-Propelled Howitzers and also Redback Infantry Fighting Vehicles.

RADM Shin said that cooperation on the frigate program could lead to future joint technology cooperation opportunities for both navies. This is in the context of the ROKN releasing a document titled "Navy Sea GHOST General Development Plan" with an emphasis on developing a large variety of uncrewed and robotic systems. He explained:

"The Sea GHOST program has been conceived within the ROK Navy to develop Manned-Unmanned Teaming Technology (MUM-T). The developments being pursued include Uncrewed Surface Vessels (USV); Uncrewed Underwater Vehicles (UUV) and Uncrewed Aerial Vehicles (UAV). In the next phase we plan to move to unmanned maritime capabilities.

"I think the key to acquiring these unmanned systems is speed."

He explained that this will be achieved in a phased manner, starting with remote control systems, then semi-autonomous and then finally fully autonomous operations. Another matter of fundamental importance is to always include the latest available technology.

"The core of our frigate programs is not to see a repeat of the tragedy of 2010. This is the baseline for our developments. The frigates being proposed by the government (for Australia) have exceptional survivability so that they are on par with any country in the world. In terms of anti-submarine warfare – for example, the sonar system – these are world leading capabilities."

The ROKN has also developed an acquisition methodology to match the goal of achieving full autonomy. This strategy will see weapons in particular developed in the form of a modular solution – something the ROKN Chief of Operations has called the "rolling snowball strategy."

Asked to comment on the speed of the Korean acquisition process – such as being able to build

Republic of Korean navy ships Seoae Ryusungryong (DDG 993), Yul Gok Yii (DDG 992), Kang Gam Chan (DDH 979) and the U.S. Navy Arleigh Burke-class guided-missile destroyer USS Spruance (DDG 111) conduct maneuvers during a combined maritime operation in the waters East of the Korean Peninsula. (U.S. Navy photo by Mass Communication Specialist 2nd Class Will Gaskill/Released)

ROKS Chungnam, FFX Batch-III launching ceremony in April 2023 (HHI image)

an entire 11,000 tonne KDX-III destroyer in just 9 months – RADM Shin said:

"Firstly, thank you for your kind words about the ROK acquisition process being fast, but from our perspective it is still slow.

"I believe there are three pillars that contribute to our processes. The first is the leading role of DAPA, so this is a government-led effort. Secondly, we have world class shipbuilders in Korea. Thirdly, we have our Agency for Defense Development (ADD) which engages in Research & Development."

He said that during the last 40 years both Hanwha Ocean and HHI have been able to flourish, due in part to government support. They have both been able to accumulate world class expertise during this period. In addition, the ADD has been especially involved in combat system development work. This combination explains the success of ROKN projects – a recipe that Korea is prepared to share with the Australian government.

He also touched on the unique security situation on the Korean peninsula, saying that the constant threat from the north – for example the ROKS Cheonan sinking - had made the country fast in acquisition, as well as explaining the development of a world-class fleet. He said:

"The core of our frigate programs is not to see a repeat of the tragedy of 2010. This is the baseline for our developments. The frigates being proposed by the government (for Australia) have exceptional survivability so that they are on par with any country in the world. In terms of anti-submarine warfare – for example, the sonar system – these are world leading capabilities."

RADM Shin concluded with a summary: firstly, the ROKN can satisfy the Australian requirement for delivery dates and to provide all necessary technical support. Secondly, Korea is able to integrate all of the weapons required by the RAN. Thirdly, the ROKN has a great deal of combat system expertise that it is also prepared to share.

He also emphasised that crew numbers on Korean ships are reducing due to technology while at the same time the level of onboard comfort and living conditions for sailors is improving. He mentioned that an Australian delegation to South Korea in June had received a briefing from the ROKN showing how crew training can take place in a way that meets all the requirements.

He said that the maritime domain is vital for both Korea and Australia:

"Based on the frigate cooperation, I hope that our two countries can continue to build towards a strategic partnership to safeguard the Indo-Pacific region."

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Exercise Pitch Black 2024 draws the crowds

Gordon Arthur // ***Darwin***

Afterburners glowed brightly and the air reverberated with the thunder of powerful jet engines as fighter after fighter tore down Darwin's main runway and soared into the darkening sky. Australian. British. South Korean. French. Singaporean. Indian. Thai. Italian. One followed the other, their sleek fuselages gleaming in the setting sun, as they raced into the expansive Northern Territory sky to tangle with the "enemy".

Before that could occur, however, some aircraft needed to top up their fuel reserves. As an air-to-air refueller – either from Australia, France, Italy, NATO, Singapore or the UK – flew racetrack patterns overhead, thirsty fighters sidled up to the tanker from the port side and delicately connected to trailing fuel hoses or the flying boom. After several minutes and with fuel tanks topped off, the pilots disconnected, waited for their partners to refuel, and then veered off to prosecute the next aerial battle.

This scenario played out dozens of times as more than 130 international fighters tested their mettle against each other during Exercise Pitch Black 2024. In fact, during the course of this exercise – held from 12 July till 2 August at the Top End – more than 1,700 missions were flown across a massive exercise area equalling the size of the UK. At the height of the event, as forces as large as 50+ aircraft at a time manoeuvred and attempted to outsmart each other, a million litres of aviation gas per day was consumed.

Held every two years in northern Australia, the Pitch Black series is now in its 43rd year. Featuring some 4,435 personnel from 20 countries, this year's iteration was the largest ever in the fast-jet exercise. The following countries contributed aircraft: Australia, France, Germany, India, Indonesia, Italy, Japan, Malaysia, Papua New Guinea, the Philippines, Singapore, South Korea, Spain, Thailand, the UK and USA. Furthermore, Brunei, Canada, Fiji and New Zealand contributed either personnel or observers.

Asia-Pacific Defence Reporter attended Pitch Black 2024, observing some of the action and interviewing various participants. Several themes worthy of attention emerged, each of which is examined in turn: the event's sheer size, a heavy European presence, a first-time naval component, and a growing international desire for interoperability.

An Italian Navy F-35B fighter refuels from an RAAF KC-30A tanker somewhere over the Northern Territory. (Gordon Arthur)

Scope and scale

As already mentioned, this year's Pitch Black was the largest ever. Boasting approximately 140 aircraft, the event has arguably reached its maximum capacity, for ramp space was at a premium at the Northern Territory's two principal airbases of Darwin and Tindal. So crowded were the aprons that most of the air-to-air tanker fleet had to be located some 3,000km away at RAAF Base Amberley. Naturally, this increased the duration of most aerial refuelling missions for these aircraft, even if it did better replicate the tyranny of distance that hounds operations in the Indo-Pacific region.

Space limitations resulted in the US Air Force (USAF) sending a small contingent of just six F-22A Raptors, and no airborne early warning (AEW) aircraft or tankers. Lieutenant Colonel Ty Bridge, Deputy Chief, Exercises Division of Headquarters, US Pacific Air Forces (PACAF), told *APDR*, "Many times, at exercises with an international engagement focus like this, the expectation is that more and more often equals better, but that's not necessarily the case. Because of the base limitations…we deliberately only planned a six-ship of F-22s." Importantly,

An F-15K belonging to the Republic of Korea Air Force takes off from RAAF Base Darwin during Pitch Black 2024. (Gordon Arthur)

this was the first time F-22s participated in a Pitch Black, although they have of course flown in Australia before.

With space at a premium, Bridge related that the US side was "asked to limit our participation, and justifiably so. You want it so that more countries are able to get into the exercise." With more international participants, the PACAF planner said, engagement can increase, and therefore the US military does not need to double or triple up in bilateral exercises on other occasions. Indeed, Bridge believes that smaller exercises, with a sharp focus in scope, enable the USAF to "see better outcomes on a more recurring basis". Pitch Black was just one of 40+ exercises for PACAF this year.

Bridge said the F-22's involvement had been deliberately planned after Pitch Black 2022. "The great thing about having such a premier aircraft is we can adapt and adjust with as many different reps and sets that we can get. We can then progressively increase the complexity of the events as the different countries learn, adapt and then are hungry to get at another chance for something tougher." Throughout the exercise, with typically three waves per day, different nations were given the chance to lead and plan missions. Furthermore, air forces alternated between acting as blue and red forces.

Although Australia is sharpening its expeditionary airbases in northern Australia – specifically Scherger, Curtin and Learmouth – Pitch Black 2024 was a reminder of the strategic importance, and vulnerability, of RAAF Bases Darwin and Tindal. Enhancing bases and facilities in this vital part of Australia was one of six priorities listed in April's National Defence Strategy. New construction at both airbases was in evidence, with work being done to enhance and harden their infrastructure.

The USA is playing an important role here, as it is funding nearly US $450 million in infrastructure improvements at Tindal and Darwin. This includes US $80 million for eleven giant jet fuel storage tanks, a squadron operations facility and new parking apron in Darwin; and many projects at Tindal. A US $90 million fuel farm at the latter has been completed, while new ramps to accommodate six B-52 bombers are currently being built for US $100-140 million, these are due for completion in late 2026. Other Tindal projects include US $35 million for office and maintenance facilities, and US $80-100 million for a new hangar.

Whilst the exercise was under way, General Kevin Schneider, the PACAF commander, toured base improvements in the Northern Territory. He told media, "Everything is on track." Schneider stressed that these are not US bases, nor will the USA operate unilaterally out of Australia.

Incidentally, Tindal is the forward base for the RAAF's new MQ-4C Tritons, the first of which formally entered service on 1 August. Defence Minister Richard Marles said on that occasion, "We're giving our northern bases an ability for our nation to be able to project much better

generally, and much better from those bases. And that's fundamentally what we need to do in order to keep us, to keep Australians, safe. Actually, all of this, in terms of building this capability, makes us less of a target, and that's the whole point of the strategic posture that we have and the direction that we're taking."

RAAF Base Tindal is home to No. 75 Squadron's 16 F-35A fighters. As Australian defence planners talk of reduced warning time and a greater threat from China, this squadron is at the tip of the spear in protecting the northern approaches to Australia. During the exercise, it predominantly provided red air, according to its CO, Wing Commander Andrew Neilson. "75 Squadron has a long history of being up in the northern part of Australia and in the region more generally … We welcome the opportunity to work with the various nations that have come for Pitch Black, because they're all part of our regional alliances, our friendship group at least."

Logistics should not be ignored either. In the exercise's first week, 380 tonnes of cargo was unloaded. Something as simple as accommodation also had a huge bearing on the scale of Pitch Back, and this year the Defence Accommodation Precinct - Darwin (DAP-D) played a critical role. DAP-D is a 3,400-bed facility around 30 minutes from central Darwin. In July 2023, Defence signed a five-year lease agreement for DAP-D, and approximately 4,000 personnel stayed there during Pitch Black 2024. Instead of visiting nations having to spend heavily on accommodation during the peak tourist season, DAP-D reduced the cost of entry for participants.

Europe brings energy

Five European nations crossed the globe to participate in Pitch Black 2024, two for the first time. France, Germany and the UK had joined before, but Italy and Spain were first-timers. Collectively they brought 50+ aircraft, which is an impressive feat. It needs to be asked why these NATO members deemed the Australian exercise worth the investment, even while Europe warily watches Russia's continued invasion of Ukraine on its own doorstep.

Europe was well represented at the Australian exercise by France, Germany, Italy, Spain and the UK. This was one of six British Typhoon FGR4 fighters involved. (Gordon Arthur)

Pierre-André Imbert, France's Ambassador to Australia, provided part of the answer: "We have different exercises to be sure that we can interoperate and be ready to assist each other," he said. "That's why it's very key for us to ensure freedom of navigation to have access to the commons and to demonstrate that we're ready to come and to be here very quickly, to participate with our allies and to defend our territories and also our friends." As Europe's only Pacific power, France has territories in New Caledonia and French Polynesia it must protect.

Likewise, Lieutenant Colonel Fabian Schroppe, the Luftwaffe's Deputy Detachment Commander, explained: "It's the largest and broadest project and deployment the German Luftwaffe has ever done. Our main goal is we want to improve and enhance our capabilities in terms of strategic deployment all around the world." Again underscoring global concern about adventurism by authoritarian countries like China, the Luftwaffe stated: "Through joint training, the partners will increase their operational capability and prove that, in an emergency, they will be able to enforce the principles of a rules-based international order."

France's international deployment was given the name Pegase (Pegasus), with one aircraft detachment deploying east and another west from France, before meeting up in Australia. Pegase actually comprised three separate exercises on three continents. One was the trilateral Pacific Skies 24 deployment alongside Germany and Spain from 27 June - 15 August. Aircraft joined the Arctic Defender exercise in Alaska, Pitch Black in Australia and Tarang Shakti in India. Pacific Skies 24 saw stopovers in Canada, Japan, New Zealand and the UAE too.

Another exercise within the French Pegase mission was Griffin Strike, a long-range power projection exercise alongside the UK from 6-10 July. This saw British and French aircraft pass through Singapore and the UAE on their way to Australia.

In a rare Pitch Black accident, one of four Italian Air Force F-2000A Eurofighters crashed in the Northern Territory on 24 July. Fortunately, the pilot was unharmed, and Air Commodore Peter Robinson, the RAAF Exercise Commander, told media, "Our defence personnel worked rapidly and efficiently to respond to this situation and worked to help recover the pilot." Flight operations were immediately grounded, before resuming the following day.

Naval angle

A unique aspect to Pitch Black 2024 was the first ever involvement of an aircraft carrier, thanks to the Italian Navy's Cavour. This carrier, accompanied by the frigate Alpino, was in Australian waters as part of a five-month Indo-Pacific deployment, its first time sailing in the region. Cavour embarked AV-8 and F-35B aircraft, as the Italian Navy prepares to declare an initial operational capability for F-35B shipboard use. Incidentally, the Italian Navy is planning to equip its F-35Bs with Kongsberg's Joint Strike Missile and MBDA's SPEAR standoff weapons. As the Italian Navy gradually accrues a fleet of 15 F-35Bs, its elderly AV-8s will be retired.

The Philippine Air Force despatched aircraft – four FA-50PH light fighters – to Pitch Black 2024, the aircraft's first overseas foray. (Gordon Arthur)

RAAF Group Captain Gary Sadler, Deputy Commander of Pitch Black 2024, said, "Obviously, having a carrier for the first time changes things up quite considerably. It changes up the planning." Although an "absolute game-changer" for the exercise, "there were some challenges, there's no doubt about that". Nonetheless, Sadler said it was a "very, very valuable capability," bringing a dynamic that the exercise had not had previously. Concerning future Pitch Blacks, Sadler said, "I think there's considerable opportunity for us to integrate that into future iterations of the exercise mission sets, because it does bring that flexibility … So it's a great thing to have."

After leaving Australia, Cavour travelled to Guam and Japan, before passing through the South China Sea to the Philippines. As the Italian Navy's Rear Admiral Giancarlo Ciappina said, "An aircraft carrier – just being present somewhere – it has an effect, it can influence. It's a very powerful tool."

Some 40% of Europe's trade flows through the South China Sea. Increasingly, international navies are seizing the opportunity to sail through the South China Sea or Taiwan Strait, bodies of water that China lays exclusive claim to without any form of warrant. One of the most recent transits was the Canadian frigate HCMS Montréal sailing through the Taiwan Strait on 31 July. Under Operation Horizon, a Canadian push to enhance its Indo-Pacific presence, Ottawa stated, "Together with our allies, Canada supports the rules-based international order by operating in accordance with international law. Our activities promote peace, resilience and security in the Indo-Pacific."

Such passages, entirely within international law, remind China that its claims are not recognised by the global community. Indeed, the presence of an Italian aircraft carrier – like British and French ones before it – sends a strong message to Beijing that Europe is invested in ensuring that international norms are maintained in places like the South China Sea.

Increasing interoperability

The buzzword at Pitch Black 2024, repeated by virtually every national contingent, was "interoperability". As an example, Sadler of the RAAF emphasised the exercise was "really around making sure that we can interoperate and cooperate in terms of safe and professional aviation operations".

When *APDR* asked whether the exercise scenario in any way reflected tensions with China, Sadler stated, "In terms of the strategic challenges around the globe at the moment, we certainly acknowledge those when we're talking about the activities that we're trying to look out for in the exercise. And whilst they may have a broad shaping effect, there's no specific activity within the exercise per se." He affirmed, "There isn't a particular threat, if you like, that we're

Adding variety to the mostly Western aircraft, the only Russian-origin fighters at Pitch Black 2024 were six Su-30MKIs of the Indian Air Force. (Gordon Arthur)

trying to address."

This message that Pitch Black did not target any particular villain was echoed by Bridge of the USAF. He expressed, "There are other exercises that INDOPACOM has focus both in our strategic messaging, our posture and our combined joint warfighting." An example is Talisman Sabre, which indeed directly rehearses procedures that would be employed in any conflict with China. Instead, Bridge said, "What Pitch Black allows us to be able to do is focus on the allies and partners, and the interoperability, and allows us to plan in other venues and other times to get at working with those other countries that are focusing on deterrence and a free and open Indo-Pacific."

There is that phrase "interoperability" again. So the pertinent question to ask is, why is interoperability so desirable? It comes down to the fact that partners and allies may one day need to operate, and fight, together. It could be a humanitarian or disaster relief mission in a far-flung corner of Asia, or it could be countering a belligerent nation such as China.

Colonel M. Kobayashi, Detachment Commander of the Japan Air Self-Defense Force, which brought six F-2 fighters and an E-767 AEW aircraft, said his country's participation was "to contribute to realising a free and open Indo-Pacific". He added, "The security environment in the Indo-Pacific region has become increasingly severe. At this difficult time, it's extremely important for allies and like-minded countries' forces to work closely and cooperate."

Indeed, the enormous size of Pitch Black 2024 was testament to growing international concern about the direction security tensions in the Indo-Pacific region are heading. Whether in Asia or Europe, many are alarmed at the rapid modernisation and build-up of the People's Liberation Army.

Interestingly, one of those countries currently bearing the brunt of Chinese aggression is the Philippines. After the Sinophile Rodrigo Duterte departed the presidency in the Philippines, and Manila once again began to assert its natural rights over its own EEZ, Beijing has grown distressingly violent in its dealings with the Philippines, particularly around Second Thomas Shoal where the Philippine maintains a military garrison aboard a rusting ship.

The Philippine Air Force (PAF) appeared for the first time at Pitch Black this year, deploying its FA-50PH light fighters overseas on their maiden outing. However, Colonel Randy M. Pascua, Contingent Commander of the PAF, insisted his air force's presence was not a preparation for anything happening in his own country. He stated, "Our main purpose for being here is to develop our operational capability, focusing on the development of the skills of the fighter pilots, as well as the maintenance."

Here again, though, there is more to the story. The PAF is transitioning from counterinsurgency operations to territorial defence, a task made more urgent because of China's provocative

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Space was found for the Papua New Guinea Defence Force to get involved in this high-end exercise. This is a PAC-750XL that mostly ferried VIPs around. (Gordon Arthur)

activities. Pascua noted, "In the Philippines, we are experts when it comes to air-to-surface strikes. [However], one component of Pitch Black is air interdiction as well as offensive counter-air operations," and these are skills the PAF wants to improve.

As the PAF pointed out, "Pitch Black provides an unparalleled platform for us to engage in realistic, high-intensity training with some of the world's leading air forces, which is crucial for enhancing our operational capabilities and readiness." The PAF said Pitch Black would "significantly enhance our interoperability with other air forces, which is crucial for coordinated responses to regional security challenges".

Another debutant at Pitch Black was Papua New Guinea. Its defence force obviously does not possess fighters, but a role was still found for this country. The PNG Defence Force brought PAC-750XL turboprop aircraft that primarily conducted VIP shuttle flights between Darwin and Tindal, saving passengers a 3.5-hour drive. This illustrated how the exercise has a way for all nations – no matter their capability – to make a contribution. Naturally, Australia is keen to shore up relations with PNG in the light of Chinese efforts to woo South Pacific nations and gain influence. Beijing already has Solomon Islands neatly in its pocket thanks to a 2022 security deal between the two.

Conclusion

There were a number of takeaways from Pitch Black 2024, such as the aforementioned European engagement, new forays into naval operations, and the involvement of air forces large and small. However, undergirding it all was the sentiment that interoperability between like-minded partners is more important than ever. The Indo-Pacific region is facing new and urgent threats to stability, and therefore it is necessary for relationships and alliances to be strengthened to deter any would-be antagonists.

As Australia enhances its northern bases, future Pitch Blacks may expand even further, or move in new directions such as incorporating naval aviation. Indeed, Bridge of the USAF noted that an increase in capacity at existing bases would allow different capabilities such as fighters, tankers, C2 and airlift to be added. He fully anticipated that in the future the USAF will eventually bring F-35s, as well as incoming platforms like the E-7 and F-15EX.

Sadler summed up the event like this: "Bringing all these countries together, it's about the shared values that we have for security, for stability, for peace and prosperity in the region for all participants. And I think this sort of activity reflects the commitment to transparency, to make sure that everybody is fully aware about what we're trying to achieve and how we're going about it."

Passive radar adds to battlefield awareness

Kym Bergmann // ***Adelaide***

In the endless cycle of product development and countermeasures, radar is a good example of technological leapfrogs. As events are showing during Russia's illegal invasion of Ukraine, battlefield radars are vital for air defence – but are themselves susceptible to attack.

Russia has lost several advanced S-400 missile batteries either from Ukrainian drone strikes or attacks from HIMARS batteries. The main vulnerability of these long-range systems is their active radars - used firstly for target detection and then separately for missile guidance and control. Once they have been switched on, the battery is relatively easy to geolocate and attack because the signals can be detected at ranges of dozens of kilometres or more.

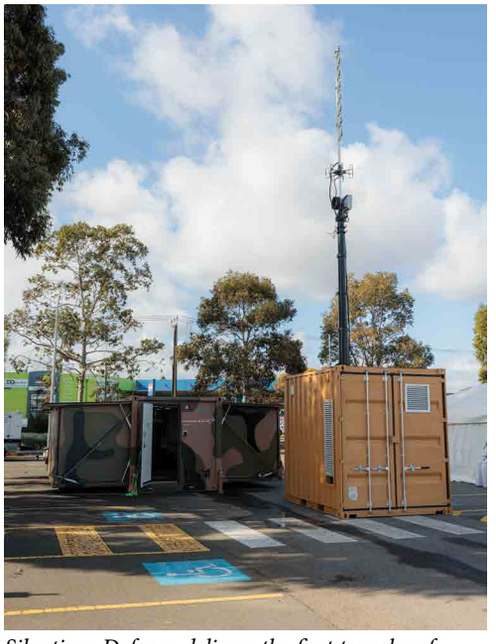
The forces of Ukraine have been playing a cat-and-mouse game trying to trick Russian forces into unnecessarily using their radars – especially those on the Crimean Peninsula. These are part of a layered air-defence system to protect the huge naval port of Sevastopol which is rapidly being destroyed, and already Russian ships have had to withdraw to Novorossiysk, much further along the Black Sea coast.

A solution to the problem of radar detection is to move from active systems – which currently dominate the battlespace – to the emerging technology of passive radar. A conventional radar blasts out a beam of electrons and then looks for the reflection of a small number of them for detection and tracking. One method of self-protection when in danger is to switch it off, but then it is unable to perform its main function.

Passive radar also relies on electrons bouncing off the target – but these come from 3rd party sources, with FM radio stations being especially useful. This means that the radar system itself can remain silent and still be able to detect and track anything from aircraft through to missiles and drones using the large amounts of energy being blasted out – in rural areas – by the local country & western station.

The Adelaide-based company Silentium is a world leader in this technology and in October last year landed a contract with the US Army for a man-portable passive radar system.

Another important breakthrough for the company was being part of the winning team led by Lockheed Martin Australia for the AIR 6500 Joint Air Battle Management System project. This led, in turn, to an announcement on 18 July in Adelaide that Silentium had already delivered the first system with the code name MAVERICK – a larger version of that sold to the US - that will be an important part of a deployable air defence system.



Silentium Defence delivers the first tranche of sensor systems - MAVERICK Fortress-3D passive radar system – for Defence's Joint Air Battle Management System, AIR6500. (Lockheed Martin photo)

Dr James Palmer, CEO Silentium Defence said, "The rate and complexity with which threats are evolving in today's battlespace is unlike anything we've seen before.

"Asymmetric advantage requires access to innovative technologies delivered at pace, and accurate, real-time data for more informed decision making. With handover of our 'MAVERICK Fortress-3D' passive radar systems, Silentium Defence has delivered both technology faster and an edge for Defence, and we're immensely proud of that achievement."

The company says that the MAVERICK system is a new dimension in passive sensing, bringing 3D covert surveillance to the battlefield. Deployed as a compact, cabin-based solution, the system can be operated either independently as a stand-alone-asset or networked into a common operating picture.

Warren McDonald, Lockheed Martin Australia and New Zealand's Chief Executive said, "We are delighted to partner with Silentium Defence on AIR 6500 since 2017. Today, Silentium Defence continues to show its firm commitment to agile contracting and rapid capability delivery that underpins the AIR 6500 program.

"I commend Silentium Defence on its early delivery of the first sensors under the AIR 6500 Tranche 2A contract. This is an important milestone that shows Australian industry can and has stepped up to deliver accelerated sovereign capability to meet Defence's mission."

McDonald added, "In partnership with Defence, Lockheed Martin Australia is drawing on the nation's best homegrown technologies to build an advanced, resilient and affordable air battle management system that bolsters Australia's national security."

Active radars will continue to play a major role in the battlespace and for AIR 6500 powerful electronically scanned arrays from Canberra based CEA are part of the mix. However, Silentium's solution is a complementary technology that will add greatly to the overall situational awareness of the system.

Because of the low size, weight and cost of Silentium systems they can be a powerful tool in the fight against a large variety of airborne threats – and their reach extends even into space.

Has the War in Ukraine Changed Everything?

George Galdorisi // ***Washington***

In an era of great power competition, unmanned maritime systems have begun to take centre stage and are now on an accelerated development path for reasons that are clear. Like their air and ground counterparts, these unmanned maritime systems are valued because of their ability to reduce the risk to human life in high threat areas, to deliver persistent surveillance over areas of interest, and provide options to warfighters that derive from the inherent advantages of unmanned technologies. While development of these technologies was on a solid upward path, Russia's invasion of Ukraine accelerated that trajectory.

T38 Arabian Sea live fire event with Switchblade 300. (Photo credit: Dave Meron)

While it will take years to unpack all the lessons learned from the ongoing war, one mission that has surfaced during this conflict connects maritime warfare and unmanned surface vehicles in the use of USVs armed with explosives to attack naval vessels. This is a tactic and concept of operations that has been discussed in numerous professional articles and even war-gamed, but until now has been hypothetical.

Today it is real. As described in reports of Ukraine's attacks on Russian naval vessels in the Black Sea, armed USVs have been used with deadly effect. Here is how one naval analyst described the momentous impact of using armed USVs to attack naval vessels and what that comports for the future of maritime warfare:

Ukraine's attack on Sevastopol on October 29, 2022 will go down in history as the first major example of what many believe is a new era of drone warfare. The Russian Navy Black Sea Fleet found itself defending against both surface and aerial drones. Seven uncrewed surface vessels (USVs) were involved, along with nine uncrewed air vehicles (UAVs).

USVs have evolved quickly over the past few years, but only now have they truly gone to war. The surface drones approached the port in the early morning. They raced toward their targets, piloted remotely from hundreds of miles away using onboard electro-optical devices. On their bows, impact fuses would detonate the warheads.

Future wars may see increased use of weaponised surface drones. Individually, they may pose only a limited danger, but their low cost and the low risk associated with their use will likely lead to them becoming a persistent threat. They may shape future wars just as their aerial counterparts are already doing. But will leading navies accept the obvious lessons and initiate similar low-cost armed USVs?

Some see the use of USVs to attack surface vessels as ushering in a new era in warfare, with one analyst opining: "The next major advance in the realm of drone warfare is being rapidly incubated and could flood into war zones and become a huge security problem in non-combat environments too, in the near future. One-way attack 'kamikaze' drones that have 'democratised' the access to precision aerial strike capabilities, even at standoff ranges deep into highly contested territory."

In May 2023 Ukraine targeted a Russian intelligence ship, Ivan Khurs, in the Black Sea, approximately 140 kilometres north-east of the Istanbul Strait using an unmanned surface vehicle. While there are conflicting reports from Ukrainian and Russian officials as to whether the USV actually hit the Ivan Khurs and caused an explosion, the fact that Ukraine believes that this is a viable tactic speaks volumes about the potential for USVs to be used as kamikaze weapons. In August 2023 a Ukrainian unmanned surface vessel successfully attacked the Russian Navy amphibious landing ship Olenegorsky Gornyak.

More recently, in January 2024 Ukraine used swarm tactics by deploying kamikaze USVs to sink the Russian Tarantul-II class corvette. As one

analyst observed:

Ukraine's sinking of the Russian missile corvette Ivanovets on 31 January with unmanned surface vehicles (USVs) has caused naval analysts to again note the impact drones can have on the modern battlefield. Analysis of the sinking has shed new light on surface warfare involving unmanned surface vehicles and suggests that old and seemingly obsolete tactics involving manoeuvrability and firepower may be new again.

Beyond this "one-of" attack, Ukraine has demonstrated the ability to hold under threat any Russian ship operating in the Black Sea. These attacks by USVs and other assets have not only helped put Russian ships at risk, but in doing so have effectively pushed Russian ships back from the Ukrainian coastline and enabled commercial ships to use this new corridor to export grain. Defence experts agree that Ukraine has opened a new era of naval warfare by employing suicide sea drones armed with explosives designed to ram into targets and detonate. Here is how one analyst described the impact of these attacks:

The Russian Black Sea fleet has disappeared from the Black Sea. Russian warships are still in the Black Sea and the Sea of Azov extension in the northeast, and the more distant naval base at Novorossiysk, but rarely move out of port, even for a few days.

What keeps these Russian Navy ships from going to sea is the very real threat of attack by Ukrainian USVs (Unmanned Surface Vehicles), also known as drones. There are several models, including Sea Baby (Malyuk in Ukrainian), Mother (Mamai), and MAGURA which means Maritime Autonomous Guard Unmanned Robotic Apparatus. Sea Baby and Mother were developed by the SBU (Ukrainian Secret Service) and the Navy.

These USVs are no longer used just for delivering explosives against a target, as they can also be used for reconnaissance when equipped with video cameras that broadcast what they see back to the USV operator. Some USVs have been armed with small rocket launchers.

Ukrainian USVs have been quite successful in attacking and sinking or disabling Russian navy ships. So far there have been twelve attacks which resulted in damage to twelve ships and the sinking of a cruiser, two small landing ships and one missile corvette. The longest-range raids have been against targets in the Kerch Strait including the eighteen-kilometre-long Kerch Strait bridge, which has been repeatedly attacked by Ukrainian USVs.

Indeed, as part of its aid package to Ukraine, the United States is sending unmanned surface vehicles to Ukraine to help the Ukrainian navy keep pressure on Russian naval vessels. Concurrently, leveraging the success of Ukrainian unmanned surface vehicles, one U.S. USV manufacturer, MARTAC, has built a state-of-the-art USV, the M18 MUSKIE. Here is how one naval analyst described this innovative system:

Maritime Tactical Systems, Inc. (MARTAC), an innovator in Maritime Autonomous Surface Vessels (ASVs), is proud to unveil the latest product in our portfolio, the MUSKIE M18 (M18) ASV. The M18 is an 18 foot (5.5m) low-cost, attritable system for use on one-way missions. The M18 configuration is designed as a high-performance, monohull ASV capable of burst speeds of 50+ kts, open ocean cruising ranges up to 500 nautical miles, and a payload capacity up to 1000 pounds (450 kg).

Recently procured by the United States Department of Defense (DoD), the M18 was designed and developed from concept to empower operators to execute missions accommodating a variety of payloads, kinetics and kill systems in a low-cost platform that allows for broad acquisition and adoption of an asymmetric capability against conventional naval assets. M18s have MARTAC's base autonomy stack where they can be operated by a remote operator or fully autonomously with operator intervention at any time during the mission.

Some see the use of USVs to attack surface vessels as ushering in a new era in warfare, with one commentator noting: "Though in some ways relatively primitive, the uncrewed capabilities used by Ukraine could presage a wider shift in the conduct of war at sea." Great Britain's First Sea Lord likened Ukraine's use of armed USVs to attack Russian naval vessels to the "Dreadnought Moment" when advances in propulsion, gunnery, and armor that led the British and German navies to overhaul their strategies in the early 1900s, adding that this new way of war represents a paradigm shift in naval warfare.

Indeed, a RAND report made the direct connection regarding how armed USVs could be vital in the dense of Taiwan, noting, in part:

Ukraine has demonstrated the ability of explosive uncrewed surface vessels (USVs) to target ships. These weapons could play a role in preventing Chinese forces from successfully invading Taiwan in potential future scenarios.

By striking at the waterline with larger payloads than comparably sized missiles or uncrewed aircraft, USVs can potentially inflict devastating damage. Swarms of low-profile USVs approaching rapidly from multiple angles can be difficult to detect, track, and target effectively. One or two getting through would constitute success.

To counter this threat, Taiwan could launch hundreds or even thousands of explosive USVs to interdict the PLAN fleet. Small USVs like Ukraine's—which are about 12 feet long, with a shallow draft—could be launched from a wide range of piers along Taiwan's west coast and the offshore islands it controls. Distributing them across a range of military and civilian facilities could make them less vulnerable to an initial surprise attack while in storage.

In addition to warships, the PLAN could use large cargo ships to deliver massive quantities of materiel across the strait. Such vessels, even if surrounded by a screen of protective warships, could be vulnerable to USVs sneaking into the formation while warships were themselves overwhelmed by USV attacks. The cargo ships could have minimal organic abilities to counter USVs.

More recently, two defence analysts echoed this theme, suggesting that swarms of expendable drones could impossibly complicate China's attempt to invade Taiwan. The Pentagon has indicated that this idea has traction in a new program dubbed "Replicator," with Deputy Defense Secretary Kathleen Hicks noting during a military-industry conference, "Replicator will galvanise progress in the too-slow shift of U.S. military innovation to leverage platforms that are small, smart, cheap and many."

While there is no articulated direct link between Ukraine's use of small, attritable, unmanned surface vessels to attack Russian assets and the U.S. Department of Defense Replicator program, it is impossible to miss this connection. Indeed, many nations will be watching how Replicator evolves in the U.S. military and these observations will likely inform how they develop similar programs.

While column space doesn't allow for a comprehensive description of the Replicator program a few highlights are instructive.

Regarding Replicator, a Department of Defense website captured the essence of Deputy Defense Secretary Hicks announcement of the Replicator program this way:

As China focuses on the sheer mass of its military, the U.S. will out-match adversaries by out-thinking, out-strategising and out-maneuvering them. Under the strategy, the Defense Department will field thousands of

autonomous systems across multiple domains within the next 18 to 24 months.

Replicator is meant to help overcome the PRC's biggest advantage, which is mass. More ships. More missiles. More people. Through the initiative, the U.S. will augment its manufacturing and mobilisation capabilities with our real comparative advantage, which is the innovation and spirit of our people.

"All-domain, attritable autonomous systems will overcome the challenge of anti-access, area-denial systems. Our ADA2 to thwart their A2AD," said Hicks.

Hicks assigned DoD's Defense Innovation Unit (DIU) to spearhead this effort and noted that DIU would use this timeline to find mature systems to instantiate Replicator. She described the organising impulse for Replicator: To overcome

T38 Devil Ray autonomous exercise (Photo credit: Dave Meron)

Citing this address by DEPSECDEF Hicks, one defence analyst noted:

The Pentagon is betting that by fielding thousands of attritable autonomous systems across domains in fewer than two years, the United States can overcome China's advantage of mass in manpower, ships, aircraft and missiles, Deputy Defense Secretary Kathleen Hicks said in a Monday speech.

Speaking at a National Defense Industrial Association event, she said that using the Replicator Initiative "we'll counter the PLA's [People's Liberation Army's] mass with mass of our own, but ours will be harder to plan for, harder to hit and harder to beat."

China's advantage of mass. To this end, defence officials indicate that they intend to award contracts for Replicator during this timeframe.

As the de facto executive agent for Replicator, DoD's Defense Innovation Unit posted an explanation of the program on its website:

The Replicator initiative is a specific example of how the Department will accelerate delivery of innovation to the warfighter at speed and scale through senior leader focus on a specific operational challenge to remove systemic roadblocks. This initiative is purposefully designed to overcome challenges faced by commercial partners inside and outside the Department, ensuring the Department can organise its demand signal and communicate that to the commercial sector to ultimately acquire 'ready to scale' capabilities.

The first iteration of Replicator (Replicator 1), announced in August 2023, will deliver all-domain attritable autonomous systems (ADA2) to warfighters at a scale of multiple thousands, across multiple warfighting domains, within 18-24 months, or by August 2025. The DoD is creating a new "state of the art" with the use of ADA2 systems, which are less expensive, put fewer people in the line of fire, and can be changed, updated, or improved with substantially shorter lead times. Successive iterations of Replicator will apply lessons learned to address additional capability gaps beyond ADA2 systems.

Another defence analyst explained why the Replicator program has gained purchase in Pentagon circles:

Autonomous weapons are seen as a potential way to counter China's numerical advantages in ships, missiles and troops in a rapidly narrowing window. Fielding large numbers of cheap, expendable drones, proponents argue, is faster and lower cost than exquisite weapons systems and puts fewer troops at risk.

As the Department of Defense seeks to acquire the many systems, subsystems and command and control capabilities to field Replicator, it may be time to field "Replicator 1.0" today. In late 2023, U.S. Fifth Fleet and CTF-59 equipped a MARTAC T38 Devil Ray with a portable six-round launcher loaded with Switchblade 300s, (which the U.S. military officially calls the Lethal Miniature Aerial Missile System (LMAMS)). This effort was successful with multiple on-target hits.

The saying "Necessity is the mother of invention" is apt when it comes to attritable unmanned surface vessels armed with explosives. Nations and navies will need to provide their capital ships with ways to deal with these deadly USVs as well as develop their own attack USVs to hold enemy ships at risk.

How this will be done will be left to the imagination of military and industry partners. Given the groundswell of international interest in unmanned surface vessels, many nations and navies likely see the importance of advancing this technology as rapidly as possible and continue a robust series of exercises, experiments and demonstrations on many continents to accelerate the development of these innovative systems.

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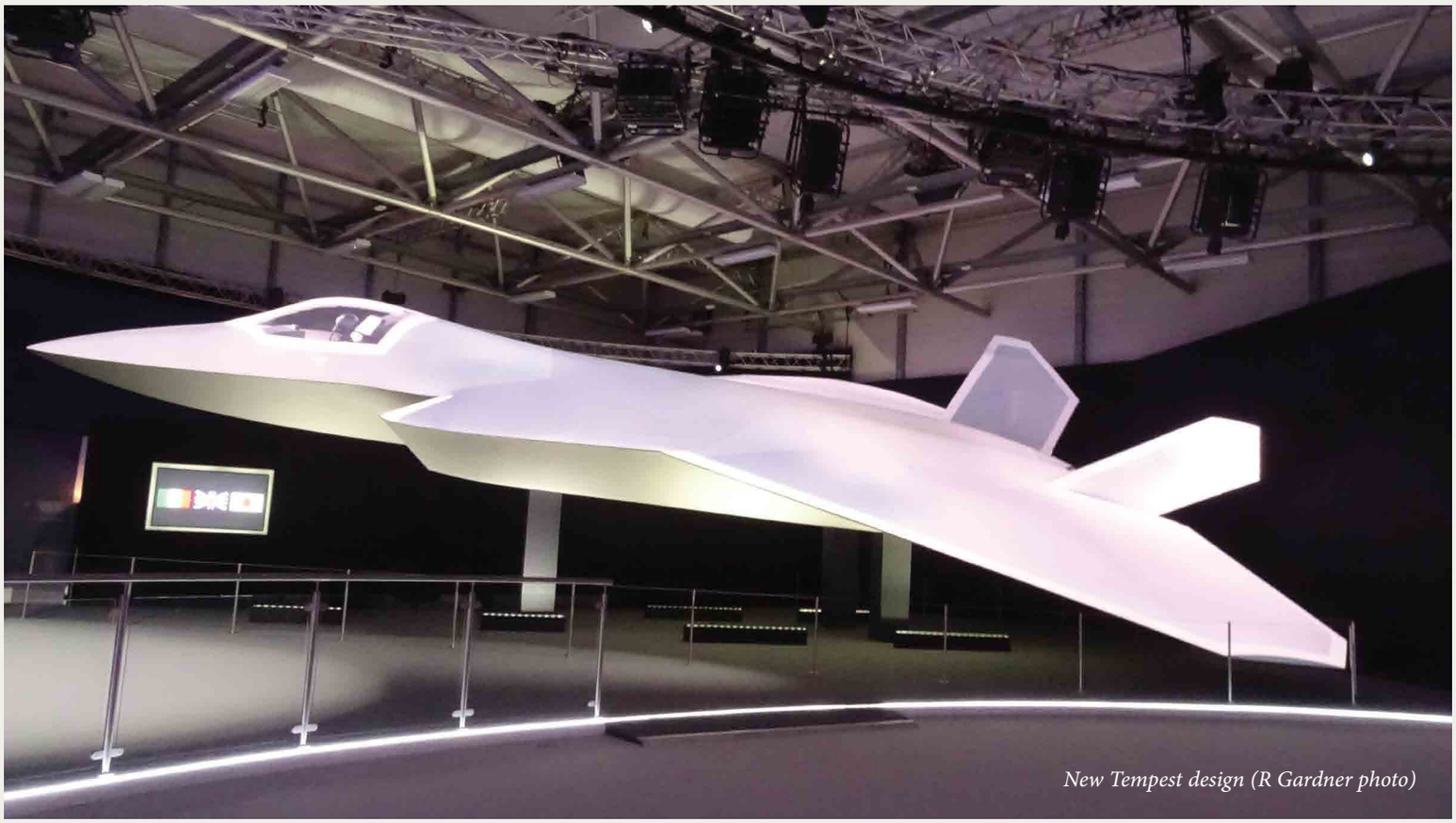


New Tempest design (R Gardner photo)

Defence pace quickens at Farnborough

Richard Gardner // *London*

There can be no doubt that the global pace of development of advanced defence programs is now at a new high, as reflected at the recent Farnborough International air show in the UK, where more than 250 official delegations from around the world attended. With over 1,600 companies and organisations on show, this revealed progress across a sector-wide range of aerospace activity.

While the inevitable huge announcements of new orders for established commercial aircraft attracted media attention, it was in the defence sector that much more significant news was forthcoming throughout the event. This provided a constant flow of company briefings on a huge range of updates and all-new programs - national and international.

BAE Systems provided a large exhibition hall of its own containing examples of current cutting-edge development activity highlighting its dedication to growing sovereign capabilities. This included wider international partnerships and next-generation technologies, touching on training and support for the new era and introducing new manufacturing concepts.

All domains from sub-surface to sea, air, land and space were covered but without a doubt the most eye-catching single focus of attention was the revealing of a new full-size concept model of the next generation Global Combat Air Program (GCAP) aircraft. This is being developed by the UK, Italy and Japan at a rapid pace by the three partners – BAE Systems, Leonardo and Mitsubishi.

This latest iteration features an evolved design with a larger wing, and a capacious weapons bay and the overall airframe now looks significantly bigger than the previous display mock-ups. Within a stealthy airframe there is provision for the bigger weapons and air-launched platforms, with the larger wing bringing longer endurance and a high performance.

Much effort at government and industry levels has been devoted to bringing together the key aspects of common operational requirements with appropriate systems reviews, and all within a highly digital environment. This is incorporating an accelerating level of Artificial Intelligence

(AI) on a scale not attempted before in such an international project.

At a GCAP briefing Herman Claesen, Managing Director FCAS at BAE Systems, told *APDR* that speed of developing the concept design involved an impressive level of computing power to arrive at this milestone design stage. GCAP is seen as a central crewed platform at the heart of a system-of-systems configured to work seamlessly with existing 4th and 5th generation aircraft.

In addition, it will connect with emerging new assets across multi-domains which will allow an unprecedented level of integration sharing data with crewed and un-crewed platforms, including autonomous air vehicles and other aircraft, and surface assets. He said: "We are making fantastic progress".

Interoperability with the air forces of allied nations is being factored into the design but clearly the issue of sovereign capability is a driving factor. Introducing national upgrades to non-sovereign built air platforms inevitably adds costs and delays and so freedom to introduce new weapons and systems as required in the future is seen as an important factor.

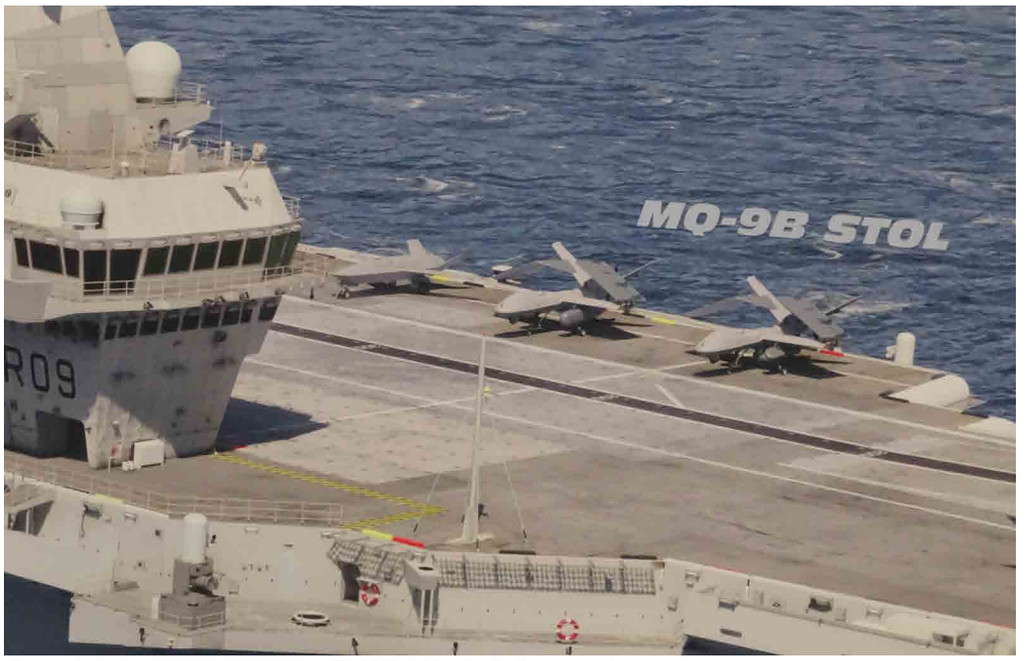
It is also important to safeguard and encourage new technological expertise building a new generation of highly incentivised specialists across a wide range of 21st century industrial capabilities. Government research centres in all three partner countries are contributing to the fast expanding program. Around 1,700 project employees involved already within BAE Systems in the UK, and by the end of this year Leonardo will have 2,000 specialists working on GCAP.

Open architecture is a key design feature, and every effort is being expended to ensure that the emerging aircraft platform will be able to adapt over its lifetime. Digital tools are being used speeding up progress to design, evaluating and testing every aspect of the GCAP even before it emerges in the form of the first flying development aircraft, known in the UK as the Tempest.

This is now well underway with the first airframe parts being assembled in what has been described by the company as the most innovative and advanced "Factory of the Future".

The highly digitised nature of the program is in constant evolution so the traditional timescales involving multiple changes during the development and testing period are now being severely reduced. This can be seen by the fact that the initial demonstrator will be completed next year with "a jet in the air in 2027".

Asked about any slow-down due to the change in government in the UK Claesen said Sir Kier Starmer the new Prime Minister had offered very assuring words during his visit to the exhibit on Day 1 of the show and "No toe brakes are being applied!"



General Atomics graphic showing STOVL MQ-9B (R Gardner photo)

He added that the PM understood the strategic value of GCAP as important in many ways to the UK as well as being an important international project. Hitoshi Shiraishi the GCAP partner lead at Mitsubishi said:

"We expect to obtain better results and deeper knowledge than ever before by combining the different cultures, experiences and knowledge of the three industries involved. I also hope with the broad participation of Japan's defence companies it will foster innovation in the country's industrial sector, such as digital transformation, as well as the development of human resources in the field of science and technology."

Claesen ended by pointing out that as a measure of the level of advancement of GCAP's capabilities its next generation radar will be capable of providing 10,000 times more data than other combat radars giving it a battle-winning advantage. The plan is to see initial deliveries of production GCAPs starting in 2035, and as numbers build, the type will operate alongside upgraded Typhoons and F-35s in UK and Italian service. These are both expected to continue into the 2040s and beyond, and also alongside Japan's F2s and F-35s.

The UK has funded a converted Boeing 757, the Excalibur Flight Test Aircraft (FTA) as a flight test platform for developing advanced radar and sensor developments. These will include supporting the GCAP Integrated Sensing and Non-Kinetic Effects and Integrated Communications System (ISANKE & ICS). Leonardo UK is the lead on developing these technology demonstrators for Tempest, GCAP, and other UK defence air projects.

BAE Falcon Works

The BAE Systems Falcon Works is the group's centre for advanced and agile research and technology development for the air sector, with a focus on early life-cycle development of game-changing technologies that have potential to shape future programs. Its current highly innovative products are designed to address the speed at which warfare is now changing and are aimed at keeping ahead by accelerating selected new solutions.

As well as developing practical answers to evolving operational requirements the activities consider such factors as introducing advanced additive materials and manufacturing technologies with secure cloud processing, AI, autonomous operations and nano technologies. Sustainability in manufacture, operation and disposal all feature in the efforts to do things differently and better, while helping to keep effective defence affordable.

Amongst the Falcon Works futuristic projects on display at the show was the T-650, an all-electric heavy-lift UAS concept vehicle designed to be used to transport essential front-line supplies with a rapid response capability. Consisting of a rugged VTOL frame capable of underslung loads

of ammunition, fuel or even a casualty pod, the air vehicle is un-crewed eliminating risk to human pilots.

The concept vehicle can be scaled up if required. Another exhibit that is on order for military customers and at an advanced stage in development is the Phasa-35, an all-electric solar-powered, high altitude (stratospheric) autonomous, un-crewed, long-endurance air vehicle (HALE). It is robust in construction with inter-changeable mission pods that can provide continuous surveillance or secure communications for months above the selected area as an alternative to far more expensive and less flexible Low Earth Orbit satellites.

Another highly innovative battlefield-support un-crewed air vehicle designed by BAE Systems in Australia was displayed in model form, in the colours of the Royal Australian Navy. This design, which resembles a giant insect sitting on long legs, features an ability to take-off and land vertically and can thus operate in very restricted spaces carrying a wide variety of stores.

Possible operational uses include in a ship stores re-supply or anti-submarine role, flying off a small platform pad. A large mock-up was first seen at the UK's DSEI show last year in Army colours and logistic support configuration.

Global air programs

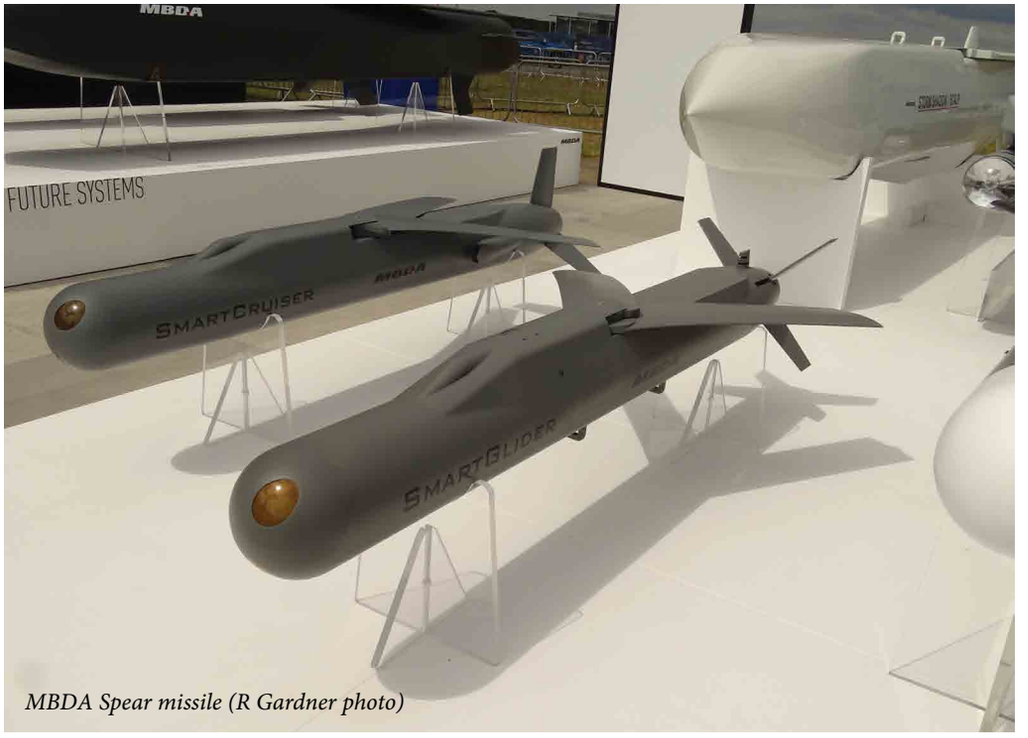
Boeing concentrated its Farnborough presence on commercial aviation, though on a much reduced level. Its military contribution included a P-8A and four F-15QA Eagle multi-role fighters, one of which was loaded up with no fewer than 12 AMRAAM air-to-air missiles. These aircraft were flown direct to customer, Qatar immediately after the show, having provided daily flying displays that illustrated why, with fly-by-wire controls, upgraded engines and avionics, it is still in production, some five decades after its first flight.

RX used the show to highlight its progress on upgrading the GE F135 engine for the F-35 with a power management system upgrade and also the Engine Core Upgrade (ECU) where the preliminary design review is now complete. The full service life of the F-35 engines is being upgraded and readiness levels are being met in the meantime. New deliveries will incorporate the upgrades.

There was little news at Farnborough on the Franco-German-Spanish Future Combat Air System - the rival to GCAP - though it seems that the in-service timetable is slipping back towards 2040. This is presently of little concern to the partners as the French forces have many more Rafale combat jets on order with a healthy export backlog, the envy of Eurofighter.

The internal rivalry between Dassault and Airbus, both partners in FCAS, and the undecided workshare role by Spain, is not helping. However, there is undoubtedly great collective experience through involvement in both the Rafale and Eurofighter programs to ensure that initial difficulties will be sorted in due course.

In the exhibition halls there were plenty of large scale models of new-design military fighters and helicopters, including the South Korean KF-21 and Turkish Kaan. The KF-21 now flying is a very impressive, compact, interceptor, though its lack of a full internal weapons bay compromises its low-observability aspirations with only semi-sunk weapons bay and wing pylons for ordnance carriage.



MBDA Spear missile (R Gardner photo)

The possibility of re-designing the fuselage to overcome this has been considered, but so also has the design of a completely new follow-on aircraft which would be larger and more capable. Hanwha's indigenous engine development aimed at powering future Block 3 KF-21 aircraft, with a 15,000lb thrust alternative to the current GE F414 is an aspiration, but it is determined to grow this expertise, having licence-produced F404s for its successful T50/FA50 fast jet family.

Missiles galore

With the war in Ukraine raging, the Ukrainian military, supplemented by an ad hoc national army of volunteers, has developed an amazingly effective self-help array of modified drones to counter larger but badly trained and led Russian groups. These have been fighting in the field and dug-in within ruined occupied cities and towns.

This has provided new surveillance and battlefield attack capabilities at low cost, but defending cities and key strategic targets from Russian missile and armed drone attack has become a task relying on sophisticated Western ground based air defence assets. These are informed by Western intelligence assistance, including satellite data and imagery with additional supporting NATO air assets operating outside Ukrainian air space.

Whilst remaining at a relatively safe distance from the Russians, these surveillance and intelligence gathering assets provide essential early warnings of enemy intentions and movements including the locations where preparation sites are based. The West has started supplying Ukraine with more capable longer-range weapons, including surface-launched missiles, precision attack weapons and even long – range cruise missiles.

There was much evidence of international companies developing or supplying the latest missiles with accompanying new capabilities and supporting infrastructure. This is to take maximum benefit from the technologies that are emerging to integrate multiple sensors and effects across the

new battlespace.

Precision (from initial and changing target intelligence) to weapon and launch equipment interoperability, and such factors as appropriate crew training, deployability and sustainment in the field are all key factors. Every weapon is expensive and it has been difficult to ramp up production because of under-prepared schedules established in the supply chain.

Ceptor has evolved into a sea and army surface-to-air weapon.

At the show RTX held an update on its global missile developments, many of which have been supplied to Ukraine. Some 19 customers have bought and ordered the company's Patriot mobile surface-to-air missile system, recent new customers being Romania and Spain. Germany and Poland are important customers

NATO is ordering Patriots across four European nations which can be distributed to meet priority NATO needs. A comment was made that building a Patriot system takes 12 months but it takes 24 months to get the parts!

Behind the scenes within the missile companies, the introduction of AI-assisted development and testing activity is now showing true game changing results. One example is the integration of AI enhanced collaboration into the Spear family of cruise missiles from MBDA within a spiral development process. It will result in a force multiplier effect in how an operator can deliver a winning effect in an engagement involving multiple high priority targets.

In just 12 months a new initiative – Orchestrike - has brought together a combination of AI hardware, network-enabled datalinks and Spear missile technology to enhance platform survivability and overall mission performance. The stand featured a simulation of how the AI assisted data for an air strike on four chosen priority targets could be integrated onto the four missiles carried by the aircraft. These would launch the weapons automatically at the optimum time in the preferred order, and if that priority changed or was affected by an unplanned attrition effect on the way, the remaining missiles would re-allocate to that original priority target - and then the next ones.

Each weapon would be fitted with a network-enabled datalink to share information within the formation. The company has also developed algorithms to support simultaneous time on target performance by multiple weapons to enable attackers to manoeuvre around known enemy air defence systems.

Spear is due to be carried externally aboard RAF Typhoon GR4 multi-role fighters on three-round launchers, but four-round launchers are due to be part of the F-35B Block 4 weapons capability, carried internally. It has now become a whole family of strike missiles in glide and powered formats, just as the company's vertical launch and Patriots will be part of a shared European Sky Shield program.

NATO is ordering Patriots across four European nations which can be distributed to meet priority NATO needs. A comment was made that building a Patriot system takes 12 months but it takes 24 months to get the parts! This is now being resolved.

On other Raytheon/RTX missile sales in Europe, bulk buys of Stinger close-range MANPADS missiles are being bought bringing economies of scale. Production of AIM-9 and AMRAAM air-to-air missiles is being ramped up and high energy laser systems have been developed as part of a layered mixed effects product line. These defensive lasers range from generating between 15KW and 50KW.

The company stated that there was scope for collaboration on future laser developments beyond those already in use. New threats from ultra-high- speed long-range missiles were particularly worrying, especially in the Pacific region, led by China, and ways of best countering this were being addressed, including threats from space.

Defences against drones and other UAVs have been developed by very many companies and are becoming available at a scalable level to meet all operational requirements for defence or civilian protection of key locations and facilities.

The MBDA small scale answer was on view in the form of its Sky Warden package. This consists of a compact transportable, or mobile, base unit featuring a telescopic mast and platform with 360 degree radar surveillance, electro-optical and IR tracking sensors and a variety of effectors to disable drones.

These range from radio link disruption to drone netted capture, sensor and propulsion destruction to total destruction. Effectors within the unit can include automatic radio link jamming equipment, gun or laser fire, depending on the immediate location and level of threat. At the upper end of the scale of directed energy effectors from MBDA is the UK's Dragonfire high-energy laser defence system for defeating all types of incoming threats to Royal Navy ships, from aircraft to missiles, armed drones and un-crewed attack boats.

New from General Atomics

The highly successful General Atomics MQ-9B Sky Guardian family of advanced long-endurance Remotely Piloted Aircraft is being offered with an upgraded Pratt & Whitney Canada PT6 E-Series turboprop engine that will provide a 33% increase in power over the current engine. Now in service with the Royal Air Force, where it is called the Protector RG1, the MQ-9B family has been extended in almost every respect after the original MQ-9B Reaper became a significant armed RPA in use by the UK and USAF over Afghanistan.

This latest version is also suitable for maritime use with search radar and anti-submarine sensors fitted in pods. It can provide up to 40 hours of continuous surveillance capability day or night in all climates and can transit in unsegregated airspace using its own company-developed detect and avoid system.

Late last year the smallest member of the MQ-9B family took part in carrier deck flying trials, proving the ability of the aircraft to operate safely in a short take-off/landing mode without the use of catapults or arrester wires. A STOL wing provided ample lift to demonstrate its capability to use unimproved landing sites as well as carrier decks.

At the company stand there was a large computer-generated image depicting several navalised MQ-9B aircraft parked up in line on the deck of HMS Queen Elizabeth with folded wings (a possible new development). The same carrier image depicted a jet-powered Collaborative Combat Aircraft (CCA) based on the XQ-67A drone developed by General Atomics and in receipt of a demonstrator contract placed for the US Air Force.

It was positioned on a forward electromagnetic launch system alongside the deck's bow ski-jump structure. It is believed such a proposal has generated much UK interest as the operation of unmanned air platforms alongside the UK's F-35B combat jets, aboard its large aircraft carriers, is seen as a potential cost-effective and operationally beneficial way of generating more weaponised critical mass from the carriers. General Atomics is also the supplier of the EMALS electromagnetic launch and recovery systems aboard the latest US aircraft carriers.

News from across the Tasman

Gordon Arthur // *New Zealand*

NZDF contributes to Pitch Black 2024 in its own way

NZ has rather limited options when it comes to fast-jet exercises. Nonetheless, the NZDF is a steadfast participant in Australia's premier Pitch Black biennial fighter event. Wing Commander Andy Armstrong, the RNZAF's exercise Detachment Commander, stated, "New Zealand has been involved in this exercise pretty much from its inception. In fact, this marks our 40th year that New Zealand has been involved."

Without any fighter jets of its own –after the Labour government decided in 2001 that new platforms were not needed to replace A-4K Skyhawks and Aermacchi MB-339 trainers – the NZDF instead contributed a combat support element that embedded within the ADF for Pitch Black 2024.

Armstrong said 65 people and three military working dogs deployed to Darwin and Amberley airbases this year. "The way we contribute to that effort is through a wide range of expertise and specialisations that range from security forces to medics, aviation refuellers, firefighters, and the list goes on." Other roles played by the NZDF were security forces, military police, logistics, intelligence, chefs, technicians, air operations headquarters staff and an air loading team.

Air Commodore Daniel "DJ" Hunt, Deputy Chief of the RNZAF, added, "Participating in high-quality, multinational exercises like this is essential to our personnel being ready to respond to a range of scenarios, often alongside our international partners and, of course, our ally Australia."

Hunt shared, "Ultimately, our participation in exercises like these is crucial in reinforcing New Zealand's commitment to supporting the international rules-based order, and reiterates that we're a reliable and valued partner in the Indo-Pacific."

Armstrong noted too, "We share a very strong bond with Australia, our closest strategic partner in the Southwest Pacific. I can tell you that the ANZAC spirit is very much alive and well."

The RNZAF spokesperson further noted: "We're getting a lot of value out of operating this way and providing the combat support capabilities to our fellow nations. The other thing that's important to us is the exercise creates an opportunity for New Zealand to work at the highest professional standard possible, and we're committed to that from the beginning of the exercise right through to the very end."

An RNZAF handler and her military working dog McClane patrol RAAF Base Darwin during Exercise Pitch Black 2024. (NZDF)

European aircraft visit NZ for the first time

Extending their voyages even farther after reaching Australia for Exercise Pitch Black 2024, three European aircraft touched down in NZ on 23 July. Three A400Ms belonging to the French, German and Spanish air forces landed at Ohakea as part of their Pacific Skies 24 deployment. Significantly, this was the first time German and Spanish military aircraft had ever visited Aotearoa.

Air Commodore Hunt commented, "We operate, at times, in Europe, and we have great working relationships with our fellow aviators in these countries. So it's a real pleasure to welcome them to New Zealand and engage with them in our own country."

Hunt continued, "It's especially timely in that they're all fellow members of the Movements Coordination Centre Europe, which New Zealand joined earlier this year. This organisation provides its members access to the air transport of other nations, and has broadened the scope of the air transport options available to the NZDF, for moving personnel and freight around the world, within Europe and in the Pacific."

Support for Ukraine

On 10 July, as Prime Minister Chris Luxon attended the NATO Leaders' Summit in Washington DC, the NZ government announced an additional NZ$6 million in military aid and NZ$10 million in humanitarian assistance for Ukraine.

Of the sum allocated to Ukraine's military, NZ$2 million is for healthcare and the remainder for the Drone Coalition, a UK- and Latvia-led initiative to put more UAVs in Ukrainian hands. "New Zealand understands that, while we're distant from Ukraine, what happens there affects us all, and we're prepared to stand with Ukraine for the long haul," Luxon said.

Over the past 2.5 years, Wellington has pledged more than NZ$130 million in assistance to war-torn Ukraine.

Bushmasters get workout

The army's 43 Bushmaster 5.5 vehicles started arriving from Thales Australia last year, and the Linton-based Queen Alexandra's Mounted Rifles (QAMR) is charged with bringing the new platform into service.

As well as running conversion courses for the Protected Vehicle Medium (PV-M), QAMR recently employed the Bushmasters in Exercise Rumani 24 at the Waiouru Training Area. Operated by the Wellington East Coast Squadron of QAMR, this was the PV-M's first official exercise outside of a course environment, and therefore "an important milestone in its introduction to service". The regiment stated, "A lot of valuable information about how we operate tactically, day-to-day life in the vehicle and its capabilities, was learned…"

Solomon Islands support ends

The NZDF recently drew the curtain on its contribution to the Solomon Islands Assistance Force (SIAF). NZ had four personnel in Solomon Islands until recently. The SIAF deployed to Honiara in late November 2021 after its government requested help in restoring stability after a bout of civil unrest.

Solomon Islands does not have a military, so the Royal Solomon Islands Police Force is charged with maintaining law and order and ensuring security. The SIAF – which also included NZ Police, ADF, Australian Federal Police, Republic of Fiji Military Forces and Fiji Police Force personnel – worked alongside local police. Last September, the mandate for the SIAF's deployment had been extended through till mid-2024.

Australasia is alarmed at the close relationship Solomon Islands has forged with China, culminating in a secretive security pact in April 2022.

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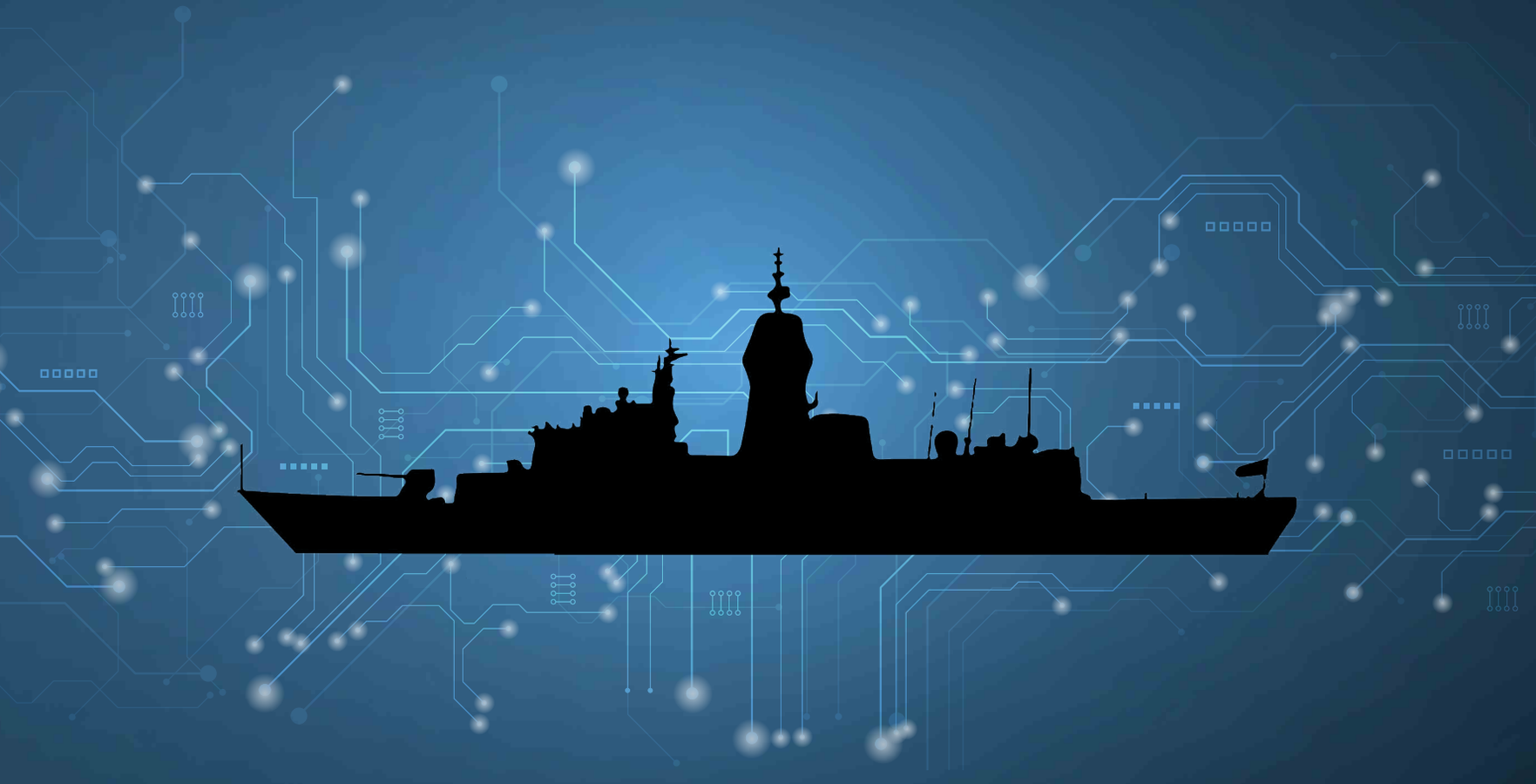

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