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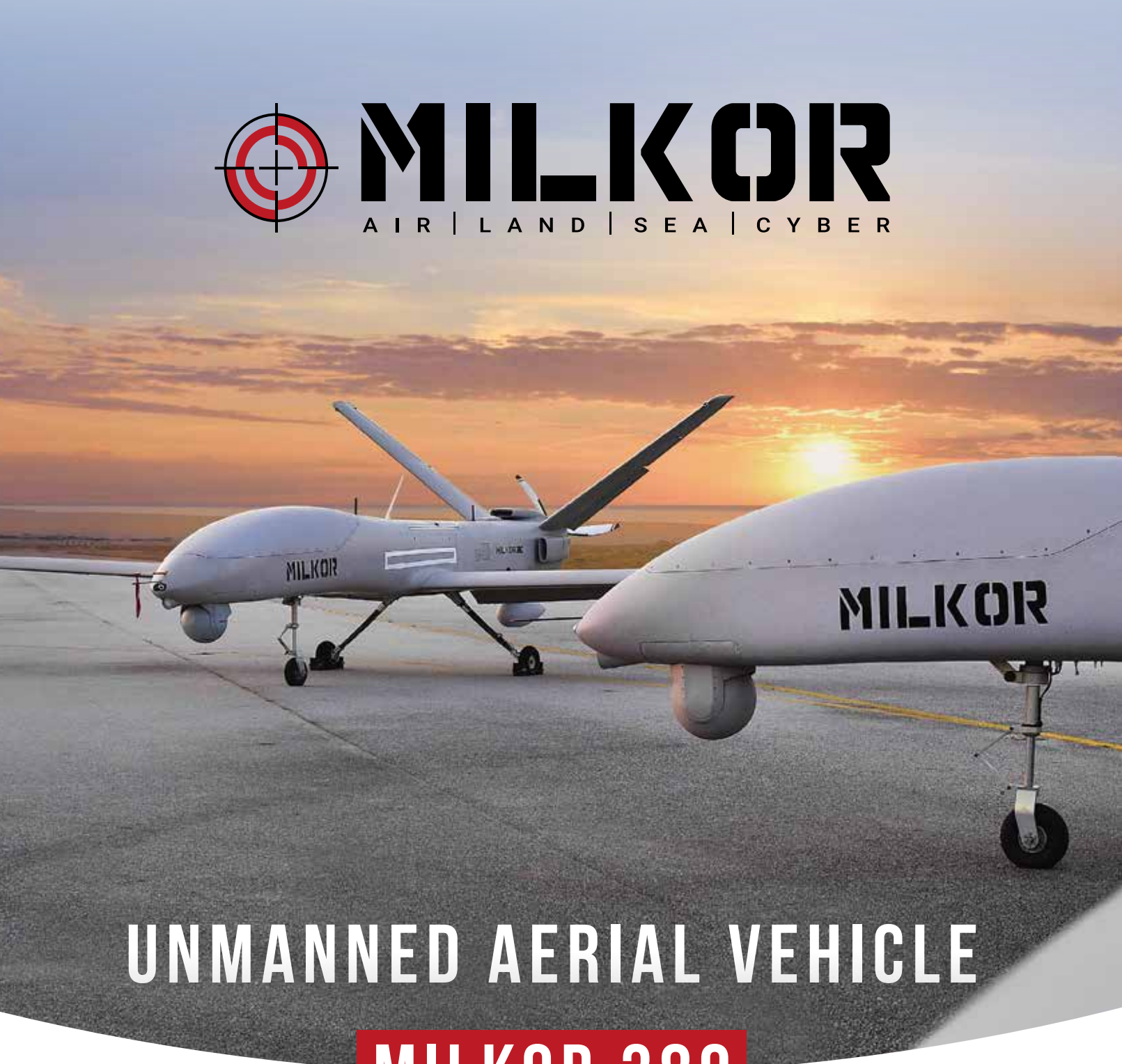

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ASIAN MILITARY REVIEW

Australian Army soldiers conduct helicopter insertion and extraction training as part of UH-60M Black Hawk helicopter introduction into service activities. In early 2023, the Australian Government's announced its decision to replace the Airbus Taipan Multi Role Helicopter (MRH90) with a fleet of 40 Sikorsky UH-60M Black Hawk utility helicopters. (Australian DoD).

Editorial

CHINA'S STEALTH BASE BUILD-UP

The 'second coming' of Donald Trump as President of the most powerful nation on earth is causing real concern across the globe. Aside from rolling back crucial environmental policies which will have an impact not only on climate change (and consequences such as population migration - itself a cause of conflict) but will set a bad example to other wavering countries. A more isolationist 'America first' attitude is already setting a tone for further moves away from multinationalism and towards protectionism.

Trump's past and current relationships with autocratic leaders who are eager to see the overturn of democratic rule and international order is worrying not only for America's NATO allies who see future danger beyond whatever the outcome of Ukraine will be, but also those in the Indo-Pacific who are facing an ever more hard-line foreign policy directed by President Xi-Jingping of China, whose military continues to modernise at a frightening pace. Forcing unaligned nations towards China at this stage for whatever would be a very bad thing in the medium to long term.

This is absolutely the wrong time for an America first policy in terms of international relations. China is always generous in what it initially offers in terms of trade and financial support to most other nations it is seeking to influence, but the longer term goal is to tie that country into economic reliance and the build up of facilities that are negotiated on a long term basis. On 7 June, a RAND report stated that "the People's Republic of China (PRC) is brokering international access agreements to expand its security footprint abroad, create avenues for overseas military activities, and extend the reach of the People's Liberation Army (PLA) and associated paramilitary elements."

One of its first overseas military bases was established in Djibouti in 2017. Initially it was structured as a supply base but since then Chinese Marines have become permanently established there, reflecting China's strategy of a slow entry followed by structured build up. This is becoming a pattern where the initial insertion is small, but there is an incremental pattern from investment zone to logistics facility, then a security deal perhaps involving Chinese police as happened in Vanuatu.

China has already been exploring other international bases in countries which would allow it to secure military access or basing agreements. These include Cambodia, Equatorial Guinea, Namibia, the Solomon Islands, the United Arab Emirates, and Vanuatu, among others, states the report. Other countries also named include Pakistan, Myanmar and Bangladesh - which would be a concern to India in particular. Coastal ports would also support the global strategic reach of the People's Liberation Army Navy (PLAN).

While the RAND report finds an "absence of evidence of PLA planning to use its bases to support offensive operations in wartime," it adds that this "does not definitely provide evidence of an absence of PRC intent." While this growth is not expected to challenge the U.S. up to 2030, as previously stated, China plans its moves for the medium to long term.

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Gordon Arthur

Indonesia once regularly turned to Russia for military equipment, such as this Su-30MK2, but in recent years it has looked more to Western suppliers.

INDONESIA STILL OPTS FOR SILO PROCUREMENT OVER INTEROPERABILITY

Diverse procurement strategies exacerbates capability gaps within and between Indonesia's armed forces.

By Gordon Arthur

Indonesia proposed raising its defence expenditure to $10.6 billion (IDR165.2 trillion) for FY2025, of which nearly 42 percent will go on procurements. In election campaigning, incoming president Prabowo Subianto promised to elevate defence spending to attain a level of 1.5 percent of GDP by 2029.

Dr. Natalie Sambhi, executive director of Verve Research, told *Asian Military Review:* "The Indonesian parliament and related committees will continue to allocate large sums of money to the defence budget … Now that Prabowo can select both his defence and finance ministers, it's critical that Indonesia has robust oversight in order to ensure large-ticket purchases can be afforded in the long run."

She added, "As part of an overall modernisation process, the Indonesian Armed Forces' (TNI) priority is to secure leading-edge military hardware from a range of reliable partners, focused on maritime defence. Some challenges related to this goal are budgetary, interoperability across varied platforms, sufficient human resources and skill levels to match the hardware, secure supply chains for sustainment and maintenance, and the needs of a predominantly land-based force."

As guardian of the world's largest archipelagic waters, Indonesia's security needs are daunting. China is testing Jakarta's resolve in the South China Sea, for example, as it impinges upon Indonesian waters near the Natuna Islands.

Dr. Alban Sciascia, director of PT Semar Sentinel Indonesia, also told *AMR,* "It's important to keep in mind that Indonesia's modernisation plan, the Minimum Essential Force (MEF), has been delayed and hasn't been fully completed." Indeed, the MEF introduced in 2010 was scheduled to conclude in 2024, but the air force, army and navy had only met 51 percent, 60 percent and 76 percent of their respective goals by early 2023.

Sciascia continued, "This delay is impacting priorities and is creating new challenges such as increasing capacity gaps and limited fiscal space, while the regional security environment is evolving at a pretty fast pace."

Airbus

The Indonesian Air Force is awaiting the delivery of two A400M transports from Airbus, plus it holds options for four additional aircraft.

Indonesian Air Force

The Indonesian Air Force (TNI-AU) maintains a disparate fleet of aircraft, but it is attempting to modernise them. Sciascia said: "Rafale combat aircraft and Scorpene submarines will be really important – if not essential – for the future of Indonesia, and its ability to protect its sovereign interests and deter potential aggressors." In fact, $8.1 billion has been invested in Rafale fighters, with 42 aircraft being procured in three tranches under a 2022 agreement. The last tranche of 18 contractually entered force in January.

Sambhi shared: "For the air force, maintaining a fleet of fighter jets interoperable between each other and with partner nations will be important." However, herein lies a serious problem. In recent times, Jakarta has expressed interest in Eurofighters, Boeing F-15s, Sukhoi Su-35s, Korean Aerospace Industries KF-21s, Dassault Rafales and Mirage 2000-5s. In August 2023, for instance, Boeing signed a memorandum of understanding (MoU) regarding a planned sale of 24 F-15EX fighters. Indonesia habitually expresses interest in new equipment, without thinking through the consequences or allocating the requisite funding.

Sciascia thus assessed: "The TNI has been facing existing challenges related to interoperability. It's no secret that Indonesia has been focusing on procuring different equipment from different countries (as part of its diversification strategy), and that its joint operations concept is limited because of the relative inability to get all this equipment interoperating on the battlefield. This is why key concepts such as interoperability, data links and collaborative combat are getting more attention in the country, and are ranking as priorities in order to improve the TNI's capabilities."

Indonesia announced a contract for 12 second-hand Mirage 2000-5s from Qatar in mid-2023, but this was later scuttled. Sciascia identified this willingness to acquire gap-fillers as being problematic. "What's the point of acquiring 20-year-old equipment when you can refurbish and/or modernise existing equipment for less money? All in all, this lack of grand strategy is also impacting the armed forces' operational capacities and readiness..."

The country is also supposed to be a serious investor in South Korea's KF-21 Boramae 4.5-generation fighter project, but Indonesia's financial contributions have lapsed badly. Sciascia said, "Despite criticism of the project, its impact on the defence industry could be positive," because of technology transfers.

PT Pindad has delivered all 18 Harimau medium tanks on order to the Indonesian Army, these having been produced in conjunction with FNSS. (PT Pindad)

Transport aircraft are also important, with state-owned PT Dirgantara Indonesia (PTDI) able to build aircraft like the CN235-220. Ongoing orders are expected for this type, plus the TNI-AU received five new Lockheed Martin C-130J-30 Super Hercules transports in 2023-24. The air force is also awaiting two Airbus A400M aircraft in 2025, to be used for troop transport, cargo movement, air-to-air refuelling and humanitarian missions. Jakarta also holds an option for four extra A400Ms.

Major capability gaps exist. New airborne early-warning aircraft were scrubbed last December in order to help pay for naval projects, while Sciascia said, "If the budget is available, increasing air-to-air refuelling capacities through Airbus A330 MRTTs will provide strategic advantage to the Indonesian Air Force in terms of power projection."

The air force is beefing up unmanned aerial vehicle (UAV) capabilities too. Last year the TNI-AU purchased 12 Ankas from Turkish Aerospace for $300 million. Half will be assembled by PTDI under a technology transfer agreement. Indonesia also committed to buying Bayraktar TB2 UAVs in June.

In mid-2023, Thales and PT Len Industri signed a contract for 13 Thales Ground Master long-range air surveillance radars. The TNI-AU will use these GM403 radars in deployable configuration to safeguard national airspace, as its radar network is riddled with holes. Future deals are likely to replace obsolescent radars too. A month earlier, the two companies signed a joint venture agreement that includes a centre of excellence and cooperation in areas like radars and command-and-control systems.

Indonesian Army

The Indonesian Army (TNI-AD) is the dominant service, accounting for the largest proportion of the TNI's 404,500 personnel. Sambhi pointed out that the army is responsible for humanitarian assistance and disaster relief (HADR) missions. "While one primary task is internal security, the likelihood and intensity of HADR contingencies means that equipment that best allows army personnel to respond to natural disasters and other emergencies should be prioritised. Second, equipment that better allows the army to respond to internal-security issues such as the conflict in Papua is also important. However, what's effective in counterinsurgencies isn't necessarily greater lethality, but also protection for ground forces."

Indonesia has a vibrant industry producing military vehicles. In February, PT Pindad handed over 10 Harimau medium tanks; three Badak 6x6 fire support vehicles; 10 Pandur II 8x8 infantry fighting vehicles; 12 Anoa 6x6 armoured personnel carriers; and seven Komodo and 10 Maung 4x4 light tactical vehicles. Boasting a John Cockerill CMI-3105HP turret armed with a 105mm main gun, the Harimau tank was developed in conjunction with FNSS and is now being assembled by PT Pindad. A 2019 contract covered 18 tanks, but more will be required.

PT Pindad delivered more vehicles

PT Pindad continues to churn out Anoa 6x6 armoured personnel carriers for the Indonesian Army, demonstrating a good degree of self-sufficiency.

in October: the remainder of an order for 23 Pandur IIs, the eight final Harimau tanks, nine Anoas, four Komodos and 250 Maung V3s. The TNI requires 5,000 Maungs, with PT Pindad's production target being 1,500 vehicles annually. As for the Pandur IIs, PT Pindad and Excalibur Group signed a licensing agreement on 12 April 2019, and the 8x8 vehicles being delivered are armed with a Mk44 Bushmaster II 30mm cannon mounted in a UT30MK2 remote weapon station manufactured by Ares in Brazil. The TNI-AD still requires self-propelled air defence systems too.

In August 2023, Indonesia signed a strategic-partnership MoU with Lockheed Martin to buy 24 S-70M Black Hawks. A contract was signed last December, although the quantity may have reduced to 22 aircraft by that time. PTDI has traditionally collaborated with Airbus and Bell, so this agreement allows the aerospace company to now also cooperate with Sikorsky.

Sciascia summed up: "For the Indonesian Army, new helicopters such as S-70 Black Hawks will provide real capabilities, while the future of tanks and armoured personnel carriers can lead local industries to develop solutions to fit the needs of the armed forces. Nevertheless, while all this equipment will definitely boost Indonesian capacity and help Jakarta defend its sovereignty, it'll be essential for decision-makers to carefully assess what the next steps are and what should be prioritised. Indeed, it'll be necessary to take into consideration interoperability and collaborative combat concepts to make sure all future, incoming equipment can operate at maximum capacity on the battlefield."

Indonesian Navy

The Indonesian Navy (TNI-AL) has a tough task of securing national waters, amplified by a disparate naval fleet with little commonality between designs. Sambhi pointed out: "In terms of maritime defence, ensuring the navy has robust submarine and anti-submarine warfare capabilities, particularly for deterrence and intelligence gathering, is paramount."

Nonetheless, Jakarta's naval aspirations are ambitious. The TNI-AL's latest plan delineates future targets for ship categories. In its future strike force, the navy wants 12 submarines (currently it has four; note that subsequent numbers in brackets refer to existing vessel numbers), four (0) destroyers, 36 (9) frigates, 18 (25) corvettes and 27 (21) fast attack craft. Its patrol force is seeking 42 (2) offshore patrol vessels (OPV) and 50 (47) patrol craft. These numbers clearly indicate where future programmes will focus. Incidentally, destroyers represent a completely new class for the TNI-AL.

As for the projection force, the navy is seeking four (it currently has none) landing helicopter docks, eight (5) landing platform docks and 28 (24) landing ship tanks. Finally, the support force wants six (6) tankers, six (3) hospital ships, six (0) support ships, six (11) mine countermeasures vessels, 12 (6) hydrographic vessels, three (8) training ships and six (2) tugboats. If plans reach fruition, this would give Indonesia a fleet of 274 vessels, compared to the 173 it currently has.

Already on order are two Scorpene Evolved submarines with lithium-ion batteries from Naval Group. Jakarta ordered these for $2.16 billion on 28 March. To be built locally within eight years, this is a marquee programme for PT PAL. On its pathway towards a dozen submarines, the navy has already lodged a proposal to buy two more submarines from 2025-29. Chief of Naval Staff Admiral Muhammad Ali said in May, "It's possible that there'll be additional submarines from other countries outside of this, hopefully, if there's a budget." Potential vendors are France, Germany, Italy and Turkey.

However, China is also pushing an S26T originally built for Thailand and, to make the offer more alluring, Beijing is offering a Type 052D destroyer at a bargain price. Sciascia remarked that "such procurements could potentially jeopardise Indonesia's sovereignty if – or when – a conflict erupts in the region. This lack of grand strategy and long-term assessment is concerning, as it could lead to diversified procurements, but not for what we could dub as good reasons."

On 28 March, an Indonesian order worth $1.28 billion for two Fincantieri-built PPA OPVs was announced. However, that initial contract did not constitute a final purchase agreement, as noted by the shipbuilder: "The effectiveness of the contract is subject to the necessary authorisations from the competent authorities." The plan was for Fincantieri to deliver two 4,900-tonne PPAs originally destined for the Italian Navy in October 2024 and April 2025 respectively. Once received, these will likely operate in Indonesia's western waters, where the workload is high because of Chinese intrusions and innumerable illegal activities in the Malacca Strait area.

As with air force aircraft, the TNI-AL often seems more interested in collecting disparate types of vessels than in promoting commonality. PT PAL is building two Merah Putih-class Red White frigates based on Babcock's Arrowhead 140 hull design. These 5,996-tonne frigates will be the navy's most advanced surface combatants. This contract came into force in May 2021, with the first frigate due for completion in August 2026 and the second in 2027.

The TNI-AL has shown interest in local construction of Naval Group's FDI frigates too. This suggests earlier plans to

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The largest naval vessels that PT PAL has constructed to date are Makassar-class landing platform docks. Commissioned in 2009, this is KRI *Banjarmasin.*

buy six Fincantieri FREMM frigates and two second-hand Maestrale-class frigates have dissolved.

The navy initially wants a single landing helicopter dock with a displacement of around 22,000-25,000 tonnes in the 2025-29 period. Coastal anti-ship missile systems are also on the wish list, as are new amphibious assault vehicles like the FNSS ZAHA for the marine corps.

The navy chief listed Boeing Insitu ScanEagle, Bayraktar TB2 and Bayraktar Akinci UAVs as being desirable too, as well as something like Boeing P-6 maritime patrol aircraft. The latter, based on a Bombardier Global 6500 business jet, was unveiled last year by Canadian firm PAL Aerospace. The P-6 represents a more affordable solution than the P-8A Poseidon, which Indonesia is known to be interested in.

Local shipyards build numerous vessels such as PC-40M patrol boats, landing craft, 90m OPVs and KCR-60M missile boats, reflecting the government's desire to build domestically where viable.

Indigenous industry

Indonesia has a thriving domestic industrial base, and Sciascia explained: "There has been real progress in the past few years and an interesting policymaking process. The decision to establish a defence holding under Defend ID is salutary, as it helps to set up clear priorities and leadership over the public sector. It'll also help in the future to prioritise key programmes and to make sure that offsets and local-content obligations are really beneficial to the whole industrial sector. While there are quite some hopes for the future, it's also important to note that it'll be essential for the domestic public defence sector to work fully with the private sector. For years, public companies – especially those that are part of Defend ID – have been the primary recipients of government funding and been involved in priority programmes." Simultaneously, the private defence sector has historically been restricted to distributing products.

Defend ID comprises five state-owned entities: PT Len Industri, PT PAL, PTDI, PT Pindad and PT Dahana. Last year, Defend ID's financial performance improved, with contract growth up 29.7 percent compared to 2022. Additionally, revenue rose 27.9 percent to $1.6 billion (IDR25.22 trillion), and net profit was up 56 percent. Defend ID's President Director Bobby Rasyidin commented midyear, "This shows a very positive performance, where not a single entity in Defend ID had a negative financial or operational performance." From 2019-24, Defend ID received more than 160 defence equipment contracts.

Sciascia added: "Nowadays, some companies such as PT Infoglobal Teknologi Semesta or PT Sentra Surya Ekajaya are able to fully produce quality defence equipment and/or components. This extended cooperation between Defend ID and its subsidiaries, and the private sector – mainly composed of SMEs – will be essential to increase and strengthen the defence sector's industrial maturity to ensure maximum distribution of the benefits from offsets and local content requirements."

Sambhi highlighted one reason for the nation's maturing defence industry: "Credit for Indonesia's progress in developing its indigenous defence industry capacity are the legislative requirements for technology transfer and investment. That has helped normalise a focus on domestic capacities and infrastructure, rather than allowing it to be an ad hoc process."

Yet Indonesian procurement processes can be haphazard, swayed by competing influences such as defence ministers, advisors, the TNI, MoD and vested defence industry interests. Sambhi explained: "Some procurements have been shaped by military modernisation plans, first articulated by the Minimum Essential Force, but it's difficult for the public to see how purchases match up with the strategy given the absence of a defence white paper for the past decade." A

Indonesian private-sector companies are capable of producing innovative equipment. This is the trimaran fast attack craft KRI Golok from PT Lundin.

U.S. Navy

U.S. Naval Special Warfare (NSW) operators and Japanese Maritime Self-Defense Force (JMSDF) Special Boarding Unit members train together in Iebuneshuma, Japan during exercise Keen Sword 25, on 26 October, 2024. NSW provides maritime special operations force capabilities to enable Joint Force lethality and survivability inside denied and contested areas.

SOF INVESTS IN DELIVERY AND TEAMWORK

Getting around the area of operations - either above the land - or on/under the waves is a current focus for regional SOF operators.

By Andrew White

Following the withdrawal of the United States and its NATO partners from Afghanistan in 2021, the Indo-Pacific has quickly become a critical focus area for state actors around the globe seeking to counter peer adversaries including China, North Korea and Russia.

Given their ability to operate at the tactical edge, special operations forces (SOF) from across the region are building capabilities as they consider how best to counter potential adversaries.

SOF-specific areas of interest include providing small unit teams with the ability to conduct special reconnaissance, military assistance and in extreme cases, direct action missions on land, from the air and at sea - key requirements for small unit teams operating in a region dominated by water.

Japan

After decades of pacifist attitudes towards defence, Japan is now significantly ramping up its special operations capabilities, both in terms of materiel but also capabilities through multi-lateral training opportunities with partners across the region.

One of the most recent training

U.S. Naval Special Warfare (NSW) operators and Japanese Ground Self-Defense Force (JGSDF) soldiers navigate a combat rubber raiding craft through the surf during exercise *Keen Sword* 25, on 26 October, 2024.

opportunities saw the Japan Maritime Self Defence Force's maritime special operations organisation - the Special Boarding Unit (SBU)- taking part in the biennial Rim of the Pacific (RIMPAC) exercise in Hawaii, United States over the course of June and July this year.

RIMPAC provided the SBU the opportunity to train alongside strategic SOF partners in the Indo-Pacific including India, Indonesia, South Korea and the United States as the countries consider how to operate in a rapidly evolving, congested and contested operating environment.

One defence source associated with the exercise explained to *Asian Military Review* how the exercise not only enabled Indo-Pacific SOF units to learn and improve tactics, techniques and procedures (TTPs) but also share and consider new and emerging technologies which could be used to support the full spectrum of special operations in the region.

Training serials focused on helicopter and fast rope insertion; close quarter battle in urban and rural environments; 'ship-in-a-box' tactics used to successfully board and clear surface vessels; small boat and submarine operations; military freefall; and combat diving.

Specific technology areas of interest for Japanese SOF, which also includes the Japan Ground Self Defence Force's Special Operations Group (SOG), are focused on the maritime environment and in particularly sub-surface insertion.

According to then outgoing commander of Australia's Special Operations Command (SOCOMD), Major General Paul Kenny, Japanese cooperation with Australian SOF has increased substantially in recent years, due to the emerging security situation in the Indo-Pacific.

Speaking at the SOF Week event in Tampa in May, Kenny explained how Australian-Japanese SOF collaboration had now grown from a focus on parachute insertion and counter-terrorism to "more complex" capabilities although the would not be drawn on specifics.

"Our initial focus was sharing our experiences in counter-terrorism which includes how you might respond to a domestic terrorist attack. And Australia, amongst other nations, shared their experiences with our Japanese counterparts in the run up to the Tokyo Olympics.

"But in the last couple of years … we have collectively shifted our approach as our nation's governments have realised the instability that is occurring in our region due to maligned behaviour by the PRC in particular, but also the ongoing disruptions by behaviours from the DPRK.

"Both the Japanese and the Australian governments are strongly aligned. And in fact, I think your Prime Minister made the point that Australia is a 'quasi-ally. So while we don't have a formal alliance, we are very, very closely aligned," Kenny explained before highlighting multi-lateral cooperation at so-called 'Quad' exercises with SOF partners from Australia, India, Japan and the United States.

Also speaking at SOF Week, a former SOG commander also called for Japanese SOF to be suitably equipped to "deliver a message to opponents directly or indirectly".

As a result, Japan's Ministry of Defence (J-MoD) is understood to be considering a variety of next-generation capabilities to support the SOG and SBU moving forward. Options include swimmer delivery vehicle (SDV) technologies which could be used to forward-deploy combat divers underwater in a clandestine manner to avoid detect by an adversary.

Unusually for a SOF unit, neither the SOG nor SBU has traditionally been equipped with any kind of underwater insertion capability, mainly because of Japan's pacifist attitude to security in the region.

But defence sources confirmed to *AMR* that the J-MoD is preparing to publish a requirement for some kind of SDV or even tactical delivery vehicle (TDV)- the latter of which comprises a platform capable of both carrying combat divers across the surface or under it.

Possible candidates include solutions from Vogo, DSI, Ortega, Stidd, SubSea Craft as well as JFD, the latter of which is expected to propose its Shadow Seal TDV.

The Shadow Seal has been designed for clandestine deployment from conventional and non-conventional surface vessels. With a 12-hour mission profile, it is designed to carry a crew of four SOF operators 18 nautical miles at 4.5 knots on the surface, before transitioning to a "semi-submerged" and low observable operation for a final bound of 4nm at 4kts.

South Korea

Also considering obtaining underwater SOF capabilities is the Republic of Korea Navy's Special Warfare Flotilla (SWF) which is studying the potential of a Special Assault Boat (SAB) requirement to support special operations in the maritime environment.

According to defence sources, the SAB concept would see SDV/TDVs deployed from some kind of surface mothership although progress to date remains at an investigative stage, it was confirmed.

Sources suggested the RoK SWF is considering the acquisition of five motherships, each of which could be capable of rapidly deploying and

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Australian DoD

In early 2023, Defence announced the Australian Government's decision to replace the Taipan Multi Role Helicopter (MRH90) with a fleet of 40 UH-60M Black Hawk Utility Helicopters. Currently, 10 Black Hawks have been delivered to Australia, with all 40 aircraft expected by 2030. Australian Army soldiers and aviators conduct helicopter insertion and extraction training as part of UH-60M Black Hawk introduction into service activities.

recovering four SDV/TDVs each. Options for the SWF include similar SDV/TDVs available to Japan, sources confirmed.

RoK SOF are also set to benefit from a new rotary wing asset as the RoK's Ministry of Defence considers the future of its Special Operations Heavy Helicopter (SOHH) programme.

The programme aims to replace a variety of rotary wing assets used by RoK Army and Navy SOF components, used to support a variety of special operations and training. Legacy platforms include UH-60 Black Hawks and CH-47D Chinooks.

In 2023, the RoK's Defense Project Promotion Committee approved the purchase of 18 Special Operations Heavy Helicopters (SOHH) variants for a total of $2.9bn with the competition expected to feature Lockheed Martin's CH-53K against Boeing's CH-47F. Once an aircraft has been selected, deliveries are expected to run through to 2031.

The SOHH requirement falls under a wider effort by the RoK's defence ministry referred to as the Large Transport Aircraft II programme. This is also considering the purchase of three fixed wing, tactical transport aircraft although details regarding this programme remain undisclosed as *AMR* went to press.

Australia

Similar moves to upgrade its fleet of special operations helicopters is the Australian SOCOMD which remains in the process of receiving UH-60M Black Hawk helicopters from Sikorsky.

Helicopters are already in service with the SOCOMD's 1st and 2nd Commando Regiment, based at Holsworthy Barracks in New South Wales where they support domestic counter-terrorism operations.

Speaking to *AMR*, Lockheed Martin Australia's Rodahn Gibbon, programme manager for the UH-60M, confirmed eight helicopters had already been supplied to the SOCOMD, operated by the 6th Aviation Regiment. A further four helicopters are scheduled to be delivered to the same unit by the end of the year, he confirmed.

UH-60Ms replace a total of 47 Airbus MRH-90 Taipans which have been taken out of service with the SOCOMD due to a variety of reasons, defence sources confirmed. Taipans were grounded in 2021 after beginning service with the Australian Defence Force (ADF) in 2004.

UH-60Ms are also set to benefit from a retrofit upgrade at a later date with ADF officials understood to be working with partners in the U.S. Army regarding potential SOF-specific additions. Options include the integration of a door gun in addition to fast rope insertion extraction equipment (FRIES) and winch.

The entry into service of the UH-60M with the SOCOMD followed a $1.8bn (AUD2.79bn) contract awarded to Lockheed Martin Australia in 2023 for a total of 40 UH-60M helicopters - half of which will end up in service with the Australian Army.

The decision to purchase the UH-60M follows the cancellation of the Land 2097 Phase 4 "SOF Rotary Wing Platform" requirement for the SOCOMD which dates back to 2016 when Australian SOF

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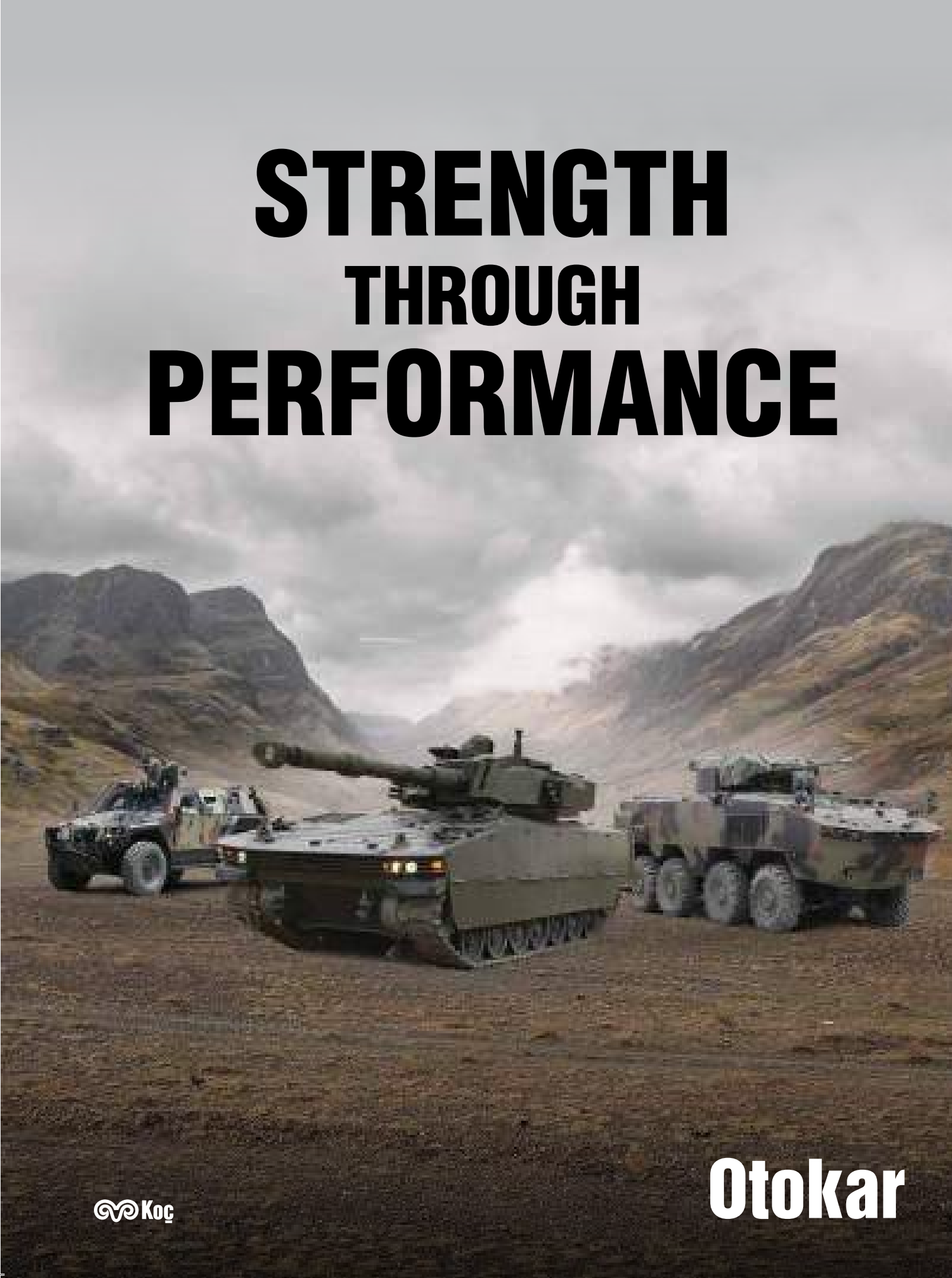

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The Shadow Seal from James Fisher Defence (JFD) has been designed for clandestine deployment from conventional and non-conventional surface vessels and is being viewed by SOF forces in the region.

demanded a helicopter capable of being carried in the back of the Boeing C-17A Globemaster III aircraft and suited to supporting special operations in dense urban environments.

Initial options for the SOCOMD had included Bell's 429; Airbus's H145M; Leonardo's AW109; and Boeing's AH-6i. However, the programme was officially cancelled in 2021 after the ADF announced it would be purchasing the UH-60M.

The Land 2097 Phase 4 requirement will now be fulfilled by UH-60Ms as well as the ADF's inventory of CH-47F Chinook heavy lift helicopters as well as the army's AH-64E Apache which is set for delivery in 2025.

India

In India, SOF continue to grow in terms of capability, particularly following the formation of the Armed Forces Special Operations Division following a decision in 2019. It brings together the Indian Army's (IA) Para-Special Forces regiments; Indian Navy's (IN) Marine Commandos; and Indian Air Force's (IAF) Garud Commandos under a single command structure.

At the Land Forces exhibition in Melbourne, Australia, India's Defence Research and Development Organisation (DRDO) promoted its latest combat freefall (CFF) parachute ensemble which, according to officials, recently began to enter service with the IAF's Garud Commando Force.

Displayed on a mannequin at the event, the CFF system was certified for service with Indian SOF earlier in the year with initial units with the Garud Commando Force currently in process of receiving the new parachute system as AMR went to press.

According to the DRDO, the CFF system "provides a total solution to paratroopers jumping from as high as 30,000ft and gliding 30km to land at a desired target".

"The system consists of a 9-cell Ram Air parachute; state of the art oxygen system, safety devices, jumpsuits, helmet-mounted hands-free communication system, navigation aids, gloves, shoes. The system can be used in High Altitude High Opening (HAHO) and High Altitude Low Opening (HALO) modes," it was added.

The parachute itself measures 8.84m in length, with total area of 34.28 sqm, providing SOF operators with a lift/drag ratio of 3.3:1 and forward speed of 21kts.

The parachute has an assembly weight of 48 pounds (22 kilograms) and payload capacity of 330lb (150kg). Typically, operators will descend 1,000ft (304m) every two minutes in a controlled descent.

India SOF operators will also be able to conduct low altitude parachute insertion at altitudes as low as 2,00ft (610m) above ground level, DRDO officials added.

Indian SOF will be able to insert using the parachutes from a variety of fixed and rotary wing assets including the Indian Army Aviation Corps' Special Operations Squadron's Light Utility Helicopter (LUH); CH-47F(I) Chinook; and C-130J Hercules.

Finally, Indian SOF are also on the lookout for a subsurface insertion capability with IN Marine Commandos or MARCOS) seeking a SDV/TDV similar to requirements elsewhere in the Indo-Pacific in the Republic of Korea and Japan.

In 2019, the Indian MoD is understood to have chosen an TDV by Vogo although no craft had yet been delivered to the customer.

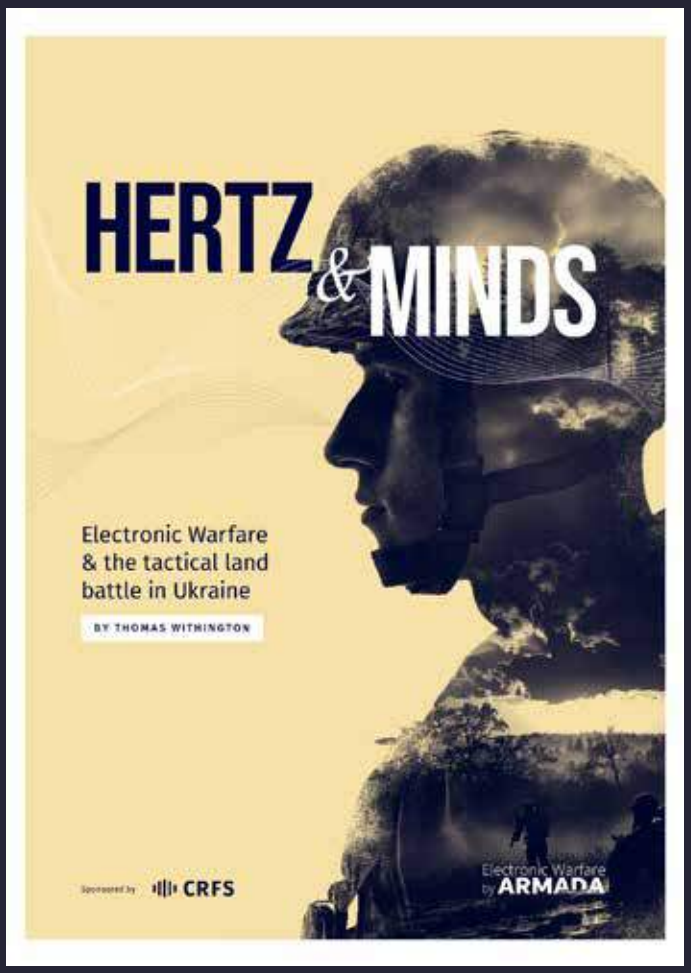
Industry sources suggested the contract would not be cancelled but instead considered the Indian MoD could reinvigorate the requirement with an additional programme of record for a new platform.

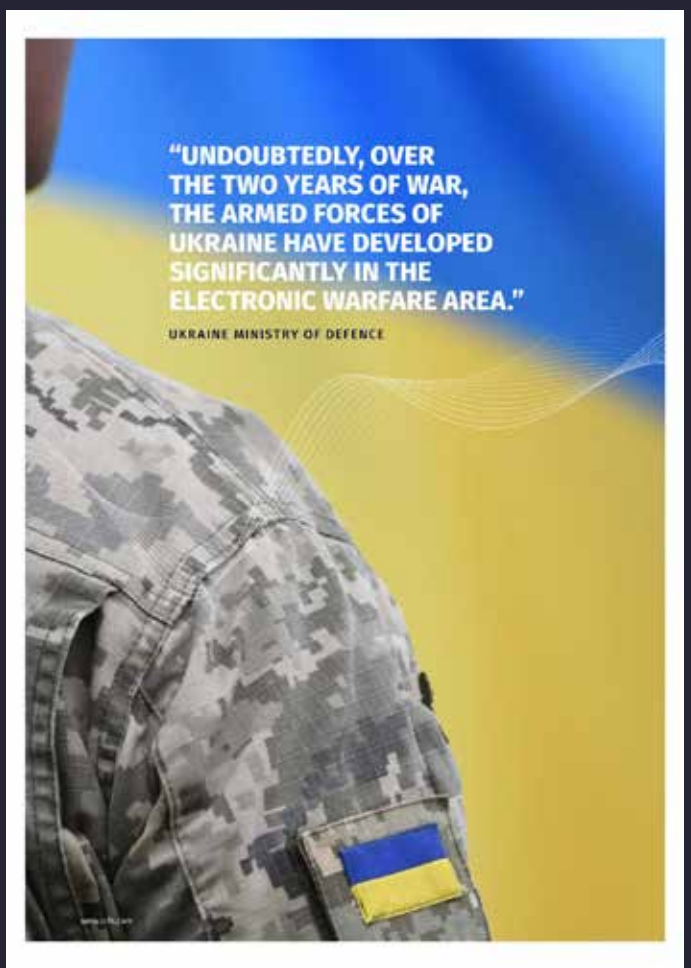
Sources suggested a second competition could be initiated by 2025. The MoD was unable to comment on any decision.

Conclusion

This new 'arms race' in the Indo-Pacific shows no signs of abating as China in particular, continues to ramp up conventional and non-conventional capabilities across the region.

SOF from across the region must be prepared to launch special operations at any time and anywhere, most likely in a multi-lateral environment against highly capable and well equipped adversaries. A





Electronic Warfare by ARMADA INTERNATIONAL

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Colonel Ben McLennan of the Australian Army's Combat Training Centre explains Exercise Talisman Sabre's scenario using a large-scale map laid out on the floor.

LVC TRAINING MOVES CLOSER TO SUPPORTING OP-TEMPO REQUIREMENTS

Australia is becoming the Indo-Pacific standard for military live, virtual and constructive training.

By Gordon Arthur

Military training has taken on new urgency as the Indo-Pacific region reacts to sterner security threats such as a more aggressive China, and as lessons are absorbed from the ongoing conflict in Ukraine.

A prime example of the valuable combination of live, virtual and constructive (LVC) training was *Talisman Sabre* 2023, a massive multilateral exercise held in Australia. The centre of gravity of the live training was the Townsville Field Training Area, where approximately 10,000 soldiers conducted wargames.

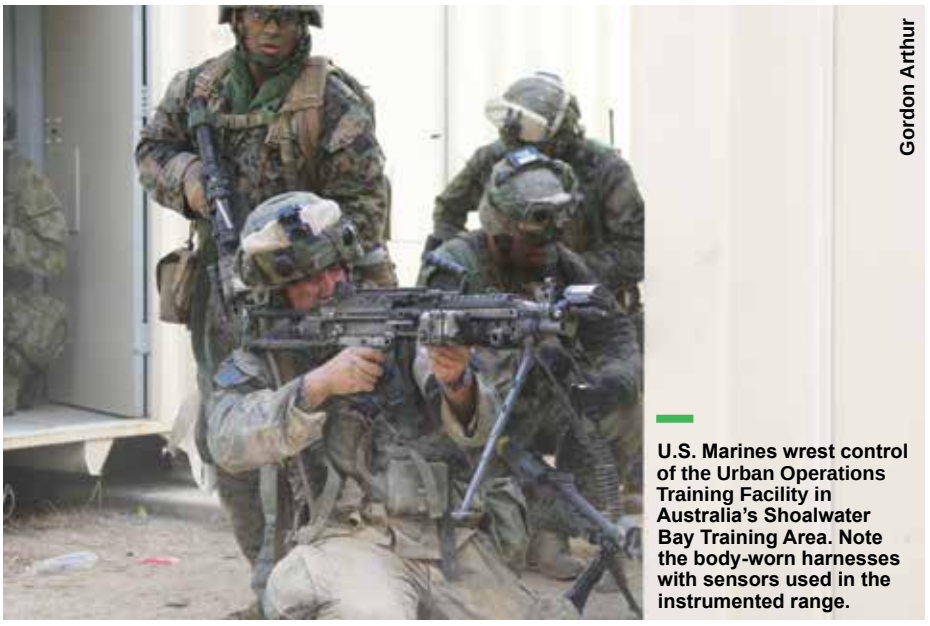
Colonel Ben McLennan, Commander of the Australian Army's Combat Training Centre (CTC), explained: "This activity that's occurring here is just the richest, most immersive and most realistic, no-consequence training environment that we can possibly create. We're calling it the Olympics of wargames, because it's the biggest, most ambitious *Talisman Sabre* ever." As well as soldiers on the ground, the exercise involved significant LVC elements. For instance, extra brigades to both the west and east were simulated in the land battle.

Colonel Bryan Martin, the U.S. Army's Operations Commander for the Hawaii-based Joint Pacific Multinational Readiness Center (JPMRC), highlighted two experimental firsts for the JPMRC during *Talisman Sabre* 2023. "The first is we're fully integrated and developing interoperability with the Australian CTC to increase the capacity and capability in both of our armies to exercise in the Indo-Pacific. The second part, we're working on initiatives from U.S. INDOPACOM to connect digital warfighting, digital wargaming, all the way from Oahu down to the tactical level here in Townsville." The JPMRC's 'exportable' combat training centre model simulates the kind of pre-combat training that occurs at Fort Irwin and Fort Polk in the United States.

During *Talisman Sabre*, the CTC Fusion Cell located in Townsville was managed by Cubic. Mick Reilly, director of learning, said the idea was to act as a mirror, not as a ruler, when providing feedback to participating units. Coaches were embedded in forces down to the combat team level, and these provided interactive and immediate feedback and mentoring. An example of inputs might be reminding an officer of recommended tactics, or showing a video recording of a recent action using a tablet connected digitally to the Fusion Cell. Cubic employed around 100 staff in Townsville during the exercise.

Case study – Australia

Continuing the Australian theme, that particular country acts as a useful case study for LVC training. Indeed, one industry source regarded Royal



U.S. Marines wrest control of the Urban Operations Training Facility in Australia's Shoalwater Bay Training Area. Note the body-worn harnesses with sensors used in the instrumented range.

Australian Air Force (RAAF) training as being among the most modern in the world, and certainly within Asia-Pacific.

Mark Horn, Cubic's director of business development, Oceania, told *Asian Military Review* that Cubic supports Australia's three armed services. It provides the technical solution for the CTC's deployable live instrumentation system, plus it holds another service contract called Exercise and Advanced Training that entails varied elements such as exercise planning, management, coaching, medical training, role players and pyrotechnic/non-pyrotechnic events. Horn said the contract is dynamic because it depends entirely on Australian requirements. "As a provider, you need to be in a position to accept that dynamic workload and be flexible enough to respond to it," Horn related.

Cubic also works with the RAAF's Air Warfare Centre and Air Combat Group, providing LVC instrumentation to improve performance and generate readiness outcomes. Although normally based at Williamtown and Amberley, this system is deployable in Pelican cases, meaning it can be taken overseas to places like Guam and Thailand.

"We do that in the air by providing plotted telemetry for jet fighters," including inboard equipment on the F-35, "and then allowing resolution of an air battle in terms of shot evaluation and also tracking of the progress. So I'd say that we'd provide simulation of the air battle effects that can include ISR as well as kinetic effects and some cyber effects, and then the ability to control the exercise whilst it's actually occurring." Cubic then offers analysis and feedback to enable understanding of what really happened.

Cubic also supports the Royal Australian Navy (RAN) for exercises, readiness planning and management. "In the training space, we execute mostly constructive simulation for the purposes of training the operations room of ships," plus its simulations support the principal warfare officers' course.

Mark Graper, senior vice president, Global Solutions at Cubic Defense, pointed out that his company has a major presence in Singapore where thousands of national servicemen are trained annually. "We're privileged to support that training. But equally, the Singapore Army deploys to Australia to take advantage of its very large training ranges, each of which is larger than the entire country of Singapore. So having

Cubic manages the Shoalwater Bay Training Area's UOTF, and this is a view of the control centre that records all the action.

training operations in both Singapore and Australia, we're uniquely poised to support those deployed operations for the Singapore military" at places like Shoalwater Bay, Queensland.

Cubic has an engineering facility in New Zealand, where training equipment is designed and made. Such equipment is used regionally in places like Indonesia, Japan and Singapore.

CAE is another company supporting Australian military training with technology, design, instruction, engineering, maintenance and project management, its support dating back nearly 30 years. For example, CAE delivers rotary-wing training for naval aviators, plus technical training to enable sailors to operate and maintain systems and technologies aboard Canberra-class landing helicopter docks, Hobart-class destroyers, Supply-class replenishment vessels and Huon-class minehunters.

CAE also trains aircrews and pilots, employing Hawk 127 full-mission simulators and providing instruction for fast-jet pilots undertaking the RAAF's lead-in fighter conversion and lead-in fighter tactical courses.

Wider region

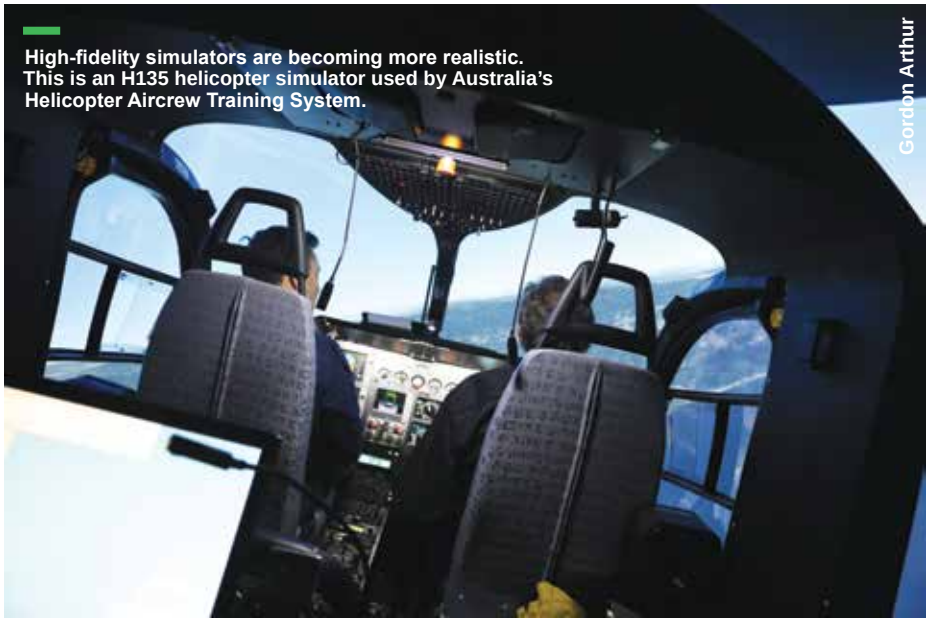
CAE has a regional presence in Brunei, India, Indonesia, Japan, the Philippines and Singapore. Indeed, its footprint extends to more than 200 training and simulation devices across the Indo-Pacific, supported by 350+ specialist staff.

A spokesperson told *AMR*, "CAE has heavily invested in the research and development of training approaches and technology specific to the needs of the region, including data-informed networks and artificial intelligence-driven tools that enhance the training experience for instructors and students. These advancements offer clearer management across the entire training continuum, with insights on performance throughout the entire journey to improve coordination between training cycles."

Since 2014, the CAE Brunei Multipurpose Centre has served Association of Southeast Asian Nations (ASEAN) customers as the region's largest helicopter training facility. "It offers an immersive training experience for Sikorsky S-92 and S-70i rotary-wing operators through the provision of classroom and synthetic training, with full mission simulators delivering the most precise mission training required for offshore operations, ship landing, oil rig operations, search and rescue, hook and hoisting operations," the spokesperson explained. Its courses have trained some 9,800 ASEAN students to date.

CAE supports multi-domain training and multinational exercises. As one example, it recently worked with industry partners to support LVC exercises on Guam. This involved linking fast-jet small footprint trainers with the Joint Terminal Controller Training and Rehearsal System (JTC-TRS) and Virtual Intelligence/Surveillance/Reconnaissance Training Application (VISTA) to support training and operational mission networks across the Indo-Pacific.

CAE has the ability to integrate systems and devices to incorporate live



High-fidelity simulators are becoming more realistic. This is an H135 helicopter simulator used by Australia's Helicopter Aircrew Training System.

Gordon Arthur

and virtual participants in the same training environment. This is "partially hosted through a cloud-based common environment that links training devices such as simulators to enable a more distributed, networked and cyber-secure mission training experience," the company elaborated. In fact, "The Simulator Common Architecture Requirements and Standards (SCARS) programme provides a classified network for personnel to train in a synthetic all-domain mission setting, anytime and anyplace, improving their ability to plan, execute and learn from their missions in a more integrated and effective manner."

Assessing the regional market, CAE's spokesperson said: "There are a few aspects of operations in the Indo-Pacific that make it unique compared to Europe or the Americas. Firstly, the geographical distance is incredibly vast, with thousands of miles separating the various airfields, ports, logistics hubs and potential operational areas. This makes the distribution of command and control, communications and logistics capacity especially challenging for whole-of-nation or multinational operations. For forward-facing deployed forces to train together in a realistic and timely manner, at the desired level, the need for synthetic and advanced solutions is fundamental."

Saab is another company with a prominent training footprint in the region. Without divulging individual customers, Hans Lindgren, head of business development at Saab's business unit Training & Simulation, told *AMR*, "Saab has a number of customers in the Asia-Pacific region who use our training solutions, and we see potential in the region that will enable multinational training, including Australia."

Lindgren added: "Saab, including its Australian operations, leverages its global experience delivering training solutions to more than 40 nations around the world." Saab's products encompass live, virtual and live-fire training, plus training services. Lauding their realism, Lindgren said the company's systems can be used at the individual soldier level through to combined-arms brigade collective training. It has contracts with the U.S. Army and USMC, the latter's instrumentation systems offering "additional possibilities for their organisation to deploy forces and train within an interoperable framework in order to maintain regional stability and alliances," including within Asia-Pacific.

Lindgren noted: "Interoperability and cooperation between nations is becoming more common among armed forces around the world. The Saab solution is technology-agnostic, meaning laser as well as other technologies such as geo-pairing, can be used to enable a blended solution, facilitating the possibility to include artillery, combat support and long-range missiles in training. Additionally, by including virtual and constructive aspects to a live training scenario, more holistic and effective training can be executed."

Technologies

In August, Bohemia Interactive Australia announced that New Zealand's military had granted it a contract to upgrade VBS4 virtual desktop simulation systems. This VBS4 suite is used for collective tactical and mission rehearsals. Ryan Stephenson, Bohemia Interactive Australia's managing director, said, "The NZ Army's Command and Control Systems School are real power users of simulation tools, and have developed considerable expertise in leveraging simulation as a multiplier to produce training effects for their servicemen and women."

Trevor Smith, a senior instructor at Bohemia Interactive Simulations, explained to *AMR* that its virtual-reality software allows unlimited training space for personnel to walk, drive or fly through. The company provides the sandbox, so to speak, and militaries can add their own elements such as enemy combatants. The software helps train decision-making, records everything from every angle, and a head-mounted helmet can give participants 360° views. Other regional customers include Singapore, South Korea and Taiwan.

Systematic is well known for its SitaWare battle management software, and it offers a training product called SitaWare Aspire with which to trains users at all levels. A recent customer was the British Army, which trained 200 personnel in just six days.

As an example of an application of virtual reality, the Australian company FLAIM Systems recently announced an Australian Army contract for its Sweeper product. Sweeper is a fully immersive countermine and explosive hazard awareness training system that builds muscle memory. It uses virtual reality to simulate mine and explosive hazards across diverse scenarios, whether it be in Ukraine or Solomon Islands.

South Korea's army is expanding its number of instrumented live-fire training sites from four to nine by next year. Seoul will also expand indoor shooting ranges and shooting ranges with barriers, with 25 new facilities to be added in 2025. This year it released a tender seeking three instrumented ranges for urban operations too.

Virtual-reality training systems depend upon suitable headsets or goggles. Microsoft, for instance, is working on the U.S. Army's Integrated Visual Augmentation System (IVAS) with its commercial HoloLens head-up display. IVAS is billed as a device for soldiers that can be used in combat, in darkness and for mixed-reality training, though

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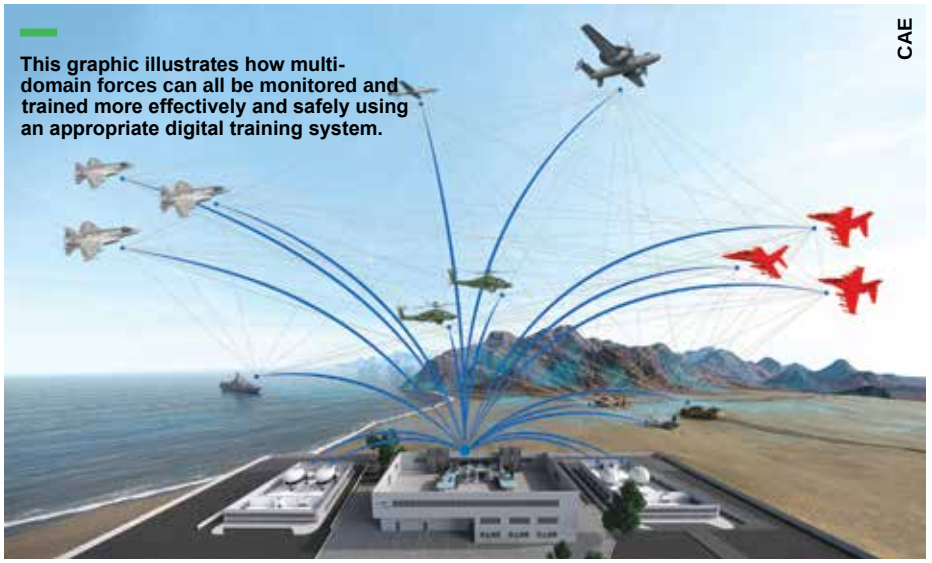
CAE

This graphic illustrates how multi-domain forces can all be monitored and trained more effectively and safely using an appropriate digital training system.

the programme has had difficulties. So far, the US Army has acquired 5,000 1.0 glasses, with plans to buy 5,000 1.1 units for limited use. Microsoft is also working on a new "make or break" 1.2 version, with tests starting next year to determine whether the project should continue.

The future

Cubic's Graper predicted LVC will become more popular and more useful in the future. "I think we're just at the beginning, and the reason is there will always be live training and there will always be some things that are done in simulators only. But increasingly, high-value training will be a blend of live and synthetic, and the thing about the LVC blend is it allows us to replicate training effects that you see in the news from Ukraine, but we can't necessarily do it all live." LVC training can thus go beyond direct fire – such as laser on laser, or tank gun versus tank gun – to replicate an almost infinite range of effects.

As technology advances, "The greatest benefits have yet to be realised," Graper enthused. Indeed, industry is mostly ready to move forward, but it can only do so at the pace of requirements issued by militaries. "So we try to encourage our end users and customers to think about what the offerings are, what the possibilities are."

Graper shared that pilots, for instance, cannot always fly live, "Because, for one, I don't want to show all my cards in peacetime. And number two, it's very expensive and I might not have a range space and it may not be safe. But if I can replicate the scenario with the realistic threat density and complexity, then I'm forcing blue [force] to train to a tough scenario in a realistic fashion."

Some Asian pilots might consider it beneath their dignity to fly in simulators rather than a real jet. However, most are getting beyond such a prohibitive mindset as the realism of simulators increases, plus some air forces cannot afford to fly as much as they would like to. CAE also sees further LVC training opportunities as regional militaries introduce next-generation platforms and increase manned-unmanned teaming.

CAE observed that "popularity is growing in the creation of a distributed LVC capability using both dedicated training and operational networks, as well as adding training capability to existing operational systems. Live training missions must be able to benefit from the addition of virtual and constructive blue and red forces to make training as realistic and challenging as personnel would experience when they're deployed." However, the importance of enhanced cybersecurity measures cannot be understated when moving simulation systems to new networks.

CAE observed that, to achieve agile command and control, personnel must be able to access centrally managed training at their deployed locations. These must be "connected securely and systematically, planned and executed together with allied participation. LVC capability for the Indo-Pacific region must therefore span all echelons of military operations – from tactical to operational and strategic."

The company further remarked: "Defence forces and governments continue to find ways to maximise efficiency and enhance readiness through training, which includes allowing active-duty personnel to focus on operational requirements and reduce demand on live platforms. There has been a growing trend among defence forces to adopt synthetic training environments for a greater percentage of their overall training, and outsourcing a variety of training and operational support services to reduce cost, risk and operational demand."

Virtual and constructive training mitigates risk, and multi-domain scenarios can be tailored and repeated until desired proficiency levels are reached. Furthermore, virtual training significantly reduces carbon footprints compared to live training. As CAE put it: "LVC training systems deliver efficient, consistent and repeatable training environments that keep up with the operational tempo of forward-deployed forces, allowing them to train on their schedule and extend their continuity of training through rehearsal in theatre." A


Saab

Soldiers utilise one of Saab's numerous training aid devices, in this particular case it is one to replicate mortar firing procedures.

Kelvin Wong

Flying display by AVIC's Shenyang J-35A.

CHINA'S MODERN AIR THREAT ARRIVES - EXIT RECYCLED RUSSIAN JETS

Air Show China demonstrated that Chinese air power is leaving behind its legacy Russian jets in favour of nationally developed platforms.

By Reuben F. Johnson

One of the main stars of the China International Aviation & Aerospace Exhibition that took place in Zhuhai, Guangdong province (12-17 November) was the Shenyang J-35A fighter. The design is an F-35-looking analogue with two engines instead of the single-engine design of the U.S. jet that now is being touted as the next-generation carrier-fighter for the People's Liberation Army Navy Air Force (PLAN AF). Mocked a decade ago as a lacklustre-performing aeroplane it emerged in a new, re-designed form and was the star of this year's Zhuhai event.

The People's Republic of China's (PRC's) new-generation fighters cause observers to ask if there is a new ranking of which country is now in the lead in the development of combat aircraft?

Harkening back to the Cold War, there was definitely a competition between the U.S. and the USSR. Looking at the skies above Le Bourget in 1989, the competition was clearly between the Sukhoi Su-27 and Mikoyan MiG-29 v. the General Dynamics (now Lockheed Martin) F-16, McDonnell Douglas (now Boeing) F/A-18 and the Rafale.

But that was – in the universe of the military aerospace industry – in a galaxy far, far away. This year, the line up of which players occupy what position has clearly changed.

In November 2024, the Air Show China expo celebrated the 28th year of its founding. If there is now a theme to this event it is that the "who's on first" aspect of this dynamic has definitely altered.

In the early 2000s this expo had a very distinctive character. Russia's aerospace sector, which at the time was the main supplier of almost every major weapon system to the PRC had an overwhelming presence. That meant that there were two types of aeroplanes in the flight display at the time. These were: 1) Chinese versions of previous-generation aircraft initially built in the USSR like the Mikoyan MiG-21, and, 2) 1980s Russian aircraft like the Sukhoi Su-27 that Chinese industry were going to reverse-engineer and copy within the next few years.

Both categories of Chinese fighters were no match for the western models that they would have to confront in any kind of an international conflict. Even in the early 1990s, the best European and U.S. designs were heads and tails above the best that Beijing and Moscow could throw into a conflict against them.

Future Shock

Moving into the future and only two and a half years ago, the Vice Chief of Naval Operations, Admiral William Lescher, told the House Armed Services Committee that the tables have since turned.

China clearly is the pacing threat for the U.S. military, he said. "The Navy brings a strong view that the decade of concern is 2020 — and in some respects, that's not a universal view in the department. But we consistently believe and have thought that that's the decade that we see of peak risk and that we're going to be ready for."

His assessment was not far behind the sentiments of the Air Force Secretary Frank Kendall, who told a conference in the U.S. at about almost the same time, that, "despite current events, the pacing challenge remains China."

This "pacing change" narrative remains the most apt characterisation of today's PRC v. the collective West situation in the combat aircraft arena.

At this year's Zhuhai, the PLAAF's

AVIC Hall main feature with J-20S twin seat and J-35A aircraft models.

rapidly expanding Chendgu J-20 stealth fighter fleet, which made its first flight in January 2010, was one of the big stories. The J-20 is a platform that has grown in capacity and performance – mostly thanks to improvements in radar technology, radar systems and propulsion.

As one Asian analyst observed, "the PRC is gaining fast on the U.S. as it [Washington] grapples with rising costs, modernisation delays and internal debates over the future of air dominance."

According to numerous reports, in 2024 the PLAAF expanded its fleet of J-20 "Mighty Dragon" fifth-generation fighters. There are 12 air brigades of this type as of May 2024. This is a notable increase from just 40 of this type in service in early 2022. Some 70 additional aircraft have entered service in the past year alone.

The J-20 was designed to be the PRC foil against the U.S. Lockheed Martin F-22A and F-35 and it is one of the key platforms designed to be the 'point of the spear' in the PRC's grand project to extend Beijing's power beyond its littoral waters. That goal is paramount to these ambitions in the South China Sea, Taiwan Strait and Western Pacific.

Consequently, the U.S. Navy and its allies are about to confront an entirely new generation of combat systems in this part of the world, all showcased in Zhuhai.

Beijing's List

Overall, Beijing is planning to make the PLAAF and PLAN AF all-5th generation forces in the Asia-Pacific region. They will replace the older Shenyang J-11 series (copies of the Russian Su-27) and the comparable Su-27SK models originally sold to the PRC in 1991 with the J-20.

Analysts looking at the J-20 of today point out that the aircraft has evolved significantly in the past 13 years. The most notable of these improvements are the swapping out of the Russian 1980s-design Lyulka AL-31F engines with the PRC's Shenyang 5th-generation Emei WS-15 engine.

"Cutting the cord, so to speak, of China's decades of reliance on Russian engines may be one of the most significant advancements that Beijing can point to in its building a military machine that can confront the U.S.," said a retired US intelligence officer who specialised in the China threat during his career.

"China has historically lagged in this area of technology but now seems to be catching up with the rest of us in the West," he continued.

The new and improved [Chengdu] J-20 is only one of signs that the U.S. has its hands full in its competition with the PRC. Chengdu's rival, the Shenyang Aerospace Corporation, had their own innovations that they were showcasing at Zhuhai this year. Two modernised versions of the carrier-capable J-15 (the Shenyang design team's copy of the Russian Su-33) made their debut in Zhuhai.

One is the J-15T, a new variant that permits the aircraft to be launched with a catapult instead of taking off from the ski-ramp carrier deck of the PLAN CV-16 Varyag and CV-17 Shandong. Another is the F-15D, an EW platform designed to be a counter to the USN's Boeing EA-18G Growler.

The U.S. clearly faces a growing challenge in the region but has not come up with a definitive answer. Is it the USAF 6th-generation Next-Generation Air Dominance (NGAD) fighter or a larger number of less-expensive platforms like the Boeing F-15EX. Ditto for the USN.

What aircraft replaces the F/A-18E/F in the naval aviation face-off against a PLAN that has just launched its third carrier. This decade holds the answer to these questions. A

Aircraft static display area at Airshow China 2024.

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A test firing of the Collins Aerospace ACES 5 ejection seat using a crash seat dummy.

Collins Aerpsace

RAPID EXIT: EVOLVING EJECTION SEATS

As aircraft designs evolve, so must the means of saving the pilot when the aircraft is lost.

By David Oliver

Ejection seats for pilots and aircrew were pioneered by the British aviation company Martin-Baker at the onset of the jet age at the end of World War Two. Since 1946 Martin Baker ejection seats and crashworthy seats have saved over 7,700 lives and there are over 16,200 seats currently in service worldwide.

Martin Baker is responsible for supplying all the ejection seats for all three Lockheed F-35 Lightning II variants which are a further development of the Mk16 seat used on other U.S. aircraft including the Beechcraft T-6 Texan II advance turboprop trainer. According to Martin-Baker, the US16E is the only Qualified Ejection Seat that meets the U.S. Government defined Neck Injury Criteria (NIC) across the pilot accommodation range. While older F-16 variants used Collins Aerospace's ejection seats, the latest variant, the Block 70/72 are fitted with Martin-Baker US18E ejection seats

which have commonality with the F-35 ejection seat and are based on the US16E.

The Martin-Baker Mk14 ejection seat, more commonly known as SJU17A and Navy Aircrew Common Ejection Seat (NACES), is currently in service in the Boeing F/A-18 and T-45 Goshawk. The NACES was developed to take aircrew safety and survival to a higher level of control. Used in the F/A-18, and T-45, the NACES is the most advanced seat used in the United States Navy inventory which uses a digital electronic sequencer along with airspeed sensors and electrically-fired systems on the seat to allow for five separate modes of operation. Version differences include mainly seat bucket shape, headrest and canopy breaker configuration, and other changes to accommodate the various cockpit requirements.

Beyond the computer controlled firing sequence, it uses the same basic frame from the Mk10 series of seats including the tubular seat adjustment rails which allow for easy disassembly. The drogue gun has been replaced with a rocket-deployed system that moves the drogue parachute from the headrest to the large tubular structure on the top of the main beam assembly. With the addition of the electronic sequencer, the scissor shackle has been eliminated.

The main recovery parachute is housed in the headrest and deployed by a rocket located on the left main beam assembly. The sequencer computer module fits under the headrest above the shoulder harness. The sequencer is actuated by dual thermal batteries which are in turn actuated by hot gas from the duel initiators located under the seat firing handle at the front of the seat bucket.

In 2022, the U.S. Navy discovered an issue affecting cartridge actuated devices (CAD) which deploy a parachute when the pilot pulls the ejection handle, in some of its fixed-wing aircraft including the F/A-18B/C/D Hornet, F/A-18E/F Super Hornet, E/A-18G Growler, and T-45C Goshawk training and F-5N Tiger II adversary aircraft.

After being notified of a potential defect by the supplier, Martin-Baker, the U.S. Navy team used validated radiography procedures to scan on-hand inventory to verify each item was properly manufactured before sending to the fleet to replace existing CADs. Cleared replacement parts were shipped to several fleet maintenance centres and in less than 45 days.

The Secretaries of the U.S. Navy and USAF are required to provide semi-annual reports to Congress on the status of ejection seats in use, thanks to a provision included in the 2022 National Defense Authorization Act. Specifically, the services must detail how many ejection seats have a waiver that allows them to remain in use, even if repairs or replacement parts are necessary. The measure followed the 2020 death of USAF pilot 1st Lt. David Schmitz, who suffered an ejection seat malfunction during an F-16 mishap.

The Martin-Baker Navy Aircrew Common Ejection Seat (NACES) being removed from a US Navy F/!8E Super Hornet.

At the same time the USAF Air Education and Training Command temporarily grounded two potentially impacted trainer fleets, the T-6A Texan IIs and T-38C Talons, some 300 aircraft in total, due to concern over defective cartridges.

A crash seat dummy used for a test of the next generation ejection seat (NGES) for the Boeing T-7A Red Hawk trainer.

ACES

Apart from Martin Baker, the only other Western company making ejection seats for high performance fighter and training aircraft is Collins Aerospace which manufactures the ACES ejection seats. Introduced in 1978, there are currently 6,000 ACES II seats in service on various aircraft, including the USAF's A-10, F-15, F-16, F-22, B-1 and B-2 fleets, as well as all F-15s and F-16s worldwide. The seat was introduced in 1978. In 2020, Collins Aerospace was awarded a $700 million firm-fixed-price contract for the delta qualification, production and fielding of a next generation ejection seat (NGES) for various USAF aircraft including the new Boeing/Saab T-7 Red Hawk advanced trainer.

The T-7's digital design process and advanced manufacturing techniques have been highlighted by Boeing as a potential

Matin-Baker

The Martin-Baker Mk16A ejection seat fitted to the Eurofighter Typhoon.

model for designing and building next generation aircraft faster and with fewer risks and defects. However, problems, including concerns over the aircraft's new ACES 5 ejection seats and other emergency egress systems, have slowed progress.

The T-7 was designed to accommodate pilots with a wider range of body types and heights, as well as both male and female pilots. In the past USAF aircraft and their cockpits were designed with fitting only men in mind, and women frequently found it difficult to receive clearance to fly ;with tests showing that the T-7's emergency escape system could be dangerous for some pilots. In 2021 the USAF admitted that tests found some ejecting pilots could be at a high risk of concussions, unsafe acceleration when parachutes open, or losing their visor at high speeds. Since than, the USAF and Boeing stated that minor adjustments to the ACES 5 seat have increased safety and reduced the risk to pilots.

However, ;the new T-7A pilot training jet won't be ready for initial operations until 2028, documents show, putting the programme another year behind schedule.

Originally, the T-7A was supposed to be ready for initial operations in 2024 but testing revealed continuing problems with the aircraft's ejection seat that have pushed the in-service date back to the second quarter of fiscal 2028, according to budget justification documents submitted with the 2025 budget issued in March 2024.

The Air Force Life Cycle Management Center's Mobility and Training Aircraft Directorate has successfully tested the ACES 5 escape system drogue chute that will go on the T-7A aircraft.

"We're testing a possible new use of the ejection seat drogue chute," said Dr. Dan Mountjoy, T-7A Crew Systems Lead Engineer with the directorate's T-7A Program Office. "The ejection seat configuration we're going to be using on the T-7A has not been used on any other platform or for the full anthropometric range of occupants. It's going to need to safely eject pilots that weigh between 103 and 245 pounds."

Historically, the drogue chute was designed to slow the ejection seat and occupant down after an ejection at speeds above 250 knots and before the personnel parachute is deployed. Working closely with the ACES 5 developer, Collins Aerospace, and the T-7A Prime contractor Boeing, the programme office needed to gather important data at speeds below 250kts and ensure the system will properly operate and supply the necessary drag to improve stability during the slower speed ejections. Four tests were accomplished at Hurricane Mesa Test Facility in Utah in November 2023.

Joe Rich, Air Vehicle Branch, Flight Systems Lead Engineer for the programme office said, "The adaptation of an existing test sled and existing drogue chute assets allowed the programme to collect the data needed in a very dynamic environment of constantly changing airspeeds during test runs. This allowed for cost savings and proof of theory for possible use of the drogue chute in slower speed ejections."

The T-7A programme has also gathered an extensive amount of amass properties information and aerodynamic wind tunnel data of the ACES 5 family of seats with the aid of the 711th Human Performance Wing at Wright Patterson Air Force Base and the 716th Test Squadron, Arnold Engineering Development Complex at Arnold Air Force Base, Tennessee. All the testing and data collection will go into an update to the modelling software for the ejection seat performance.

BAE Systems

BAE Systems are using a rocket-propelled sled to test future ejection seat systems for the next generation Tempest fighter.

The next phase of testing accomplished a fully integrated dynamic sled test in February 2024 at Holloman Air Force Base, New Mexico to gather more information needed to confirm any system updates before the implementation and resumption of its qualification programme. All the data collected is being used to determine the necessary changes that need to be made to make the T-7A escape system safe for all body types and sizes, thus meeting the USAF's mandate to accommodate a larger range of pilots.

The importance of the success of the ACES 5 system will make way for its adoption for the new B-21 and the manned element of the USAF's Next-Generation Air Dominance (NGAD) programme to to deliver a 6th-generation fighter to replace the F-22 Raptor.

The Eurofighter Typhoon is fitted with the Mk16A NXG ejection seat and Martin Baker is part of the UK team developing the RAF's next generation fighter aircraft, Tempest. Working alongside Martin Baker, a team of BAE Systems engineers has led ejection seat trials, using a rocket-propelled sled travelling at speeds of more than 434kts. Alongside Martin Baker and BAE Systems, the team behind the crew escape system includes experts from GKN for canopy design, Hamble Aerospace for detonator cords, and rig manufacturers EDM, as well as specialists from the Royal Air Force's Rapid Capabilities Office (RCO) and scientists from the Ministry of Defence.

A Swedish UH-60M Black Hawk fitted with Martin-Baker's lightweight folding utility seat.

Crashworthy Seats

Martin-Baker also manufactures what it calls 'crashworthy' seats for helicopters and fixed-wing transport aircraft. Its Multi-Functional Operators Seat (MFOS) offers 360º rotation with locking at intermediate positions. There is an option to add sideways seat movement in installations where a floor overlay pallet is used for seat integration. The lightweight MFOS is Army qualified to the requirements of AS8049/a Type B but with an increased occupant size and weight ranges now specified for military products.

Martin-Baker's Troop and Gunner seats were designed and developed to meet the new improved crash requirements of the Sikorsky UH-60M Blackhawk using Martin-Baker's patented energy attenuation technology.

Both seats are designed and tested to MIL-S-85510 using the latest military standards for occupant size and weight. The troop seat is qualified for fore and aft facing installations. The gunner seat is qualified for side facing installations. Both seats incorporate a fold-up sitting platform with a sitting sling. The gunner seat is fitted with three acceleration sensing MA-16 type inertia reels and a stand-up harness that allows the user 48 inches of webbing payout to manoeuvre around the cabin.

Since 1958, the German company AUTOFLUG has been performing repair and maintenance for Martin-Baker ejection seats in Germany as well as manufacturing components under licence. AUTOFLUG's troop seats for soldiers and parachutists offer high protection at minimum weight and with maximum installation and removal flexibility. Extensive tests have shown that the troop seats meet the highest crash safety, flammability and sustainability standards.

Its safety seats for pilots and crew members of military helicopters feature a low weight, while complying with military crash safety requirements. Seats can be provided with ballistic protection, if required. To ensure maximum flexibility AUTOFLUG currently develops modular seat concepts enabling the extension of standard seats, which include a foldable headrest, weapon supports or splinter protection.

Building on its legacy brand, Simula, BAE Systems is providing innovative, life-saving products to the rotorcraft market. Since introduction of the first successful military crashworthy crew seat in the UH-60 Black Hawk in 1977, BAE Systems has been a pioneer in aerospace crash safety and combat survivability, manufacturing military folding troop seats to FAA- certified lightweight helicopter crew and passenger seats. The S7000 seats are crashworthy and include armoured options for military crew seating applications. The S5000 line of crashworthy seats features lightweight designs for crew seating applications. With many available options, the S5000 seats are easily adaptable to any platform. BAE Systems Mission Adaptable Crew Seat (MACS) features vertical and horizontal adjustment, seat back and pan cushions support for comfort. It is fitted with 5-point restraint with dual-action rot buckle and inertial reel, a fixed headrest and is night vision goggle (NVG) compatible. An optional armoured seat features the quick installation or removal of armour panels without tools, and advanced lightweight armour materials provide ballistic protection against .50 cal projectiles. A

IS AUSTRALIA PURSUING SOVEREIGN WEAPON PRODUCTION WITH ENOUGH URGENCY?

By Gordon Arthur

Lockheed Martin

GMLRS rockets for HIMARS will start rolling off Australian production lines next year.

Australia, belatedly recognising that China represents a grave security threat, created the Guided Weapons and Explosives Ordnance (GWEO) Enterprise to oversee a more comprehensive sovereign weapons production capacity on home shores. GWEO was created on 8 May 2023.

Eighteen months on, questions spring to mind. Is GWEO giving Australia a genuine sovereign manufacturing base, one that benefits Australian national interests, and is the government moving quickly enough?

Initially there was little evidence of GWEO's progress, but momentum has been growing in the past few months. On 16 September, Canberra announced investment of $15 million (A$22 million) in a solid rocket motor factory, with plans to be producing motors for both Australia and others by 2030. Simultaneously, Australia announced $38 million over five years to "develop the next generation of guided-weapons subsystems and components, such as hypersonic and long-range strike".

In January, Lockheed Martin Australia was granted an $24 million contract to begin assembling Guided Multiple Launch Rocket Systems (GMLRS), and this will occur in 2025. GMLRS is one of four weapons GWEO has prioritised so far – the others being the Evolved SeaSparrow Missile, 155mm artillery ammunition and Naval Strike Missile (NSM).

Speaking of the latter, Kongsberg Defence Australia will establish a new missile production facility in Newcastle, with the government contributing up to $555 million. Factory construction will commence before year's end, and it will produce and service both NSMs and Joint Strike Missiles. Production for Australia and regional customers will commence in 2027.

The company told *Asian Military Review:* "This is a significant military and industrial capability that's being delivered to Australia. Strategic partnership provides a platform for active engagement and ongoing collaboration for the manufacture and maintenance of these weapons, increased supply chain involvement, and the ongoing development and upgrade of these capabilities."

As alluded to here, Kongsberg was admitted as a third strategic partner for GWEO, alongside Lockheed Martin Australia and Raytheon Australia. Kongsberg's inclusion goes some way to countering criticism that GWEO is just benefitting large American conglomerates.

Nonetheless, there is synergy between Australia and the USA. To use a favoured Chinese expression, it is "win-win". American companies recognised after the COVID-19 pandemic that they needed to diversify global supply chains. Plus the protracted Ukraine war created a seismic shift, as the USA attempts to de-risk its supply chain by adding capacity elsewhere. Apart from meeting its own domestic demands, Australia can export weapons back to the USA and elsewhere.

Is everything rosy then? Travis Reddy, CEO of DefendTex, asked: "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 Australian Defence Force capable of conducting its mission? The overwhelming answer is no."

In wartime the USA will clearly not be able to supply Australia with all that it needs. Reddy pondered: "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."

Reddy called such thinking naïve, and described such dependence as certainly not being sovereign.

Malcolm Davis, senior analyst at the Australian Strategic Policy Institute, also raised concerns. "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."

Davis advocated local production of longer-range weapons like LRASM anti-ship, JASSM-ER air-to-surface and Tomahawk cruise missiles. He added, "There's a tendency by government to default to the primes. Everything must go through Lockheed Martin, Boeing, Thales or whatever. Let's see what SMEs can do in terms of things like long-range missiles. Give them a chance to actually demonstrate their capabilities."

There is a peacetime mindset to overcome too. Whilst Russian and Chinese industry is on a wartime footing, Australia is behaving as though it still has one or two decades to sort things out. In fact, analysts predict that the coming few years represent the highest risk of Chinese aggression against Taiwan. A

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