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Front Cover Photo:
The Asia-Pacific's naval forces are profiled in this issue's Naval Directory.



ARMING THE ARCHIPELAGO

Alex Calvo explores the security challenges, both internal and external, faced by the Philippines armed forces.



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The capabilities of naval surveillance radars equipping large naval platforms, is migrating down to smaller combatants, *Thomas Withington* explains.

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Catch up on all the latest defence radio frequency news and analysis in *Thomas Withington's* regular *Pulse* column.



Editorial

ISLAND RECORDS

Traditionally, the Communist Party of the People's Republic of China (PRC) has balked at what it sees as external interference in the internal affairs of a country, particularly its own. Little surprise then that it has chosen to reject a ruling made by the Permanent Court of Arbitration (PCA), based in The Hague, the Netherlands, regarding its maritime and territorial claims in the South China Sea.

The Philippines had brought a case to the PCA arguing that the PRC's so-called 'Nine Dash Line' is a violation of the terms of the United Nations Convention on the Law of the Sea (UNCLOS). Manila claimed that the positioning of the line violated the stipulations of the UNCLOS regarding territorial waters and exclusive economic zones which extend up to 200 nautical miles (370.4 kilometres) from a nation's coastline.

On 12 July, the PCA upheld several of the Philippines' claims regarding its fishing rights around the Scarborough Shoal in the South China Sea, and parts of the disputed Spratly Island archipelago. Unsurprisingly, the PRC chose not to recognise the PCA's judgements arguing that the Philippines had already agreed to resolve any differences over the South China Sea bilaterally with the PRC through the auspices of the Association of South East Asian Nations (ASEAN), of which the Philippines is a member. The PCA ruling is unlikely to change the *status quo* in the South China Sea. The PCA has no way of forcing the implementation of its judgement, and the Philippines is too weak militarily to challenge the PRC. Moreover, the latter course of action could significantly increase tensions in the South China Sea, and wider Asia-Pacific region. The Philippines' new president Rodrigo Duterte, seen by some domestic political observers as having an accommodating approach to Sino-Philippines relations, has stated that he will discuss these matters directly with the PRC rather than through ASEAN.

While Beijing is unlikely to change its mind regarding the ruling, the fact that Mr. Duterte seems willing to solve such issues bilaterally should encourage Beijing to take up his offer. The PRC wants to be seen as a responsible actor in the Asia-Pacific and beyond. The country is unlikely to change its opinion regarding its opposition to third party interference in its internal affairs, but the commencement of a dialogue to solve existing disputes with the Philippines would demonstrate Beijing's responsible credentials.

Thomas Withington, Editor

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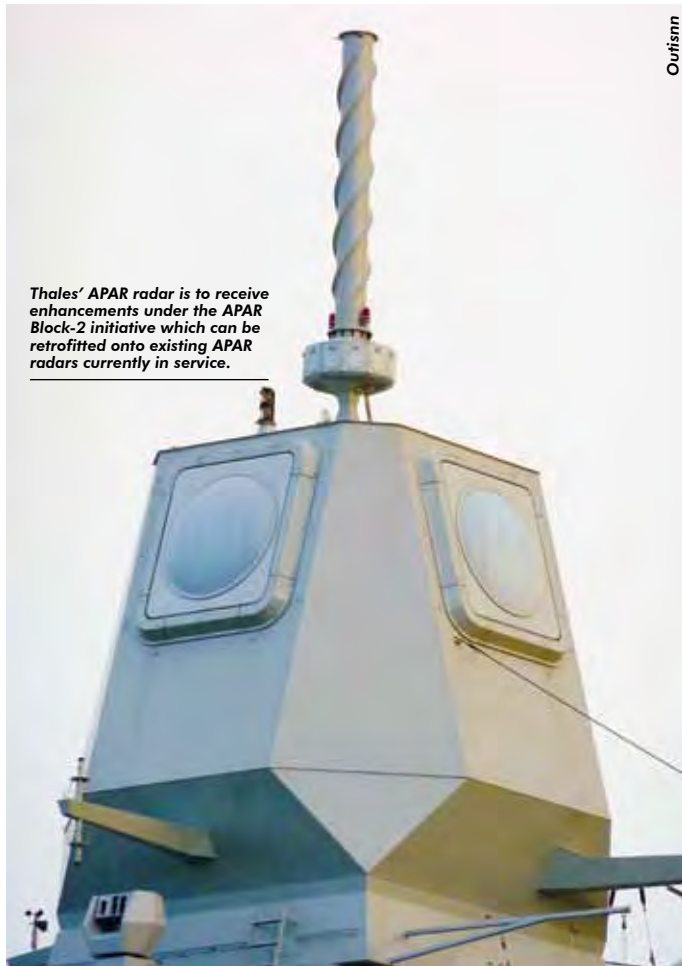
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Beechcraft

TEXTRON AVIATION

by Thomas Withington

In this issue's *Pulse*, Thales reveals enhancements to its APAR naval surveillance radar, while Leonardo launches a new airborne surveillance radar, Raytheon improves its air-launched decoys and Bittium discloses its latest tactical radio waveform developments.



Thales' APAR radar is to receive enhancements under the APAR Block-2 initiative which can be retrofitted onto existing APAR radars currently in service.

Radar

Thales has told *AMR* that the technology it is developing for its new APAR Block-2 naval surveillance radars can be retrofitted onto existing APAR systems. Moreover, the company states that the APAR Block-2 will be available for export. Thales announced that it was developing this new version of the APAR radar in late May. The company is planning to develop the new radar as part of the Royal Canadian Navy's (RCN) Canadian Surface Combatant (CSC) initiative which will develop a single ship design to replace the RCN's current 'Halifax' class destroyers; a total of twelve ships. The government of Canada is currently defining the requirements for the CSC programme, which is not expected to commence production until early next decade, with open source reports stating that around 15 new vessels will be procured.

Thales' APAR radar uses an Active Electronically Scanned Array (AESA) containing 3000 transmit/receive modules, according to the company. Transmitting in X-band (8.5-10.68 Gigahertz/GHz), the radar has a range of circa 80.9 nautical miles/nm (150 kilometres/km), tracking 200 targets simultaneously. The company adds that the radar can control simultaneous air

and surface engagements, covering 360 degrees in azimuth and 85 degrees of elevation. The radar is in service onboard the *Koninklijke Marine* (Royal Netherlands Navy) 'De Zeven Provinciën' class frigates, the *Deutsche Marine* (German Navy) 'F-124 Sachsen' class frigates and the *Søværnet* (Royal Danish Navy) 'Iver Huitfeldt' class frigates. Due to confidentiality agreements, Thales was unable to disclose to *AMR* what new technology the APAR Block-2 version of the radar will include, or when development of this new version is expected to be completed.

Leonardo (formerly Finmeccanica) meanwhile has updated *AMR* regarding its new Osprey multi-mode radar which the firm launched in early May. This X-band (8.5-10.68GHz) radar is interesting as it employs flat panel radar antennae, each of which can cover 120 degrees of azimuth, and plus or minus 30 degrees of elevation, according to the firm. A small aircraft, such as an Unmanned Aerial Vehicle (UAV), can carry a single panel, while a larger platform such as a naval support helicopter, or a maritime patrol aircraft, can carry up to three panels to provide full 360 degree azimuth coverage. The company added that the radar has an instrumented range of circa 200nm (370km). Crucially, the radar also employs AESA technology. The flat panel design is particularly useful for customers who do not wish to position a radome on the belly of their aircraft, should there be a risk of that radome getting damaged by an impact with objects on the ground when the aircraft lands on uneven surfaces, or those covered by snow or sand. This was the case for Norway which is procuring the radar to outfit its AgustaWestland/Leonardo AW-101 search-and-rescue helicopters, operated by the *Luftforsvaret* (Royal Norwegian Air Force/RNAF). The force is receiving 16 of the aircraft; each of which will carry the Osprey radar in a three-panel configuration, with deliveries of the helicopters commencing in 2017 and expected to conclude in 2020.

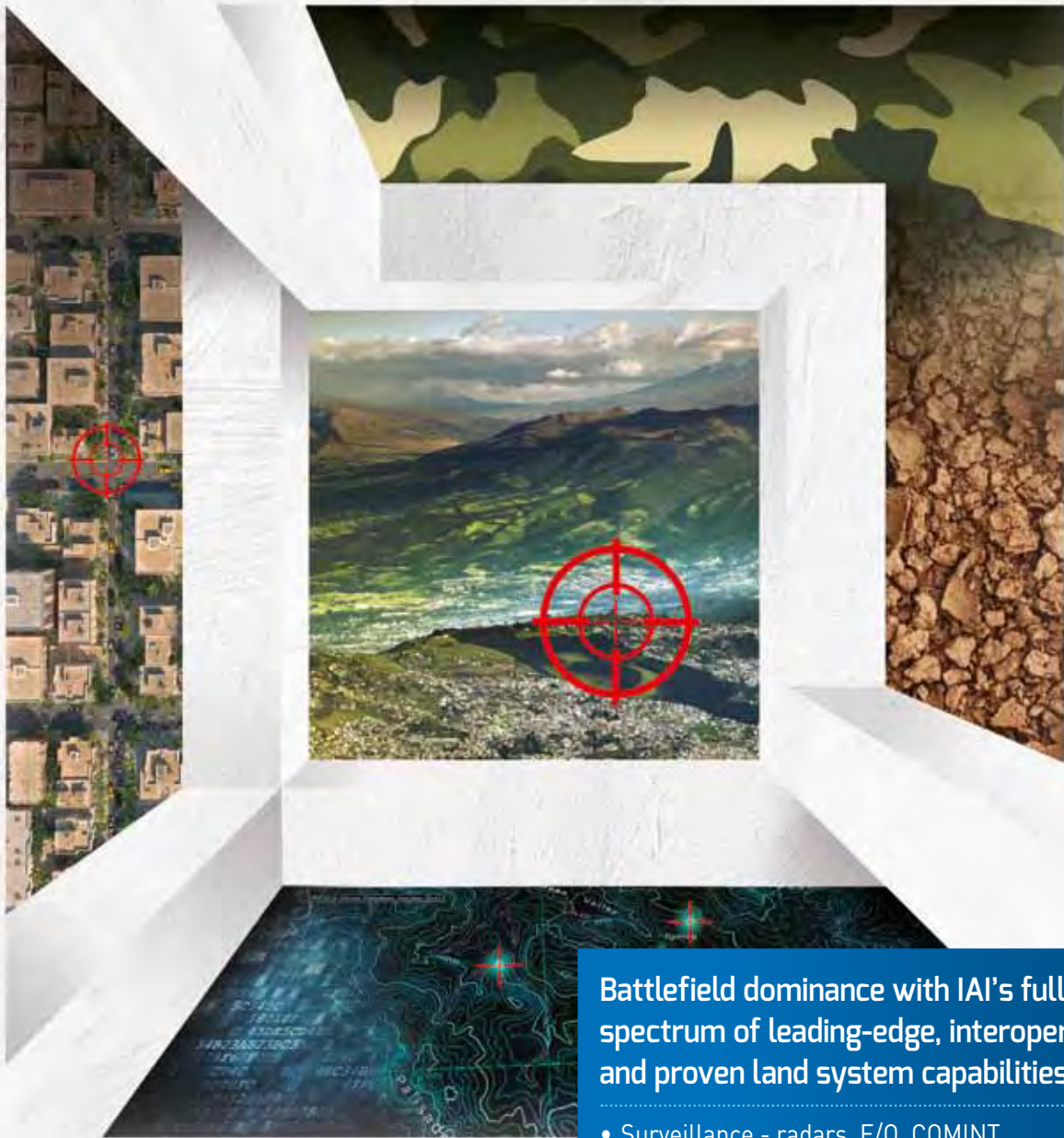
Staying with Leonardo, the company has provided additional details to *AMR* regarding the development path of its Captor-E X-band radar expected to equip the 28 Eurofighter Typhoon

aircraft ordered by Kuwait in April. In addition, the radar can be retrofitted into Typhoon Tranche-2/3A fighters already in service. The Captor-E is being developed by a consortium which includes Airbus, BAE Systems, Indra and Selex/Leonardo; collectively known as the Euro radar consortium. In a written statement provided to *AMR*,



Leonardo's new Osprey airborne surveillance radar uses flat panel antennae to dispense with the necessity of mounting a radome beneath the aircraft, and will equip the AW-101 helicopters of the Royal Norwegian Air Force.

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WHEN RESULTS MATTER



Work moves ahead on developing the Captor-E fighter aircraft radar which will equip the Eurofighter Typhoon aircraft destined for the Kuwaiti Air Force.

Leonardo stated that it is “on track to meet contracted programme deliverables.” In terms of delivery schedules for the Kuwait Air Force, and other Tranche-2/3A users, the firm stated that: “The Captor-E radar ... will be incrementally enhanced over the next three years to be available for the first deliveries to the Kuwait Air Force.” The original contract was signed in November 2014 by the North Atlantic Treaty Organisation (NATO) Eurofighter and Tornado Management Agency (NETMA) which manages the Eurofighter Typhoon programme on behalf of the original NATO customers for the aircraft; namely Germany, Italy, Spain and the United Kingdom. Following the signature of the contract, the Euroradar consortium commenced its funding of the programme. Regarding future developments, the company told AMR that “now the flight test programme is underway further flights, including powered flights of the radar, are scheduled to take place later this year.”

Looking towards the United States, Lockheed Martin has self-funded the software enhancements that allow the company’s AN/TPQ-53 S-band (2.3-2.5/2.7-3.7GHz) counter-battery radar to detect UAVs, the firm has told AMR, via an official statement. This follows the company’s announcement on 27 June that it had successfully demonstrated the radar’s ability to detect and track UAVs. The initiative occurred as part of the US Army’s Manoeuvre and Fires Integration Experiment held at Fort Sill, Oklahoma, in late April. The AN/TPQ-53 WLR can track incoming rounds at 32nm (60km) range scanning 90 degrees of azimuth, or at up to eleven nautical miles (20km) range when scanning 360 degrees of azimuth.

The US Army is receiving 51 of these radars. An initial



The US Army’s AN/TPQ-36/37 weapons locating radar will eventually be replaced by the AN/TPQ-53 system which has recently undergone trials to demonstrate enhancements to its software.

contract was issued to Lockheed Martin which was worth \$172 million to cover the delivery of twelve systems to the US Army. On 30 April 2012, the company was awarded an additional production order worth \$391 million encompassing two contracts for the delivery of up to 33 radars by the end of 2014. Options exist for the US Army to order an additional 38 systems which could be worth up to \$481 million. The AN/TPQ-53 will replace the US Army’s existing Lockheed Martin/Raytheon AN/TPQ-36/37 Firefinder weapons locating radars. Lockheed Martin has given no time line as to when the new UAV detection and tracking capability could be rolled onto the AN/TPQ-53, although it did tell AMR that the company “is working with the US Army on the next steps to bring these crucial new capabilities to its AN/TPQ-53 radar systems.”



The replacement of the USAF’s AN/TPS-75 radar is moving forward via the 3DELRR programme, the contract for which has now received a modification.

The United States Air Force (USAF) announced in early August that it has modified the contract for its forthcoming Raytheon 3DELRR (Three-Dimensional Long-Range Radar) ground-based air surveillance radar. This new radar will replace the USAF’s Northrop Grumman AN/TPS-75 S-band ground-based air surveillance radar. In October 2014, the USAF awarded an Engineering and Manufacturing Development (EMD) contract to Raytheon although this was later suspended when other potential contractors filed protests with the US government spending watchdog the Government Accountability Office. The USAF will now solicit proposals for the 3DELRR design from Lockheed Martin, Northrop Grumman and Raytheon with contracts for the low-rate initial production expected in the near future of the radar and later full rate production expected in the near future. An award of a contract to this end is now expected in the second quarter of 2017, with replacement of the AN/TPS-75 expected to conclude by 2028, according to an official USAF press release announcing the news.

Electronic Warfare

Raytheon has launched the latest version of its ADM-160 Miniature Air-Launched Decoy (MALD). On 10 July, the USAF awarded the firm a contract worth \$34 million to demonstrate the MALD-X variant of the ADM-160B/J decoys already in service with the USAF. According to publicly available information, the MALD-X design enhances the electronic warfare capabilities of the ADM-160J which can jam hostile radars. In addition, the MALD-X can fly at comparatively low altitudes, and has a data link allowing it to share the information it gathers regarding the electronic order-of-battle in its locale with other off-board platforms and subsystems. According to Jim Long who leads the business development of the ADM-160B/J family at Raytheon: “The MALD-X is a demonstration only of improvements to the MALD-J, not a replacement for MALD-J. It will never be fielded, but the improvements could be fielded later by either, or both, the

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The USAF's VC-25A is one of several aircraft which is tasked for transporting dignitaries, which will receive significant enhancements to its SATCOM capabilities via a contract awarded to ViaSat.

USAF and USN (US Navy) as the next evolution of the MALD with expanded capabilities." In terms of the MALD-X's capabilities, Mr. Long continued that; "the MALD-X will have an improved jamming payload with more power, more frequency coverage and more jamming techniques than what is currently available on the ADM-160J." In addition, the MALD-X will have the same size and weight as the ADM-160J. Regarding the next steps for the programme, Mr. Long adds that Raytheon "plans to demonstrate MALD-X through two live fire events before contract conclusion. Tentatively plans call for these to occur in February 2018."

Other new electronic warfare products to recently grace the international stage include Bird Aerosystems' SPREOS (Self-Protection Radar Electro-Optic System) Directional Infra-Red Countermeasure (DIRCM). Launched at the Eurosatory exhibition held in Paris this June, the product is designed to protect airborne platforms against infrared guided missiles, particularly those fired by Man-Portable Air Defence Systems (MANPADS). The company told AMR that the product can be "used in a wide range of airborne platforms, ranging from small helicopters to large transport aircraft." The statement from Bird Aerosystems added that the product is currently; "in final stages of development," and scheduled to commence flight testing in early 2017. While the firm demurred from providing details regarding potential customers, it did tell AMR that the launch of the SPREOS has "attracted the attention of several customers who have expressed interest in integrating the product in their aircraft." The statement continued that one of the key attractions of the product was its ability to "integrate the multiple functions of missile launch confirmation, tracking and jamming into a single line replaceable unit."

Tactical Radio

Finnish tactical communications specialists Bittium have provided AMR with an update regarding the work that the firm is performing on the pan-European ESSOR (European Secure Software Defined Radio) waveform initiative. Commencing in 2010, ESSOR is a programme which is managed by OCCAR (*Organisation Conjointe de Coopération en Matière d'Armement*/Joint Armament Control Organisation); a European intergovernmental organisation which manages collaborative arms programmes involving Belgium, France, Germany, Italy, Spain and the United Kingdom. The initiative aims to develop

a high data rate wideband networking waveform for software defined radios which can be made available to the participating nations of Finland, France, Italy, Poland, Spain and Sweden. This intends to improve interoperability by providing a waveform which can be used across the participating nations, and other third party countries in the future, and thus ported into the tactical radios used by these nations.

Bittium is one of several companies involved in the development of ESSOR, alongside Thales, Selex/Leonardo, Radmor, Saab and Indra. According to Harri Romppainen, vice president of defence at Bittium, the Finnish defence forces plan to employ the ESSOR waveform in their tactical radios from company level, down to platoon and squad levels. Currently, the firm has completed porting the ESSOR waveform into its TAC WIN high data rate IP (Internet Protocol) wireless network, which provides an IP network on the battlefield, providing a communications backbone from brigade to company levels.

TAC WIN takes the form of a compact and robust TAC WIN Tactical Router and three optional TAC WIN Radio Heads which cover the 225MHz to five gigahertz frequency range. The Tactical Router forms the wired and wireless IP networks while the three Radio Heads allow troops to connect to the TAC WIN network and hence have IP access. It is these Radio Heads which are receiving the ESSOR waveform. This means that the Tactical Router can effectively act as a junction carrying TAC WIN and ESSOR traffic, with the firm demonstrating this interoperability at the Eurosatory exhibition in Paris in June where the TAC WIN showed that it can carry voice, video and data traffic using the ESSOR waveform between TAC WIN and French Thales PR4G tactical radios. A similar demonstration at the event demonstrated the TAC WIN using the ESSOR waveform to perform live video streaming with a Selex/Leonardo tactical radio. Mr. Romppainen told AMR that the firm plans more field trials in Finland to prove ESSOR's capabilities using TAC WIN. Beyond this, the firm hopes to begin demonstrating the operational capability of the TAC WIN-ESSOR combination from 2017 with a project to this effect lasting up to four years.

SATCOM

California-based Satellite Communications (SATCOM) specialists ViaSat were celebrating a \$73 million contract awarded by the Defence Information Systems Agency, a US Department of Defence (DoD) combat support agency providing communications and IT (Information Technology) support to the Executive branch, DoD and US military commands, to equip US aircraft carrying dignitaries with SATCOM services. The aircraft to be equipped include the United States Air Force Boeing VC-25A (a Boeing 747-200B airliner known as 'Air Force One' when it is carrying the President of the United States), Boeing C-32A (a Boeing 757-200 airliner configured for dignitary transport), Boeing C-40B (a Boeing 737-700 business jet configured for dignitary transport) and US Navy/USAF Gulfstream C-37A/B (a Gulfstream G-550 business jet configured for dignitary transport). ViaSat will offer global SATCOM services employing its own ViaSat-1, Anik-F2 and WildBlue-1 spacecraft which provide near-global Ka-band (26.5-40GHz uplink/18-20GHz downlink) satellites, plus additional leased Ku-band (14GHz uplink/10.9-12.75GHz downlink) capacity from third party operators. The contract will run until 31 May 2017, with two additional six month extension periods. [AMR](#)

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THE CRUEL SEA

Surface and submarine forces in the Asia-Pacific continue to expand. A major catalyst for this over the past two decades has been People's Republic of China's proactive stance in the South China Sea, with the Vietnam People's Navy showing a particularly dramatic increase in its warfighting capabilities.

by Trevor Hollingsbee



AWD Alliance

All three of Australia's 'Hobart' class destroyers are currently under construction. Following many delays, they are all due to join the RAN fleet by 2020, to replace the 'Adelaide' class frigates. They will provide strong anti-submarine and surface warfare capabilities, as well as air defence.

Meanwhile, Australian, Japanese, Indian, Philippine and US navies have continue to step up co-operation in, and adjacent to, the South China Sea, with the Philippines' fleet being significantly bolstered by surplus vessels provided by Tokyo, Canberra, Seoul and Washington. More details regarding the Philippines Navy can be found in Alex Calvo's *Arming the Archipelago* article in this issue. Besides the maritime and territorial claims of the PRC (People's Republic of China) and other actors in the South China Sea, for example, Brunei-Darussalam, Malaysia, the PRC, the Philippines, Taiwan and Vietnam claim all, or part, of the Spratly Islands archipelago. In addition to such security concerns, there are worries in the region over periodic surges in regional piracy, and maritime insurgency, while the Republic of Korea (RoK) continues to contend with frequent hostile armed maritime incursions from the Democratic People's Republic of Korea (DPRK). In May 2015, the DPRK warned that it would open

fire on any RoK naval vessels which it deemed to be violating the maritime border between the two nations.

As the region's naval orders of battle continue to evolve, Asia-Pacific shipbuilding, maintenance and repair companies are expanding their portfolios with hefty workloads to build and modernise the region's vessels. Like all *AMR* directories, the *Naval Directory* has been compiled with insights from government and industry experts, and open sources. We encourage readers to contact us with any information they may have that may make the directory more informative and accurate.

AUSTRALIA

■ ROYAL AUSTRALIAN NAVY

Ship Type	Number in Service
'ANZAC' class frigate	8
'Adelaide' class frigate	3
'Hobart' class destroyer	Three under construction, all due in service by 2020 to replace the 'Adelaide' class
'Armidale' class offshore patrol vessel	13 (one retired in 2015 after serious fire damage sustained 2014)
'Cape' class offshore patrol vessel	Two temporarily assigned from Australian Border Force
'Huon' class mine countermeasures vessel	6
'Collins' class conventional hunter-killer submarine	6
'Leeuwin' class hydrographic ship	2
'Paluma' class survey	4
'Bay' class dock landing ship	1
'Durance' class replenishment vessel	1
'Sirius' class replenishment vessel	1
'Cantabria' class replenishment vessel	Two under construction in Spain to replace the 'Durance' and 'Sirius' classes
Aviation training vessel	One under construction in Vietnam, based on Damen frigate design



US Navy

The 'ANZAC' class destroyers have been the workhorses of the RAN and their replacement is now being considered under Canberra's ambitious proposed naval shipbuilding programme. The new frigates are likely to be larger than the 'ANZAC' class, and a number of competing European designs are being evaluated.

The Royal Australian Navy (RAN) is a busy force, with a range of regional, and multi-national, treaty and defence co-operation commitments, as well as frequent regional emergency response and humanitarian relief tasks. Meanwhile, 2016 has seen the unveiling of radical indigenous warship construction plans, which, if they come to fruition, could substantially boost future RAN capabilities and status. For example, earlier this year, DCNS was selected to build twelve conventional hunter-killer submarines (SSKs), based on the French Navy's forthcoming 'Barracuda' class nuclear-powered attack submarines, to replace the existing 'Collins' class SSKs. Twelve Offshore Patrol Vessels (OPVs) are to be constructed, to replace the 'Armidale' OPVs, which have proved to be less than ideal for the sea conditions prevailing in Australia's northern approaches. Damen, Fassmer and Lursenn are offering competing designs. Nine new frigates are to replace the 'ANZAC' class, with a choice to be made between designs tendered by BAE Systems, Fincantieri and Navantia. Finally, two underway replenishment vessels are now under construction by Navantia in Spain, and are due in service in the early 2020s.



Trevor Hollingsbee

A Thai corvette, and Bangladeshi OPV, secured together in Singapore following exercises at sea, symbolising regional naval co-operation.

BANGLADESH

■ BANGLADESHI NAVY

Ship Type	Number in Service
'Ulsan' class frigate	1
'Jianghu-II' class frigate	1
'Hamilton' class frigate	2
'Jianghu-III' class frigate	2
'Ming' class conventional hunter-killer subma rine	Two due to enter service by the end of 2016, to be used for training purposes.
'Castle' class corvette	2
'Durjoy' class corvette	2, plus two under construction.
'Type-056' class corvette	2, plus two under construction
'Island' class offshore patrol vessel	5
'Sea Dragon' class offshore patrol vessel	1
'Padma' class offshore patrol vessel	5
'X12' class fast attack craft	Eight being constructed in Bangladesh
'Type-024' class fast attack craft	5
'Type-021' class fast attack craft	4
'Kraljevica' class patrol boat	2
'Type-062-1' class patrol boat	1
'Type-037' class patrol boat	1
'Type-062' class patrol boat	4
'Type-021' class patrol boat	1
'Chamsuri' class patrol boat	4
'Meghna' class patrol boat	2
'Roebuck' class hydrographic ship	1
'Agradoot' class hydrographic ship	1
'Type-010' class mine countermeasures vessel	1
'Khan Jahan Ali' class replenishment tanker	1
'River' class mine countermeasures vessel	4
'Island' class training ship	1
'Yuchin' class mechanised landing craft	5

The indigenously-built tanker Khan Jahan Ali, commissioned in September 2015, gives the Bangladesh Navy a modern replenishment-at-sea capability. The Bangladesh government confirmed late last year that two 'Ming' class conventional hunter-killer submarines, to be used mainly for training, are due to be supplied by the People's Republic of China during 2016. Totals of six 'Durjoy' and eight 'Type-056' class corvettes are planned. Meanwhile, the eight 'X12' class fast attack craft being built domestically are based on the Indonesian derivative of the Dockstarvet Combat Boat 90 design. Reports that three Royal Navy 'River' class offshore patrol vessels are to be transferred to Bangladesh from 2018 remain unconfirmed.

BRUNEI-DARUSSALAM

■ ROYAL BRUNEI NAVY

Ship Type	Number in Service
'Darussalam' class offshore patrol vessel	4
'Itjihad' class inshore patrol vessel	4
'TBD' class fast attack craft	1
'Serasa' class mechanised landing craft	2

'Teraban' class utility landing craft	2
'Bendeharu' class inshore patrol vessel	3
PDB 0-1' class inshore patrol vessel	11
'FDB 512' class inshore patrol vessel	2

The formerly low-key Royal Brunei Navy's profile continues to rise, and it exercises regularly with the maritime forces of other Asia-Pacific nations. A defence agreement signed with India early in 2016 reportedly included plans for the acquisition of Indian-built warships.

BURMA

■ BURMESE NAVY

Ship Type	Number in Service
'Kyan Siththa' class frigate	2
'Aung Zeya' class frigate	1
'Jianghu-II' class frigate	2
'Anawratha' class corvette	3
'Houxin' class fast attack craft	6
'49 series' fast attack craft	2, construction programme expected to continue
'Super Dvora' class fast attack craft	1, five more on order
'5-Series' class fast attack craft	21
'T- 201' series motor torpedo boat	1, construction programme expected to continue
'Admirable' class mine countermeasures vessel	1
'Hainan' class fast attack craft	9
'Osprey' class offshore patrol vessel	2
'PGM-43' class inshore patrol vessel	6
'Y311' class inshore patrol vessel	1
'Y Series' class inshore patrol vessel	10
'Swift' class inshore patrol vessel	1
'Carpentaria' class inshore patrol vessel	6
'412' class inshore patrol vessel	4
'PB-90' class inshore patrol vessel	3
'PBR' class river patrol vessel	6
'Yan Naing' class river patrol vessel	11
'Michao' class river patrol vessel	25
'PCE' class river patrol vessel	4
'Thalwin' class hospital ship	1

Burma has diluted its dependence upon the People's Republic of China for the supply of defence equipment, and now has a very active indigenous warship building programme. The second 'Kyan Siththa' class frigate was commissioned at the end of 2015. These warships have a low radar cross section, and weapons and sensors sourced from a wide range of nations. The induction of a new class of motor torpedo boat, optimised for anti-submarine warfare, and six very advanced Israeli-built 'Super Dvora' class fast attack craft, is substantially boosting Burma's littoral capabilities. Reports indicate that there are plans to form a submarine arm, probably equipped with Russian 'Kilo' class conventional hunter-killer submarines, and that some Burmese personnel have received submarine training in Pakistan. Burma conducted its largest-ever naval exercise between February and March, in the vicinity of the Coco Islands, in the northeast Indian Ocean.



US Navy

15 patrol craft supplied by China about years ago are the most modern element in Cambodia's small naval force. The Cambodians are seeking frigates or corvettes from China.

CAMBODIA

■ ROYAL CAMBODIAN NAVY

Ship Type	Number in Service
'Turya' class fast attack craft	5 probably unserviceable
'Type 206' class fast attack craft	2
'Stenka' class fast attack craft	2, modified versions have been confirmed active. Status of another three remains uncertain



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'21 metre' class patrol	2
'Shershen' class fast attack craft	1, status uncertain
Chinese- built fast patrol craft	15, at least two classes of vessel for offshore, and inshore patrol
Utility Landing Craft	1

The serviceability of the navy's vessels reportedly remains poor, although the service is able to get some units to sea, and continues to exercise with US and regional navies. In early 2016 Cambodia reportedly requested two frigates or corvettes from the People's Republic of China.

DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA (DPRK) ■ DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA NAVY

Ship Type	Number in Service
'Sang-O' class conventional hunter-killer submarine	Over 40 produced in two variants, probably still in production
'Sinpo' class conventional hunter-killer submarine	1 in service, more expected eventually
'Yono' class midget submarine	10
'Romeo' class conventional hunter-killer submarine	20 numbers are reducing, one reported lost at sea in 2016
'Whiskey' class conventional hunter-killer submarine	4, probably not all operational
'Krivak' class frigate	One ex-Soviet ship, probably supplied as a hull and awaiting completion.
'Najin' class frigate	2
'Nampo' class corvette	Two to three thought to be under construction
'Sariwon' class corvette	4
'Tral' class corvette	2 probably inactive
'A/B' class fast attack craft	4
'Nongo' class fast attack craft	Probably six in service, production continuing
'Soju' class fast attack craft	8
'Huangfeng' class fast attack craft	4
'Sohung/Komar' class fast attack craft	12
'Shershen' class fast attack craft	3
'Sin Hung/Ku Song' class fast attack craft	142
'P6' class fast attack craft	12
'Ku Song' class fast attack craft	60
'Taechong I/II' class patrol boat	13
'Hainan' class patrol boat	6
'Chodo' class patrol boat	3
'Choing-Ju' class patrol boat	6
'SO-1' class patrol boat	19
'Shanghai II' class patrol boat	13
'Sinpo' class patrol boat	18
'Chongjin' class patrol boat	54
'Chado' class patrol boat	59
'Hantae' class utility landing craft	10
'Hungnam' class mechanised landing craft	15
'Hanchon' class utility landing craft	15
'Nampo' class personnel landing craft	195
'Kongbang' class assault hovercraft	140
'Yukto' class mine countermeasures vessel	23

The 'Nongo' fast attack craft are probably derived from the deleted 'Soho' class catamaran frigate, and both gun and missile armed versions exist. The 'Nampo' frigates will be helicopter-capable, and reportedly displace about 1300 tonnes. At least one 'Najin' class frigate had been extensively modified by 2015, and fitted with Tactical Missiles Corporation Kh-35 anti-ship missiles, and Kalashnikov AK-630 close-in weapon systems. Reports indicate that the 'Sinpo' class conventional hunter-killer submarine is capable of firing ballistic missiles, and has probably taken part in at least one submerged test firing. About 20 DPRK-designed 'Yono' class midget submarines, designated as the 'Ghadir' class by Iran, have been indigenously manufactured in Iranian domestic shipyards for that nation's navy.

INDIA ■ INDIAN NAVY

Ship Type	Number in Service
'Chakra' class nuclear-powered attack submarine	One leased from Russia



A powerful Russian-built general purpose frigate of the 'Talwar' class, which plays an important role in Indian Navy battle groups. India is acquiring six of the similar but more advanced, 'Admiral Grigorovich' class, which are under construction in Russia.

'Arihant' class nuclear-powered ballistic missile submarine	One in service and one under construction
'Sindhughosh' class conventional hunter-killer submarine	10
'Shishumar' class conventional hunter-killer submarine	4
'Kalvari' class conventional hunter-killer submarine	1, five under construction, more planned
'Centaur' class aircraft carrier	One to decommission in late 2016
'Vikrant' class aircraft carrier	One under construction
'Kiev' class aircraft carrier	1
'Kolkata' class destroyer	2 plus one under construction
'Delhi' class destroyer	3
'Rajput' class destroyer	5
'Shivalik' class frigate	3
'Talwar' class frigate	6
'Brahmaputra' class frigate	3
'Admiral Grigorovich' class frigates	Three to enter service, purchased in 2016 while already under construction in Russia
'Kamorta' class corvette	2 plus two under construction
'Kora' class corvette	4
'Khukri' class corvette	4
'Veer' class corvette	12
'Abhay' class corvette	4
'Austin' class amphibious assault ship	1
'Shardul' class tank landing ship	3
'Magar' class heavy landing ship	2
'Kumbhir' class heavy landing ship	4
'Pondicherry' class mine countermeasures vessel	7
'Saryu' class offshore patrol vessel	4
'Sukanya' class offshore patrol vessel	6
'Car Nicobar' class patrol boat	11, plus three under construction
'Bangaram' class patrol boat	4
'Trinkat' class patrol boat	2
'Super Dvora' class patrol boat	6
'Solas' class inshore patrol vessel	80
Immediate Support Vessels	23 for protection of offshore installations
'Deepak' class replenishment vessel	2
'Jyoti' class replenishment vessel	1
'Aditya' class replenishment vessel	1
'Sagardhwani' class hydrographic ship	1
'Sandhayak' class hydrographic ship	8
'Makar' class hydrographic ship	1

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'Gaj' class tug	2
'Bhim' class tug	3
'Madan Singh' class tug	2
'Balram' class tug	2
'Bahadur' class tug	1
'Anand' class tug	1
'BC Dutt' class tug	2
'Nakul' class tug	2
'Arga' class tug	3

Construction of the 40000 tonne indigenously-built *Vikrant* aircraft carrier continues, with the ship due to be commissioned in 2018. Like the 'Kiev' class aircraft carrier *Vikramaditya* the new aircraft carrier will use the Short Take Off but Assisted Recovery (STOVAR) system to launch and recover MIG-29K fighters. A second new-build aircraft carrier project is underway, and an indigenous lightweight naval fighter aircraft is under development.

Four 'Arihant' class indigenously-built nuclear-powered ballistic missile submarines are planned. The first-of-class will be armed with twelve Defence Research and Development Organisation K-15 submarine-launched ballistic missiles. These missiles have a probable range of 405 nautical miles (750 kilometres), and will reportedly be capable of carrying nuclear warheads. Later submarines of the class will be fitted with more advanced, progressively longer range, variants of the missile. The 'Arihant' class boats are of great political and strategic significance, as they are the first nuclear-powered ballistic missile submarines to be operated by a nation which is not a permanent member of the United Nations Security Council. In 2015 the Indian government approved the construction of six nuclear-powered attack submarines, as well as seven new frigates, although construction of either vessel has not yet commenced.

INDONESIA

■ INDONESIAN NAVY

Ship Type	Number in Service
'Chang Bogo' class conventional hunter-killer submarine	Two are under construction in the Republic of Korea, with one planned to be built in Indonesia
'Cakra' class conventional hunter-killer submarine	2
'Sigma 11054' class frigate	1 plus one under construction and additional vessels planned
'Ahmad Yani' class frigate	6, the retirement of which is expected to commence in 2017
'Bung Tomo' class corvette	3
'Diponegoro' class corvette	4
'Fatahillah' class corvette	3
'Kapitan Patimura' class corvette	14
'Mandau' class fast attack craft	4
'Todak' class fast attack craft	4
'Pandrong' class fast attack craft	2
'Clurit' class fast attack craft	10, production continues
'Sampari' class fast attack craft	4, production continues
'Klewang' class fast attack craft	One under construction
'Tarakan' class replenishment vessel	1
'Andau' class gunboat	4
'Kakap' class gunboat	4
'Sibarau' class gunboat	8
'Boa' class gunboat	13
'Tripartite' class mine countermeasures vessel	2
'Kondor' class mine countermeasures vessel	9
'Makassar' class amphibious assault ship	4

The 'Sigma 11054' class corvettes are being built by PT PAL in Indonesia, with assistance from Damen Naval Shipbuilding of the Netherlands. The 'Fatahilla' class and 'Kapitan Patimura' class corvettes are both undergoing major upgrades of their weaponry and sensors. Meanwhile, the indigenously built replenishment vessel *Tarakan* was commissioned in 2016. An eventual total of some 50 'Clurit' class and 'Sampari' class fast attack craft is envisaged, with many of both classes being armed with the new China Aviation Industry Corporation C-705 anti-ship missile. In 2014 Jakarta confirmed that the 'Klewang' class trimaran fast missile craft project is to go ahead, despite the prototype having been destroyed in a fire in 2013, although in 2016 it was stated that only one example will be completed.

The navy's current schedule will deliver two 'Chang Bogo' class conventional hunter-killer submarines from Daewoo, in 2017, and one domestically-built boat from Indonesia's PT PAL shipbuilders in the 2020s.



US Navy

Indonesia operates a variety of vessels in support of Jakarta's increasingly outward-looking foreign policy, including this modern 'Diponegoro' class corvette and her three sister ships.

The submarines will feature eight 533-millimetre torpedo tubes, capable of launching both torpedoes and mines. There are plans for the future indigenous construction of amphibious assault ships, logistics and mine warfare vessels.

JAPAN

■ JAPAN MARITIME SELF DEFENCE FORCE

Ship Type	Number in Service
'Soryu' class conventional hunter-killer submarine	6, five on order and under construction
'Oyashio' class conventional hunter-killer submarine	10
'Izumo' class helicopter carrier	1 plus one under construction, due in service in 2017
'Hyuga' class helicopter carrier	2
'Shirane' class destroyer	1 to be replaced by second 'Izumo' class destroyer
'Atago' class destroyer	2
'Kongo' class destroyer	4
Improved 'Atago' class destroyer	Two on order
'Hatakaze' class destroyer	2
'Akizuki' class destroyer	4
'Takanami' class destroyer	5
'Murasame' class destroyer	9
'Asagiri' class destroyer	8
'Hatsuyuki' class destroyer	2
'Abukuma' class corvette	6
'Osumi' class heavy landing ship	3
'Uraga' class mine countermeasures vessel	2
'Yaeyama' class mine countermeasures vessel	3
'Enoshima' class mine countermeasures vessel	2
'Hirashima' class mine countermeasures vessel	3
'Sugashima' class mine countermeasures vessel	12
'Uwajima' class mine countermeasures vessel	5
'Leshima' class mine countermeasures vessel	2
'Hayabusa' class offshore patrol vessel	6
'Shimayuki' class training vessel	3
'Kashima' class training vessel	1
'Asashio' class training submarine	1
'Oyashio' class training submarine	1
'Mashu' class replenishment vessel	2
'Towada' class replenishment vessel	3
'Hiuchi' class training vessel	5
'Hibiki' class ocean surveillance vessel	2

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US Navy

A JMSDF 'Kongo' class destroyer, which are a key node in the air defence of the Japanese fleet at a time of increasing tension with the PRC. The construction of two more advanced destroyers has been approved.

Japan continues, by way of constitutional amendment, to edge towards a more proactive stance in international maritime affairs, major concerns being protection of the nation's sea lines of communication, and backing up its maritime sovereignty claims. The 'Izumo' class destroyer is widely seen as an important symbol of Japanese naval resurgence and was commissioned in March 2015. The 'Izumo' class is likely to operate the Bell-Boeing CV-22A Osprey tiltrotor aircraft that the country will acquire in due course, and its possible use to support operations by Lockheed Martin F-35B Lightning-II fighters is being evaluated. Economic stringency has slowed the JMSDF's purchase of new vessels, but life extension and upgrade programmes are in hand for its 'Atago', 'Hatsuyuki', 'Asagiri', 'Abukuma' and 'Hatakaze' class destroyers, and 'Oyashio' class submarines. Moreover, two improved 'Atago' class destroyers, equipped with Lockheed Martin's Aegis combat management system are on order.

MALAYSIA

ROYAL MALAYSIAN NAVY

Ship Type	Number in Service
'Perdana Menteri' class conventional hunter-killer submarine	2
'Gowind' class frigate	Six under construction, to enter service from 2019
'Lekiu' class frigate	2
'Kasturi' class frigate	2
Second Generation Patrol Vessel/ Littoral Combat Ship	Six ordered although construction is yet to start
'Laksamana' class corvette	4
'Kedah' class corvette	6
'Perdana' class offshore patrol vessel	4
'Handalan' class offshore patrol vessel	4
'Jerung' class offshore patrol vessel	6
'Sri Tiga' class offshore patrol vessel	2
'CB-90' class fast attack craft	17
'Sri Indera Sakti' class multi-role support ship	1
'Mahawangsa' class multi-role support ship	1
'Mahamiru' class mine countermeasures vessel	4
'Gagah Samudera' class training ship	Two are under construction but have been delayed by contractual problems, but one is now due to complete 2016
'Hang Tuah' class training ship	1
'Perantau' class hydrographic ship	1
'Mutiar' class hydrographic ship	1
'Bunga Mas' class auxiliary vessel	Two anti-piracy escorts for Malaysian merchant ships with partly civilian crews

An expansion of the submarine fleet by three conventional hunter-killer



US Navy

Two Royal Malaysian Navy ships take part in a regional exercise. The Malaysians, particularly active on the anti-piracy front, have a quite modern and well-balanced naval force, which now includes submarines. However, financial stringency is currently acting as a brake on further advances.

submarines remain under consideration. In November 2014 Republic of Korea (RoK) shipbuilder Daewoo was awarded a contract to build six helicopter-capable, missile-armed corvettes. Three of these ships will be completed in the RoK, three will be assembled in Malaysia from modules supplied by Daewoo. Funding issues are delaying these projects, as well as longer term plans for additional corvettes and support ships.

NEW ZEALAND

ROYAL NEW ZEALAND NAVY

Ship Type	Number in Service
'ANZAC' class frigate	2
'Canterbury' class multi-role vessel	1
'Endeavour' class replenishment vessel	1
'Otago' class offshore patrol vessel	2
'Rotoifi' class inshore patrol vessel	4
'Manawanui' class diving support vessel	1
Ice-strengthened logistic support vessel	One under construction

A programme to upgrade New Zealand's maritime capabilities by 2020, with particular emphasis on safeguarding the security of the nation's offshore areas of responsibility, is underway. In July 2016, a contract was awarded to Hyundai to build an ice-strengthened oiler to replace the HMNZS *Endeavour*. The 'ANZAC' class frigates' command and control, and electronic systems



Trevor Hollingsbee

The two 'ANZAC' class frigates of the Royal New Zealand Navy are being upgraded with the MBDA Sea Ceptor SAM, and their eventual replacement by a pair of larger vessels is at the planning stage.



TECHNICAL SUPPORT MACHINE MTP-72

PURPOSE

Technical Support Machine MTP-72 is designed for the most labor intensive maintenance and current repairs of tank T-72 in the field.

The structure of the machine includes a trailer with equipment and racks with niches and special boxes for transport and storage of spare parts and consumables for the repair of the tank.

SPECIFICATIONS

Chassis	KrAZ-632207
Trailer type	
Body type	Full metal, welded
Crew	3 (driver - crane operator, locksmith - mechanic, electrician - welder)
Workshop overall dimensions, mm:	
Length	14720
Width	2760
Height	3640
Total weight of a workshop, kg	22750
Maximum speed, km/h	80
Fuel consumption, l/100 km	48
Maximum grade ascending ability, angle degree	25
Fordable depth, m	1,2
Zar-system voltage, V	24, 220, 380



STATIONARY CHARGING STATION SZS-U

PURPOSE

Stationary charging station SZS-U is intended for a charge of acid accumulator batteries, and also alkaline batteries with the rated voltage of 12 and 24 V, with the capacity from 7 to 200 A·h, what is applied in automobile and armored vehicles (personal armored vehicles or tanks)

The station represents the stationary boxing of frame type, it is divided into two compartments.

There is the chargers block in the front compartment, it's consisting of twelve independent charging modules.

There are niches for laying of 12 charging cables sets and 1 powering cables set (220 V and 380 V) in the rear compartment.

Charging modules provide a high long-term charging rate with low fluctuations at the exit, they are interfering to premature wear of accumulator battery's plates, and also are capable to determine the rated voltage of the charged battery automatically.

SPECIFICATIONS

Type	Stationary, power supply from external network
Output voltage, V	12, 24
Station voltage, V	220, 380
Number of at the same time charged accumula- tor batteries	12
Time necessary for station expansion, no more, min.	5
Outline dimensions, mm	
length	1000
width	800
height	1000
Weight, kg:	100

are being upgraded and the ships' Raytheon RIM-7 Sea Sparrow Surface-to-Air Missiles (SAMs) will be replaced by the new MBDA Sea Ceptor SAM system. Plans are also in hand for the eventual replacement of the 'ANZAC' class with larger and more capable ships, with BAE Systems' Global Combat Ship design, which is also equipping the Royal Navy, being one of the designs under consideration.

PAKISTAN

PAKISTAN NAVY

Ship Type	Number in Service
'Yuan' class conventional hunter-killer submarine	Eight planned
'Hashmat' class conventional hunter-killer submarine	2
'Khalid' class conventional hunter-killer submarine	3
'Zulfiqar' class frigate	4, four more planned
'Tariq' class frigate	5
'Alamgir' class frigate	1
'Azmat' class fast attack craft	2, one more under construction in Pakistan., another planned.
'Larkana' class fast attack craft	2
'Jalalat-II' class fast attack craft	2
'Jurrat' class fast attack craft	2
'MRTP-15' class fast attack craft	2
'MRTP-33' class fast attack craft	2
'Munsif' class mine countermeasures vessel	3
'Fuqing' class auxiliary vessel	1
'Poolster' class auxiliary vessel	1
'Griffon 2000 TD' class hovercraft	16

The 'Yuan' submarines will probably incorporate air-independent propulsion. Four will be built in the People's Republic of China, and four in Pakistan. The planned transfer of three additional 'Oliver Hazard Perry' class frigates from the US Navy has reportedly been abandoned for political reasons.



Trevor Hollingsbee

This former PLA Navy replenishment vessel, nowadays equipped with significant air defence armament, is a vital force multiplier for Pakistan's modestly-sized surface fleet. The order for Chinese 'Yuan' class submarines indicates that Pakistan is giving priority to underwater capabilities.

PEOPLE'S REPUBLIC OF CHINA

PEOPLE'S LIBERATION ARMY NAVY

Ship Type	Number in Service
'Liaoning' class aircraft carrier	1
Aircraft carrier	1, plus one under construction
'Jin' class nuclear-powered ballistic missile submarine	4, four more planned
'Xia' class nuclear-powered ballistic missile submarine	1, operational status uncertain
'Type-095' class nuclear-powered attack submarine	Probably one launched so far
'Shang' class nuclear-powered attack submarine	5 in service, up to two under construction
'Han' class nuclear-powered attack submarine	3
'Yuan' class diesel electric	15, construction continues



US Navy

This is a PLA Navy destroyer of the 'Luyang II' class which has been designed with strong air defence capabilities. China continues to produce increasingly capable surface escorts in large numbers.

attack submarine	
'Song' class diesel electric attack submarine	13
'Kilo' class diesel electric attack submarine	12
'Ming' class diesel electric attack submarine	17, numbers reducing
'Luyang-III' class destroyer	5, plus six under construction
'Luzhou' class destroyer	2
'Luyang-II' class destroyer	6
'Luyang-I' class destroyer	2
'Sovremenny' class destroyer	4
'Luhai' class destroyer	2
'Luhu' class destroyer	2
'Type 055' class destroyer	Two under construction
'Luda' class destroyer	7, numbers reducing
'Jaingkai-II' class frigate	24 in service, three under construction
'Jiangkai-I' class frigate	2
'Jiangwei-II' class frigate	10
'Jaingwei-I' class frigate	2, numbers reducing
'Jianghu' class frigate	8, numbers reducing
'Jiangdao' class corvette	Over 30 in service, production continues
'Houbei' class fast attack craft	83
'Houjian' class fast attack craft	6
'Houxin' class fast attack craft	16
'Haiqing' class fast attack craft	27, numbers reducing
'Hainan' class fast attack craft	67, numbers reducing
'Shanghai-III' class fast attack craft	15, numbers reducing
'Wolei' class minelayer	1
'Wozang' class mine countermeasures vessel	2
'Wosao' class mine countermeasures vessel	16
'Wochi' class mine countermeasures vessel	8
'Yuzhao' class amphibious assault ship	4
'Yunshu' class landing ship	10
'Yuhai' class landing ship	18
'Yuting-III' class landing ship	15
'Yuting-II' class landing ship	10
'Yuting' class landing ship	4
'Yukan' class landing ship	3
'Fuchi' class replenishment vessel	9
'Fusu' class replenishment vessel	1
'Fuqing' class replenishment vessel	2
'Type 901' class fast combat support ship	One under construction

Although it regularly proceeds to sea, there are no indications that the Liaoning aircraft carrier has achieved full operational status. Some analysts

assess that her Shenyang J-15 fighters are overweight, and underpowered for aircraft carrier operations. At least two of these aircraft have been lost in fatal crashes in the past three years. Imagery in 2016 confirmed that another aircraft carrier, equipped with a ski-jump for aircraft operations, is under construction in Dalian, northwest China. There have also been plausible open source reports that a project to build a third, catapult-equipped aircraft carrier is underway. A new class of large amphibious assault ship, to be designated as the 'Type 081' class, is planned, as is at least one more 'Yuzhao' class amphibious assault ship.

The US DoD (Department of Defence) expects the People's Republic of China in the next decade to commence construction of its as-yet-unnamed 'Type 095' class nuclear-powered attack submarine, which may enable a submarine-based land-attack capability. This is envisioned to eventually replace the new 'Shang' class nuclear-powered attack submarines, although no date has been given as to when this could occur. Finally, some 'Luda' class destroyers, and 'Jianghu' and 'Jiangwei 1' class frigates, which are slowly being phased out of navy service, have been converted to China Coast Guard patrol ships. Further conversions are expected.

PHILIPPINES

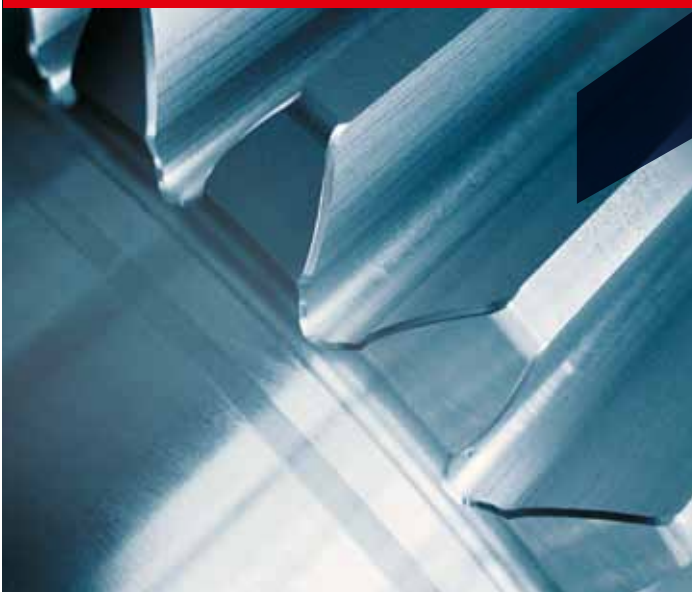
PHILIPPINE NAVY

Ship Type

Ship Type	Number in Service
'Gregorio del Pilar' class frigate	3 (ex US Coast Guard 'Hamilton' class cutters). One more likely to be acquired.
'Datu Kalantiaw' class frigate	1
'Pohang' class corvette	One due in service in 2016, ex-Republic of Korea Navy
'Emilio Jacinto' class corvette	3
'Rizal' class corvette	2
'Miguel Malvar' class corvette	6
'General Emilio Aguinaldo' class patrol vessel	1
'General Mariano Alvarez'	1

class patrol vessel	
'Jose Andrada' class patrol boat	25
'Kagitingan' class patrol boat	2
'Tomas Batillo' class fast attack craft	6
'Conrado Yap' class fast attack craft	2
'Alberto Navarette' class inshore patrol vessel	2
'Multi-Purpose Assault Craft-Mark 1' class fast attack craft	3
'Multi-Purpose Assault Craft-Mark 2' class attack craft	3
'Multi-Purpose Assault Craft-Missile' class attack craft	Three under construction
Strategic Support Vessels	1, plus one under construction
'Bacolod City' class heavy landing ship	2
'LST-1/542' class heavy landing ship	2
'Balikpapan' class heavy landing craft	5
'Tagbanua' class utility landing craft	1
'Manobo' class utility landing craft	1
'LCU Mk.6' class utility landing craft	3
'Mulgae' class utility landing craft	1
'Ang Pangulo' class presidential yacht	1
'Lake Mainit' class replenishment vessel	2
'Lake Buluan' class replenishment vessel	1
'Design 381' class coastal transport	1
'Lake Caliriya' class oiler	Ex-civilian vessel, two more due to be converted for naval use
'Gregorio Velasquez' class research vessel	Ex-US civilian vessel
'San Antonio' class survey vessel	2

The much-needed modernisation of the Philippines' fleet has gained significant momentum in recent years, the main catalyst being disputes with the People's Republic of China over the sovereignty of islands in the South China Sea. The two Indonesia-built strategic support vessels will offer both



Source: Italian Navy

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amphibious warfare, and sea control capabilities. A contract for the supply of two new-build frigates by GRSE (Garden Reach Shipbuilders and Engineers) of India was reportedly put on hold in mid-2016.

The three multi-purpose missile assault craft are under construction by a joint venture of Lung Teh of Taiwan, and Propmech of the Philippines, and will be equipped with Rafael Advanced Defence Systems Spike surface-to-surface missiles and will be the Philippines first missile-armed warships. Two AgustaWestland/Leonardo AW-159 naval support helicopters are on order, and there are long term plans to acquire submarines.

REPUBLIC OF KOREA (RoK)

■ REPUBLIC OF KOREA NAVY

Ship Type	Number in Service
'Chang Bogo' class conventional hunter-killer submarine	9
'Son Won-il' class conventional hunter-killer submarine	5, one launched, and three more are planned
'Dolgorae' class midget submarine	2
'Dokdo' class amphibious assault ship and a further example planned	1, plus one under construction,
'Go Jun Bong' class landing ship	4
'Cheon Wang Bong' class landing ship	2, plus two under construction
'Gwanggaeto the Great' class destroyer	3
'Chungmugong Yi Sun-shin' class destroyer	6
'Sejong the Great' class destroyer	3
'Ulsan' class frigate	8
'Incheon' class frigate with up to 24 likely to enter service	5, plus two under construction
'Pohang' class corvette	18, numbers reducing
'Wonsan' class minelayer/support ship	1
'Ganggyeong' class mine countermeasures vessel	6
'Yangyang' class mine countermeasures vessel	3
'Chamsuri' class offshore patrol vessel	60, numbers reducing
'Gomdoskuri' class patrol vessel and 18 more planned	18, plus one under construction
'Cheonji' class replenishment vessel	3
'Chung Haejin' class replenishment vessel	1
'Pyeongtaek' class replenishment vessel	1
'Sincheonji' class hydrographic ship	1

The second 'Dokdo' class amphibious assault ship will reportedly have enhanced command and control capabilities, and might be equipped to



US Navy

The Republic of Korea's powerful fleet includes a strong contingent of mainly indigenously constructed submarines, vital for monitoring seas adjacent to the DPRK. More are under construction and the RoK is also building submarines for Indonesia.

support operations by Lockheed Martin F-35A/B/C Lightning-II fighters. New-build 'Incheon' class frigates, 'Gomdoskuri' class patrol vessels, and a projected new design of 200 tonne patrol craft, are progressively taking over the littoral patrol roles of the 'Pohang' and 'Chamsuri' class vessels.

RUSSIA

■ RUSSIAN NAVY PACIFIC FLEET

Ship Type	Number in Service
'Borei' class nuclear-powered ballistic missile submarine	2
'Delta-III' class nuclear-powered ballistic missile submarine	3
'Oscar-II' class nuclear-powered attack submarine	5
'Akula-I' class nuclear-powered attack submarine	4
'Kilo' class conventional hunter-killer submarine	8
'Kirov' class cruiser	1
'Slava' class cruiser	1
'Udaloy-I' class destroyer	4
'Sovremenny' class destroyer	2

Aside from upgrading the Pacific Fleet's main Far East Vladivostok and Viliuchinsk naval bases, Russia has built anchorages in Primorye Territory, on Sakhalin Island, and is reportedly planning a base at Matua in the Kuril Islands. Russia's navy is also seeking facilities beyond its territory, and is continuing negotiations with Vietnam for access by Russian warships to the Vietnamese People's Navy base in Cam Ranh Bay, southeast Vietnam. The Russians are also working with the Vietnamese to establish a joint submarine maintenance centre there. According to official Russian naval sources, six 'Varchavyanka' conventional hunter-killer submarines are to be built for deployment to the Pacific Fleet.

SINGAPORE

■ REPUBLIC OF SINGAPORE NAVY

Ship Type	Number in Service
'Challenger' class conventional hunter-killer submarine	2
'Archer' class conventional hunter-killer submarine	2
'Formidable' class frigate	6
'Victory' class corvette	6
'Independence' class corvette and five more planned.	1, plus two under construction
'Fearless' class offshore patrol vessel	11, numbers reducing
'Endurance' class amphibious assault ship	4
'Landsort' class mine countermeasures vessel	4



Trevor Hollingsbee

Singapore's projected Joint Multi-Mission Ship will be based on the 'Endurance' class amphibious assault ships, which have proved successful in service. The new vessel will provide strong command and control, surveillance and aviation support facilities.



The Sri Lankan Navy is focused on offshore operations, building up its OPV fleet and taking part in regional exercises. Two advanced OPVs for Sri Lanka are currently under construction in India.

Two 'Challenger' conventional hunter-killer submarines were retired in early 2015. Two new 'Type 218SG' class conventional hunter-killer submarines are on order from ThyssenKrupp Marine Systems, with deliveries expected from 2020, to replace the two remaining 'Challenger' class. Together with the two existing 'Archer' class conventional hunter-killer submarines (modified ex-Royal Swedish Navy 'Sodermanland' class) they will form the Republic of Singapore Navy's underwater fleet from 2020. Plans to build a Joint Multi-Mission Ship (JMMS), developed from the 'Endurance' class, were confirmed in 2014, but a timescale for this project has yet to be announced. The JMMS will feature a starboard-side control island, a straight-through flight deck with five helicopter landing spots, and a well deck.

SRI LANKA

■ **SRI LANKAN NAVY**

Ship Type	Number in Service
'Sukanya' class offshore patrol vessel	1
'Reliance' class offshore patrol vessel	1
'Vikram' class offshore patrol vessel	1
'Jayasagara' class offshore patrol vessel	1
'Sankalp' class offshore patrol vessel	Two under construction in India
'Saar-4' class fast attack craft	2
'Shanghai-I' class offshore patrol vessel	2
'Shanghai-II' class offshore patrol vessel	4
'Shanghai-III' class offshore patrol vessel	3
'Lushun' class offshore patrol vessel	2
'Bay' class offshore patrol vessel	2
'Super Dvora Mk.III' class patrol boat	6
'Super Dvora Mk.II' class patrol boat	3
'Dvora Mk.I' class patrol boat	4
'Shaldag' class patrol boat	7
'Colombo' class patrol boat	22

'Simoneau' class patrol boat	3
'Chevron' class patrol boat	4
'Trinity Marine' class patrol boat	5
'Arrow' class inshore patrol craft	90, numbers reducing
'Wave Rider' class inshore patrol craft	22, numbers reducing
'Yuhai' class heavy landing ship	1
'Yunnan' class heavy landing ship	2

Sri Lanka continues its dual-track strategy to cooperate on naval matters with both India and the People's Republic of China. The fleet continues to expand, with no evidence of the disposal of older vessels, other than some of the very small craft used in counter-insurgency operations. Meanwhile, the first of two offshore patrol vessels being built in India's Goa Shipyard is due to enter service in early 2017.

TAIWAN

■ **REPUBLIC OF CHINA NAVY (ROC)**

Ship Type	Number in Service
'Chien Lung' class conventional hunter-killer submarine	2
'Hai Shih' class conventional hunter-killer submarine	2
'Kee Lung' class destroyer	4
'Cheng Kung' class destroyer	8
'Chi Yang' class frigate	6, numbers reducing
'Kang Ding' class frigate	6
'Oliver Hazard Perry' class frigate	Two ex-US Navy ships are being refitted to enter service in 2017
'Ching Chiang' class offshore patrol vessel	11
'Kuang Hua VI' class fast attack craft	31



Since the retirement of its early-model BAE Systems AV-8S Matador fighters in 2006, the Royal Thai Navy's aircraft carrier (seen here aft of this line of ships) has only operated helicopters, although it has been active in regional disaster relief efforts.

'Tuo River' class corvette	1, eleven more planned
'Lerici' class mine countermeasures vessels	Six to be built, one in Italy, the remainder in Taiwan
'Yung Yang' class mine countermeasures vessel	4
'Yung Feng' class mine countermeasures vessel	4
'Yung Ching' class mine countermeasures vessel	2
'Hsuhai' class dock landing ship	1
'Chung Cheng' class dock landing ship	1
'Chung Ho' class heavy landing ship	2
'Chung Hai' class heavy landing ship	7
'Mei Chin' class heavy landing ship	4
'Ta De' class tug	1
'Tai Hu' class tug	1
'Ta Tung' class tug	1
'Pan Shi' class fast combat support ship	1
'Chung Bai' class replenishment vessel	2
'Wu Kang' class coastal transport	2
'Wan An' class coastal transport	1
'Tai Wu' class coastal transport	1

In mid-2016 a \$15 billion programme to replace many of the larger units of the ROCN fleet with new, indigenously built assets was confirmed. Projects to build an amphibious assault ship, eleven more 'Tou Jiang' class corvettes, and four high speed minelayers are at an advanced stage. There are also longer term plans to replace the entire ROCN inventory of surface escorts with four destroyers, and twelve frigates, and to construct a new personnel transport ship, and four to eight conventional hunter-killer submarines. Some analysts believe that a new pressure hull under construction in Taiwan, ostensibly intended to refurbish one of the ROCN's two old ex-US Navy training submarines, is actually part of this project.

THAILAND
■ ROYAL THAI NAVY

Ship Type	Number in Service
'Chakri Naruebet' class aircraft carrier	1
'DW 3000F' class frigate	One under construction in the Republic of Korea, due in service 2018. A second is planned for indigenous build
'Knox' class frigate	2
'Naresuan' class frigate	2
'Modernised Jianghu' class frigate	4
'Ratanakosin' class corvette	2
'Tapi' class corvette	2
'Khamronsin' class corvette	3
'River' class offshore patrol vessel	1, plus one more under construction
'Pattani' class offshore patrol vessel	2
'Makut Rajakumarn' class offshore patrol vessel	1
'Hua Hin' class offshore patrol vessel	3
'PSMM Mk.5' class offshore patrol vessel	6
'Tor 991' class offshore patrol vessel	3
'Tor 994' class offshore patrol vessel	3
'M58' class offshore patrol vessel	One to enter service late 2016, three more planned
'M36' class offshore patrol vessel	3
'MBM-230' class fast attack craft	3
'FPB-45' class fast attack craft	3
'MV-400' class fast attack craft	3
'Cannon' class training ship	1
'Endurance' class amphibious assault ship	1
'Normed PS-700' class tank landing ship	2
'Marsun M55' class utility landing craft	2
'Thongkao' class utility landing craft	4
'Mannok' class utility landing craft	3
'Similan' class replenishment vessel	1
'Jula' class replenishment vessel	1
'YOG-5' class replenishment vessel	1
'Prong' class replenishment vessel	1
'Proet' class replenishment vessel	2
'Matra' class replenishment vessel	1
'Chuang' class replenishment vessel	2

'MSC-289' class mine countermeasures vessel	2
'Thalang' class mine countermeasures vessel	1
'M48' class mine countermeasures vessel	2
'Gaeta' class mine countermeasures vessel	2
'Chan' class hydrographic vessel	1
'Sok' class hydrographic vessel	1
'Paruehasabordee' class hydrographic vessel	1
'Rin' class tug	2
'Samsan' class tug	2
'Klungbadan' class tug	2

Thailand has previously operated conventional hunter-killer submarines, and it was confirmed in July 2016 that plans to revive Thailand's submarine capability continue to move slowly ahead, and that negotiations with the People's Republic of China for the supply of three 'Yuan' class boats continue. A submarine fleet headquarters has been built at Sattahip naval base in western Thailand, and Royal Thai Navy officers are attending submarine training in Germany and the Republic of Korea. The second BAE Systems 'River' class OPV (Offshore Patrol Vessel), being licence-built by Bangkok Dock, will be a modified version, fitted with Boeing RGM-84 Harpoon family anti-ship missiles.

VIETNAM
■ VIETNAM PEOPLE'S NAVY (VPN)

Ship Type	Number in Service
'Gepard 3.0' class frigate	4, plus two more on order from Russia
'Petya' class frigate	5
'Tarantul-1' class corvette	4
'Moiniya' class corvette	6, more planned
'BPS-500' class corvette	1
'Kilo' class conventional hunter-killer submarine	5, one more to be delivered late 2016
'Osa' class fast attack craft	8
'Svetlyak' class offshore patrol vessel	6
'Turya' class offshore patrol vessel	5
'TT-400 TP' class offshore patrol vessel	6
'Sonya' class mine countermeasures vessel	4
'Yurka' class mine countermeasures vessel	2
'Yevgenya' class mine countermeasures vessel	2
'Giao su Vien si Iran Dai Nghia' class hydrographic vessel	1
'K-122' class transport/logistics vessel	2
'HQ-996' class transport/logistics vessel	1
'Truong Sa' class transport/logistics vessel	7
'LST-542' class heavy landing ship	1
'Polnochny' class amphibious assault ship	3
'HQ-521' class amphibious assault ship	2

Hanoi is pursuing a three-track response to the People's Republic of China's proactive stance in the South China Sea. Military garrisons on several of the islands in this stretch of water claimed by Vietnam have been substantially bolstered; a major acquisition programme of foreign, and indigenously-built, warships is in progress; and, Vietnam is actively promoting links with numerous foreign navies, including exercises, and allowing access to its Da Nang naval base towards the south of the country.

The commissioning of the 'Kilo' class conventional hunter-killer submarines into the VPN poses a major potential threat to Chinese forces, and is of long-term strategic significance, particularly as they are to be equipped with Novator Design Bureau 3M-54 Klub surface-to-surface missiles. The 'Gepard' class are Vietnam's first helicopter-capable frigates, and a number of VPN Kamov Ka-28 naval support helicopters have been upgraded in Russia to operate from these ships. Two more 'Gepard' class are on order from Russia, while additional units might be built in Vietnam in due course. The indigenously-built 'BPS-500' class corvette is undergoing a major upgrade in Vietnam, with Russian assistance. [AMR](#)



Philippines marines training with their US counterparts in Exercise BALIKATAN 2016. These Filipino troops are regular participants in bilateral and multilateral exercises.

ARMING THE ARCHIPELAGO

Traditionally devoted to internal security and relying on the United States for protection from threats, the armed forces of the Philippines are undergoing a deep transformation. Insurgency remains a problem, while maritime disputes with the People's Republic of China (PRC) have become Manila's top national security concern.

by **Alex Calvo**

The country's grand strategy to address concerns involving the PRC employs a three-pronged approach including rearmament, tighter links with Washington DC, Tokyo, and other Asia-Pacific democracies plus Vietnam, and international arbitration. This latter approach has seen the country bring a case against the PRC under the terms of the United Nations Convention on the Law of the Sea (UNCLOS) at the Permanent Court of Arbitration (PCA) in the Hague, the Netherlands. The Philippines government argued that the PRC's so-called 'Nine Dash Line', which demarcates Beijing's

maritime and territorial claims in the South China Sea, violated the stipulations of the UNCLOS regarding Exclusive Economic Zone (EEZ) agreements, and territorial waters. The PRC refused to participate in the arbitration, arguing that the Philippines had agreed to solve such disputes bilaterally, in particular through the signature of both nations to the 2002 Conduct of Parties in the South China Sea agreement concluded between the Association of South East Asian Nations, of which the Philippines is a member, and the PRC. On 12 July, the PCA issued its ruling which argued that the PRC had breached international law, and could not

interfere with fishing rights which the Philippines enjoys at Scarborough Shoal (claimed by Taiwan and the PRC), and cannot exercise EEZ rights within 200 nautical miles/nm (370.4 kilometres/km), of Mischief Reef and Thomas Shoal in the disputed Spratly Islands in the South China Sea (all, or parts of, the islands are also claimed by Brunei-Darussalam, the PRC, Malaysia, the Philippines, Taiwan and Vietnam). Under the terms of the UNCLOS, an EEZ can stretch 200nm from a nation's coastline.

Perhaps as a reflection of the PRC's growing strategic posture in the East and South China Seas, the United States is re-

turning to the Philippines after 25 years. In 1991, the government of the Philippines requested the withdrawal of all permanent US military basing in the country following a vote in the Philippines Senate to this effect. However, in April 2014, the administration of President Barack Obama and his then counterpart President Benigno Aquino signed the Enhanced Defence Cooperation Agreement (EDCA) granting the US military access to five bases, and allowing rotational deployments rather than a permanent US military presence, while Japan moves from providing equipment and training to the coastguard to a much wider and deeper defence relationship. The Philippines signed a defence equipment transfer agreement with Japan in February 2016, a first for both Manila and Tokyo, paving the way for much closer cooperation, and providing hard evidence of Japan's changing defence posture *vis-à-vis* the PRC. In November 2015, local media reports stated that the two countries had discussed the supply by Japan of Lockheed Martin P-3C Orion and Beechcraft TC-90 King Air maritime patrol aircraft.

The Philippines must prepare not only for conventional conflict, but also for an escalation of the Moro conflict which pits the country's armed forces against separatist and Islamist organisations operating on the island of Mindanao in the south of the

archipelago. Finally, given the recent election of President Rodrigo Duterte, whom some observers see as 'soft' on the PRC, there is a measure of uncertainty on the political direction of the Philippines' military modernisation efforts. Mr. Duterte has proposed reopening direct talks with Beijing to address existential maritime and territorial disputes, and the joint development of natural resources by the two countries in contested waters in the East and South China Seas. Interestingly, despite the new president's tough law and order stance, which earned him the nickname of 'Duterte Harry' while mayor of Davao City, the largest conurbation in Mindanao, in reference to Inspector 'Dirty' Harry Callahan, played by Clint Eastwood in the 1971 thriller *Dirty Harry*. While not as attractive to the foreign media as his crime buster image, we should remember that Mr. Duterte, who is the country's first head of state from Mindanao, has been known for his inclusive approach to religious and ethnic minorities. On 25 July 2016 he announced a unilateral ceasefire with the CPP/NPA (Communist Party of the Philippines/New People's Army), to try to stem an insurgency which has involved much of the archipelago since 1971.

The Numbers

The Philippines' military encompass 220,000 active and 430,000 reserve person-

nel. Military spending is widely seen as low, standing at \$3.1 billion for 2014, but is rising: From 1.1 percent of the GDP (Gross Domestic Product) in 2014, it increased to 1.3 percent for 2015, according to the Stockholm International Peace Research Institute, a think tank. While this seems a significant increase, it took the 2015 defence budget to \$3.8 billion, absorbing 6.6 percent of total government spending. Concerning the 2017 budget proposal, Benjamin Diokno, the secretary of budget and management of the Philippines which supervises government spending, pointed out on 14 July 2016 that any further budget increases in 2017 will focus on military wages and pensions rather than hardware acquisition.

With regard to the defence industry, the country lacks a strong manufacturing base, with companies mostly restricting themselves to small arms, mortars, and ammunition, plus items such as tactical radios. Existing domestic players include small arms and ammunition manufacturers Government Arsenal (state-owned), United Defence Manufacturing Corporation which supplies rifles and the Arms Corporation of the Philippines (Armscor), plus the state-owned Philippine Aerospace Defence Company (PADC) which can perform limited aircraft maintenance, and its private sector counterpart Lufthansa Technik Philippines. Shipyards to

The Philippines Navy has updated its capabilities by taking delivery of the BRP Tarlac amphibious assault ship and three heavy landing craft.



Roy Kabanlit



Naval Task Force-40 being inspected as Typhoon Landon/Kuppo approaches Luzon. The country's navy stands at the forefront of assistance to the civilian population during natural disasters; a role where they also often exercise with foreign counterparts.

have recently built naval vessels include Propmech and the Philippine Iron Construction and Marine Works.

Navy

The Philippine Navy (*Hukbong Dagat ng Pilipinas/HDP*) and coastguard (*Tanod Baybayin ng Pilipinas/TBP*) are arguably too weak to effectively defend Manila's claims in the South China Sea (*see above*), and prevent insurgents and criminals from roaming the country's waters, despite modernisation and acquisition plans under Mr. Duterte's predecessor Mr. Aquino. In 2015, Armando J. Heredia, a Filipino naval affairs observer, wrote about "several stalled key acquisitions that were to be delivered during his term, including the on-again, off-again frigate programme, the long-range maritime patrol aircraft and the air defence radar network." When asked about these initiatives for this article, he said that "Under the new Duterte Administration, external defence has further taken a back seat to funding and procurement priorities." With a stated shift to internal security operations (initiatives such as the) Frigate Acquisition Programme have been put on hold.

The Navy's current order of battle includes some 120 vessels, among them three old frigates and eleven corvettes, the remainder are mostly coastal patrol boats and fast attack craft. The HDP is the only regional navy without any anti-submarine capability. In August 2015, Australia provided two heavy landing craft, improving the navy's ability to move troops and provide logistical assistance during natural disasters, while in May 2016 Indonesia delivered the BRP *Tarlac*, the first of two amphibious assault ships, built by Indonesia's PT PAL shipyard, with a second being under construction. The Republic of Korea has agreed to provide a 'Pohang' class corvette to the HDP, expected to be delivered by the end of 2016.

The above mentioned frigates are former US Coast Guard 'Hamilton' class cutters, with decades of service requiring intensive maintenance. The Philippines formally commissioned the third, the 49-year old BRP *Andres Bonifacio* in July 2016. She is currently being refitted and is expected to reach the Philippines in October 2016. Equipped with an OTO Melara 76mm main armament, in line with her two predecessors, she is expected to be

upgraded with two BAE Systems' Mk.38 Mod.2 cannons equipped with a laser range-finder and infrared optronics. Her flight deck may become home to an AgustaWestland/Leonardo AW-109E naval support helicopter, like her sisters. However, the US will remove her Raytheon Phalanx close-in weapons system prior to delivery and she can carry no anti-ship missiles. While unfit for intensive naval combat, Beijing mostly relies on maritime militia units to encroach on the Philippines' territorial waters, thus making these three old ships a valuable addition to the HDP's order of battle short of an actual outbreak of conventional hostilities.

The light frigate programme is currently in the post qualification phase, its overall multi-year budget being \$383 million. In July 2016 India's state-owned Garden Reach Shipbuilders and Engineers, which had emerged as the winner of the initial contract for these ships, was disqualified for financial reasons. This has reopened the door to the 1400-ton 'Incheon' class design built by the Republic of Korea's Hyundai and STX which came second in the original competition. Tender stipulations state that the ships should



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US Marines disembarking in Subic Bay during Exercise BALIKATAN in 2009. The end of a permanent US military presence in the country has gradually given rise to regular rotations.

displace at least 2000 tons and be 92 metres (301 feet) long, with the Philippines building further examples domestically. In February 2016 it was announced that Israel's Rafael Advanced Defence Systems would be supplying three remote-controlled Mini Typhoon 12.7mm remote weapons systems, plus an unspecified number of Spike-ER surface-to-surface missile launchers and rounds to the HDP, for the three 'Mk.III' class attack craft to be built by a joint venture involving the Philippines' Propmech Corporation and Taiwan's Lung Teh Shipbuilding Corporation. The contract is worth \$12 million. Further details regarding the Philippines Navy can be found in this issue's *Asia-Pacific Naval Directory*.

Air Force

In April, the United States delivered two Lockheed Martin C-130T turboprop freighters configured for in-flight refuelling to the *Hukbong Himpapawid ng Pilipinas* (Philippines Air Force/HHP), with additional deliveries of these aircraft expected in 2017. Meanwhile, the air force has purchased twelve KAI (Korea Aerospace Industries) FA-50 fighters; the first two were received in November 2015,

with the remaining ten to be delivered over two years. These aircraft are meant to serve as a stop-gap measure until Manila can procure more advanced fighters. While most are expected to serve as trainers, HHP sources have told AMR that up to four could be equipped with advanced radar and medium-range air-to-air missiles. In June 2016, President-elect Duterte criticised this acquisition as a "waste of money" as they were being used just "for ceremonies," adding that the two planes could not be employed to fight insurgents, and were not enough to "challenge China."

In January 2016, the Senate's budget committee approved an additional \$234 million to acquire fighters. One of the aircraft being considered is the Saab JAS-39E Gripen. Manila is also finalising the details to lease five TC-90 aircraft (*see above*) in a bid to reinforce its poor maritime awareness capabilities. At the same time, the Department of National Defence has budgeted \$127 million for two maritime patrol aircraft for the HHP. Chris Rawley, a senior member of CIMSEC (Centre for International Maritime Security), believes however that, "As an archipelagic nation, the Philippines could greatly benefit from the over-the-horizon situational

awareness that long range, land-based unmanned aerial vehicles would provide. These systems can be a more affordable force multiplier for navies with limited maritime patrol assets."

Army

During the Cold War, with the United States in charge of external security, the Philippines' army focused on counterinsurgency, thus falling behind on conventional capabilities. Current tensions with the PRC and continuing domestic insurgencies (*see above*) have prompted a spike in defence spending, but ground forces have only received some ten percent of the extra funds. The army's current order of battle includes some 45 main battle tanks, 450 armoured personnel carriers and 270 towed artillery pieces. As in the navy's case, recent rearmament has mostly consisted of transfers of second-hand hardware, with Israel providing 28 and the United States 114 BAE Systems M-113A2 armoured personnel carriers in 2015.

Space

Manila has yet to establish a cyber warfare command, although the *Agence France Presse* news agency announced



After years of neglect, the Philippines air force is upgrading its fighter force with new FA-50 fighters, seen as a pragmatic choice given financial constraints.

KAI

Conclusions

The Philippines currently stand at a crossroads, torn between the demands of internal security and the need to deploy the necessary sea power to prevent further encroachment of its interests in the South China Sea by the PRC. The coming months will be crucial to determine whether Manila can translate her recent legal victory in the South China Sea arbitration case into a different reality on the ground, and what hardware will be at the forefront of rearmament. In this regard, it will be interesting to see whether shore-launched anti-ship missiles, sea mines, and other asymmetrical systems take the lead in confronting the PRC's superior naval power, and how an outnumbered TBP chooses to deal with trawlers full of militias operating in the South China Sea thought to be sponsored by Beijing. In terms of maritime awareness, cooperation with Japan seems to be the key to this vital area, particularly in terms of air assets, while the long-held aspiration of a greater domestic defence industry remains, for the time being, mostly a dream. **AMR**

plans for a cyber operations centre to this end in 2012. Concerning space, the Philippines and Japan are cooperating in some non-military projects which may nevertheless end up having dual-purpose applications. In April 2016, JAXA (Japan Aerospace Exploration Agency) deployed the Diwata-1, the Philippines' first microsatellite from the Interna-

tional Space Station's Japanese Experiment Module. Expected to stay in orbit for some 20 months, it was developed by a team of Filipino engineers and scientists under Japanese supervision. A second microsatellite, Diwata-2, is expected to follow in 2017 and the cost of the development of these microsatellites is \$870,000.

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An international coalition of nations is undertaking Operation **INHERENT RESOLVE** across the Middle East in order to destroy ISIS with missions covering the, land and sea domains.

US DoD



AVOIDING MISTAKEN IDENTITY

The international Battle Management System (BMS) market remains a vibrant sector for armed forces seeking mature systems to facilitate a greater understanding and manipulation of Command and Control (C2) across the battlefield.

by **Andrew White**

Overall, the market is witnessing a continuation of large-scale BMS programmes such as the Indian Army’s ongoing initiative in this regard while at the technological level, hardware and software is being miniaturised so as to proliferate BMS capabilities down to the lowest tactical levels. Yet globally, financial constraints, particularly in Europe and North America, are affecting BMS programmes. For example, the Polish Ministry of Defence’s (MoD) *Technology Modernisation Programme 2016-2022* which outlines a total of 14 procurement efforts is expected

to witness cuts to several of these in the programme’s latest revision due to be published in September 2016. One of the concepts expected to be cut is a BMS for the KTO Rosomak armoured eight-wheel drive vehicle, itself a licence-built version of the Patria Armoured Modular Vehicle, operated by the *Wojska Lądowe* (Polish Army). Previous plans had called for the MoD to equip a total of 317 Rosomak vehicles with a BMS in order to improve Situational Awareness (SA) for mounted and dismounted troops alike.

More positively, NATO (North Atlantic Treaty Organisation) announced towards the end of July that its Communication

and Information Agency (NCIA), which procures C2 systems on behalf of the Alliance (as opposed to individual NATO members) remains in the process of preparing documentation for the solicitation of more than \$3 billion of technology over a three-year acquisition effort. Although 50 percent of funds will be dedicated to enhancing satellite communications for the Alliance, NCIA officials explained to *AMR* the remainder would be spent on BMS-related technologies. For example, solicitation is expected to begin in 2017 with one BMS-related project designed to provide C2 capabilities for Chemical, Biological,

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Saab

Saab's SLB, a variant of the 9Land C2 product illustrated here, will replace the legacy RA-180 BMS as part of a modernisation drive by the Swedish armed forces.

Radiological and Nuclear (CBRN) threat management. The NCI has set aside \$11.1 million for this particular effort which aims to fulfil capability gaps, possibly in the detection and analytical fields, although this has not been confirmed by NATO, regarding chemical and biological weapons in the Middle East as well as increased nuclear activity in the Democratic People's Republic of Korea (DPRK). The Syrian theatre has witnessed frequent chemical weapons usage, most recently in early August when the city of Saraqib in northwest Syria was attacked with air-to-ground barrel bombs containing chlorine. Meanwhile, on 6 January, the DPRK tested what its government alleged to be a hydrogen bomb, although this is disputed by some nuclear weapons experts.

Beyond CBRN capabilities, the NCI explained in a statement published on 24 July, that the funding would also be used to improve the Alliance's "cyber, air defence and satellite communications" in addition to C2 for "complex multinational operations." This requirement is a response to campaigns which are seeing increasing integration and interoperability

with international partners. Nowhere is this more apparent than in the Middle East where NATO and allied nations continue to perform counter-insurgency operations against the Islamic State of Iraq and Syria (ISIS) organisation. Operation INHERENT RESOLVE (OIR) was launched in 2015 with a mission to defeat ISIS in the Combined Joint Operations Area of northern Iraq and Syria. Led by CENTCOM (United States Central Command) the OIR coalition features approximately 60 nations providing air, ground and maritime forces, bringing with it significant issues regarding interoperability and C2.

The NCI \$3 billion allocation discussed above will see \$22 million set aside for the NCI's TRITON programme which has been running since 2011. This particular concept aims to provide NATO maritime forces with a general overview of the battle area for enhanced SA and, therefore, enhanced decision-making processes. On 17 May, the TRITON project released an Invitation to Bid for Increment-1 of the initiative which will primarily provide Maritime Situational Awareness and "replace the

operational level functionality of the existing Maritime Command and Control Information System (MCCIS)," a NCI press release explained. The MCCIS entered service earlier this century as a C2 system which could provide NATO navies with a Recognised Maritime Picture (RMP) by federating together information derived from a number of sources such as vessel radar, to provide naval commanders with a robust RMP despite a diverse number of nations and vessels which may be contributing to a NATO naval task force. A winning bidder for Increment-1 is expected to be chosen by the end of 2016 with the award of a 36-month contract worth an undisclosed sum, NCI confirmed.

However, in line with financial restrictions on defence expenditure being experienced around the world, NATO is extremely wary of overspend on these types of programmes. NCI sources explained to AMR how the agency would be pursuing a non-conventional procurement cycle to enable BMS upgrades to existing systems to fulfil the TRITON requirement, as opposed to purchasing a new BMS to meet this requirement outright.



Atos's Bull BMS forms part of the French MoD's Scorpion modernisation programme with applications to equip dismounted soldiers and special forces as well as tactical ground vehicles.

Changing Shapes

Seeking to downsize BMS hardware to allow it to be used at the lowest tactical level by a dismounted soldier is French company Atos which, at the Eurosatory defence and security exhibition in Paris

on 13 June, unveiled its latest tactical BMS technology. The Bull BMS has been designed to support the C2 requirements of battlegroup (battalion-level) operations as well as the integration of airborne assets into its picture. The system, which

features a tablet-size End User Device (EUD), can be used by mounted and dismounted personnel as well as by tactical operations centres dotted around the battlefield.

According to company officials, the Bull BMS allows soldiers to "focus on their mission while benefiting from the power of digitisation" with the added benefit of accelerated decision-making cycles and priorities of action. "The sharing of strategic information in real time gives battalions an advantage in terms of autonomy, responsiveness and protection, which visibly and durably changes the tactical situation on the ground," a company statement reads. Designed for ground and ground-air operations, the Bull BMS provides connectivity from squads or sections up to battlegroup headquarters, and can be carried across legacy communications systems, such as the *Armée de Terre's* (French Army's) Thales PR4G tactical radio network.

According to Atos, the Bull BMS is capable of providing real-time information across a continuously updating



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map of the battlefield where ground forces require the most complete SA in order to facilitate decision-making. The BMS allows ground commanders to acquire and share intelligence, process and distribute orders, establish and update tactical situation pictures, and to view the logistics situation. "Using this modern system is simple and ergonomic. The interface is fluid and robust in an environment where the faster the information is delivered, the better the command level can take the decision," a company official explained to *AMR*. The Bull has been designed to be easily integrated across several platforms as it takes the form of a ruggedised laptop and to this end is already furnishing a number of French Army platforms such as the Nexter VBCI eight-wheel drive Infantry Fighting Vehicle, the rotorcraft of the ALAT (*Aviation Légère de l'Armée de Terre/ French Army Aviation*), and the Sagem/Safran Electronics and Defence FÉLIN (*Fantassin à Équipement et Liaisons Intégrés/ Integrated Infantry Communications and Equipment*) soldier system, and as part of the French Army's Scorpion Combat Information System upgrade which is currently ongoing.

Also unveiled to the market at Eurosatory was Thales' Digipack BMS which the company has designed as a variant of its in-service Commander Battlegroup product. This has been designed to fulfil the most basic requirement in BMS capability and can even act as a stepping stone towards more advanced BMSs in the future. To this end, the company is targeting aspiring armed forces in the Asia-Pacific, the Middle East and South America. The Digipack must be connected to a vehicle's, or soldier's, existing radios, Thales explained to *AMR* during Eurosatory. The system includes geo-location information to generate a basic level of SA regarding blue and red forces, supported by text-based messaging, operating at bandwidth speeds of approximately 250kbps (kilobits per second). "Network-centric operations hinge on the ability



IAI's BlueDome BMS solution has already been tested by the IDF in association with multiple layers of command and control, and reconnaissance payloads.

to share the right information with the right people at the right time," a Thales spokesperson explained at Eurosatory. "Digipack meets the requirements of these new forms of engagement to support land forces in their digital transformation." Similar to a smartphone, Digipack can be upgraded with specialist applications or 'apps' as and when they become available.

Israel

Like Thales, Israel Aerospace Industries (IAI) is offering its BlueDome BMS for the tracking of friendly forces to reduce the threat of fratricide. Speaking to *AMR*, an IAI spokesperson explained how the concept, designed to improve combat efficiency, comprised an "independent, self-contained system (for) dismounted troops and various ground and air platforms." They added that "BlueDome will help achieve a significant reduction in friendly-fire incidents." The system can

IAI

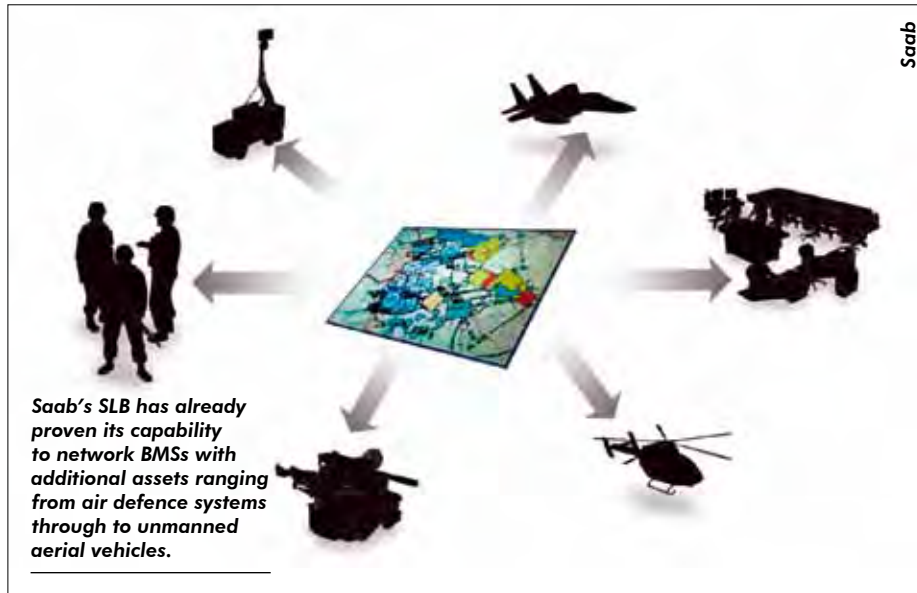
be integrated into a variety of EUDs ranging from handheld optronics through to tactical ground vehicles and helicopters. Geolocation information is relayed to the BMS via small transponders carried by soldiers and platforms which transmit coded information regarding their identity and whereabouts. "It's worn on the soldiers' uniform or helmet. When the interrogator receives the response from the transponder, this confirms that a friendly force has been detected," the spokesperson explained. "BlueDome operates independently of any other system, without the need for long radio communications or using navigation means that may reveal the force's location to hostile entities. The system is highly reliable and protected from enemy jamming, misuse or interception.

"The immediate and dependable detection of friendly forces shortens and streamlines the process of understanding the dynamic battle management situation and minimises friendly fire events," they added. Earlier in the year, a test and evaluation exercise was conducted in Israel in conjunction with the

Israeli Defence Force (IDF). IAI explained how the BlueDome was used during low light training exercises as well as in urban and rural environments, even locating friendly forces in built-up areas.

Sweden

Meanwhile, Saab also used Eurosatory to promote the deployment of its Strids Ledning Batalion (SLB) BMS in support of the Swedish Defence Materiel Administration's \$160 million tactical radio programme, awarded to Telefunken Racom in April. A variant of the company's 9Land BMS solution, the SLB will replace legacy RA-180 BMS currently used by the *Armén* (Swedish Army). The SLB BMS comprises a Basic Needs Tracker (BNT), Combat Needs Integrator (CNI), and All Needs Net Commander (ANNC). The BNT has been designed for individual soldiers providing SA to the lowest level on the battlefield and includes navigation and route management tools, blue force



tracking, messaging and alerts. It is wearable and can be integrated onboard light tactical ground vehicles. "Soldiers are the outermost node in a network, which means they are not only receiving information, but also generating informa-

tion for the entire BMS," a Saab official explained to AMR.

Furthermore, the CNI incorporates the same capabilities as the BNT with the addition of integrated vehicle information systems, sensors and full motion video,

allowing it to assist fire support missions, collaborative mission management and remote sensor management. Finally, the ANNC extends the reach of the CNI technology to higher command elements and horizontally to coalition partners during multinational operations. It also includes an After Action Review feature allowing armed forces to generate 'lessons learned' following a mission.

Conclusion

Following multiple so-called "blue-on-blue" fratricide events during operations in Iraq over the first decade of the millennium, the ability to more cohesively conduct coalition operations remains a high priority for nations around the world. For example, on 6 March 2015, a Canadian soldier was mistakenly killed by Kurdish *Peshmerga* guerrillas in Iraq after being mistakenly identified as an ISIS cadre when returning to an observation post. The need to have timely and reliable information on the battlefield is unlikely to diminish and looks set to only increase in the future. [AMR](#)

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Thales' NS-100 radar has been designed to equip small sized combatants, and is outfitted with the wherewithal to receive transmissions from the ADS-B and AIS networks.

BIG SURVEILLANCE FOR SMALL PLATFORMS

The high performance found in naval surveillance radars equipping large surface combatants is migrating to smaller ships of corvette and Offshore Patrol Vessel (OPV) size, bringing ever-increasing levels of capability.

by Thomas Withington

The Republic of Singapore Navy (RSN) will outfit its forthcoming 'Independence' class Littoral Mission Vessels (LMVs) with Kelvin Hughes' SharpEye navigation radar, as announced by the firm in early August. The RSN is acquiring a total of eight 'Independence' class corvettes which are replacing

its erstwhile 'Fearless' class ships. Each 'Independence' class ship, the eponymous vessel was commissioned this May, will be outfitted with Kelvin Hughes' X-band (8.5-10.68 Gigahertz/GHz) version of its SharpEye naval radar. The selection of this radar is not surprising: Surface combatants of corvette size and below, namely

warships displacing under 3000 tonnes, including OPVs, both in the Asia-Pacific and beyond, are receiving progressively more capable naval surveillance radars.

What are the reasons for this trend? Navies around the world are increasingly being called upon to ensure the safety and security of their littorals. The Asia-Pacific has a notable example of this *vis-à-vis* the

People's Republic of China's (PRC) so-called Nine Dash Line which denotes the country's maritime and territorial claims in the South China Sea. The subject of intense controversy in the Asia-Pacific region, the Nine Dash Line arguably overlaps into several Exclusive Economic Zones (EEZs) which are prescribed by the United Nations Convention of the Law of the Sea and allow a state to exploit the waters up to 200 nautical miles/nm (107.9 kilometres/km) from its coastline. The EEZs of several nations, including the Philippines and parts of Malaysia, are covered by the PRC's Nine Dash Line. Therefore, the littorals of such nations can become contested, as recent events in the South China Sea have illustrated. During one incident in May 2015, Chinese vessels and Vietnam People's Navy (VPN) ships clashed in the South China Sea following the positioning of the PRC's *Haiyang Shiyou 981* oil platform in the vicinity of the Paracel Islands, an archipelago in the South China Sea, controlled by the PRC but claimed by Taiwan and Vietnam. On this occasion, the clashes between the VPN and the PRC ships accompanying the oil rig were confined to ramming and the use of high-pressure water hoses against each ship, but such incidents do little to cool tempers in this increasingly volatile stretch of water.

Getting Smaller

The lesson of the May 2015 confrontation is the importance of maritime situational awareness for the vessels which routinely patrol such contested waters. Advances in the miniaturisation of electronics, principally following Moore's Law which states that the number of transistors that can outfit an individual chip doubles every two years, have enabled the size of electronic circuits to progressively reduce. The consequence of this for radar design is that circuitry reduces in size, which enables comparatively more functionality in radars designed for small vessels than might have been possible a decade ago. For naval vessels, this increase in functionality provides OPVs and corvettes with good resolution regarding the surface and air targets they are able to detect and track. Previous to the introduction of naval surveillance radars such as Cassidian/Airbus' TRS-3D in the 1990s, powerful naval surveillance radars capable of providing a detailed air and maritime picture tended to be the preserve of large combatants such as the US Navy's 'Arleigh Burke' class destroyers and 'Ticonderoga' class cruisers. These ships had the

required space to accommodate the large antennae and electronics cabinets that radars such as Lockheed Martin's AN/SPY-1B/D S-band (2.3-2.5/2.7-3.7GHz) product, which weighs 83 tonnes including its antennae and electronics, require. Smaller OPV/Corvette sized combatants may not be able to perform complex missions such as ballistic missile defence or fleet air defence with their radars despite their sophistication. This is because they may be unable to safely accommodate large antennae without endangering sea-keeping, and to generate required electrical power levels. For example, the AN/SPY-1B/D typically generates a peak power of four to six megawatts, due to power plant limitations (broadly speaking, the more radio frequency energy a radar transmits, the greater its detection range), nevertheless they can provide a detailed view of the air and maritime situation in the ship's locale.

Requirements

Radars optimised for comparatively small naval combatants have several requirements such as a significant elevation coverage of up to 90 degrees from the antenna, Airbus told AMR via a written statement. This ensures that as much of the sky as possible can be watched by the radar. The need to detect very small objects that may have a Radar Cross Section (RCS) of under 0.1 square metres (one square foot) is

also an imperative while, at the same time, being able to discern such targets against 'clutter', the 'noise' which can be detected by a radar, such as wave crests into which smaller targets such as jet skis or a submarine periscope can hide; plus the need to detect and track small and fast targets such as surface-skimming anti-ship missiles, Airbus' statement continued.

For small combatants, all of these capabilities must be housed on a radar small enough to outfit the vessel. Spike Hughes, sales and marketing manager at Kelvin Hughes, notes the importance of low RCS target detection: "Small target detection in radar terms means low RCS targets such as RHIBs (Rigid Hull Inflatable Boats), wooden boats and jet skis fall into this category, which may be fast moving or very slow moving." Mr. Hughes also states that versatility in terms of roles is important: "A naval surveillance radar has to provide a number of roles now, firstly navigation, then safety at sea, i.e. collision avoidance, and a surveillance role to provide security through detection of asymmetric threats which may pose a threat to the ship or be operating illegally." Such asymmetric threats can encompass everything, from water-borne insurgents to narcotics traffickers using small boats to transport their products.

Alongside Singapore, the SharpEye radar has been procured by the *Tentera Laut DiRaja Malaysia* (TLDM/Royal Ma-



Kelvin Hughes

The RSN has opted for Kelvin Hughes' X-band SharpEye radar to outfit its new 'Independence' class corvettes, replacing its 'Fearless' ships.

Airbus has enjoyed success with its TRS-4D radar which has been selected to equip the later ships in the US Navy's 'Freedom' class, and the 'Baden-Württemberg' class of the German Navy shown here.



laysian Navy) for its Second Generation Patrol Vessels (also known as the Littoral Combat Ship) of which the navy is expected to acquire six, with deliveries of the ships concluding in 2020. The Sharp-Eye radars, two of which (one X-band and one S-band) will equip each vessel, will be joined by a single Thales Smart-S Mk.2 S-band naval surveillance radar which has a detection range of 130 nautical miles/nm (150 kilometres/km) and the ability to track 500 air and surface targets. Augmenting Thales' radar product family for small combatants is its NS-100. This radar uses an Active Electronically Scanned Array (AESA) antenna (*see below*), which has the asset of reducing the amount of space that such a radar absorbs on a warship. According to a statement supplied to AMR by Thales, "(The) NS-100 is a radar with limited required footprint. This results in fast and simple on-board installation, also on ships with limited available space." This S-band radar, which has a range of 107.9nm (200 km) provides 70 degrees of elevation coverage. The radar also comes equipped with Automatic Identification System (AIS) and Automatic Dependent Surveillance-Broadcast (ADS-B) interrogators. AIS is mandated by the International Maritime Organisa-

tion's International Convention for the Safety of Life at Sea which requires all vessels displacing in excess of 300 tonnes to carry a Very High Frequency (30 to 300 Megahertz) transponder which transmits details of their identity, position, course and speed. ADS-B, meanwhile, forms one part of the US Next Generation Air Transportation System air traffic management infrastructure which has developed surveillance technology that is being increasingly adopted around the world to provide civilian aircraft identification using satellite navigation, with the radar able to detect the Ultra High Frequency (300MHz to three gigahertz) transmissions made by an aircraft's ADS-B transponder.

Beyond Thales and Kelvin Hughes, the provision of naval surveillance radar to comparatively small surface combatants is the preserve of several companies such as Denmark's Terma which has outfitted vessels like the Royal Navy's 'River' class OPVs with its SCANTER-4103 X-band product. The firm was selected by the United Kingdom Ministry of Defence to this end in December 2014, and deliveries of the radar to equip the vessels, four of which have been commissioned, a fifth is under construction, and two have been ordered commenced this year. Provid-

ing target detection to a range of 90nm (167km), the SCANTER-4103 can track up to 500 surface and 100 air targets simultaneously. In terms of customers in the Asia-Pacific, the SCANTER-4103 equips the *Tentara Nasional Indonesia-Angkatan Laut* (Indonesian Navy) 'Fatahillah' class corvette, and a single 'Darussalam' class corvette of the *Tentera Laut Diraja Brunei* (Royal Brunei Navy).

US Markets

European manufacturers are also enjoying success in new markets, notably the United States, which had always been hard for non-US companies to penetrate. Airbus' TRS-3D radar has been selected for the United States Navy's 'Freedom' class Littoral Combat Ships. With a surveillance range of up to 97nm (150km), this C-band (5.25-5.925GHz) radar is available in two variants with 16 (TRS-3D/16) and 32 (TRS-3D/32) radiating elements mounted on the radar's antenna. Alongside the TRS-3D, known in US Navy service as the AN/APS-75, some of the vessels in the 'Freedom' class, notably the latter vessels from the ninth example (USS *Indianapolis*, plus four additional vessels on order), will receive the improved Airbus TRS-4D radar which, like the TRS-

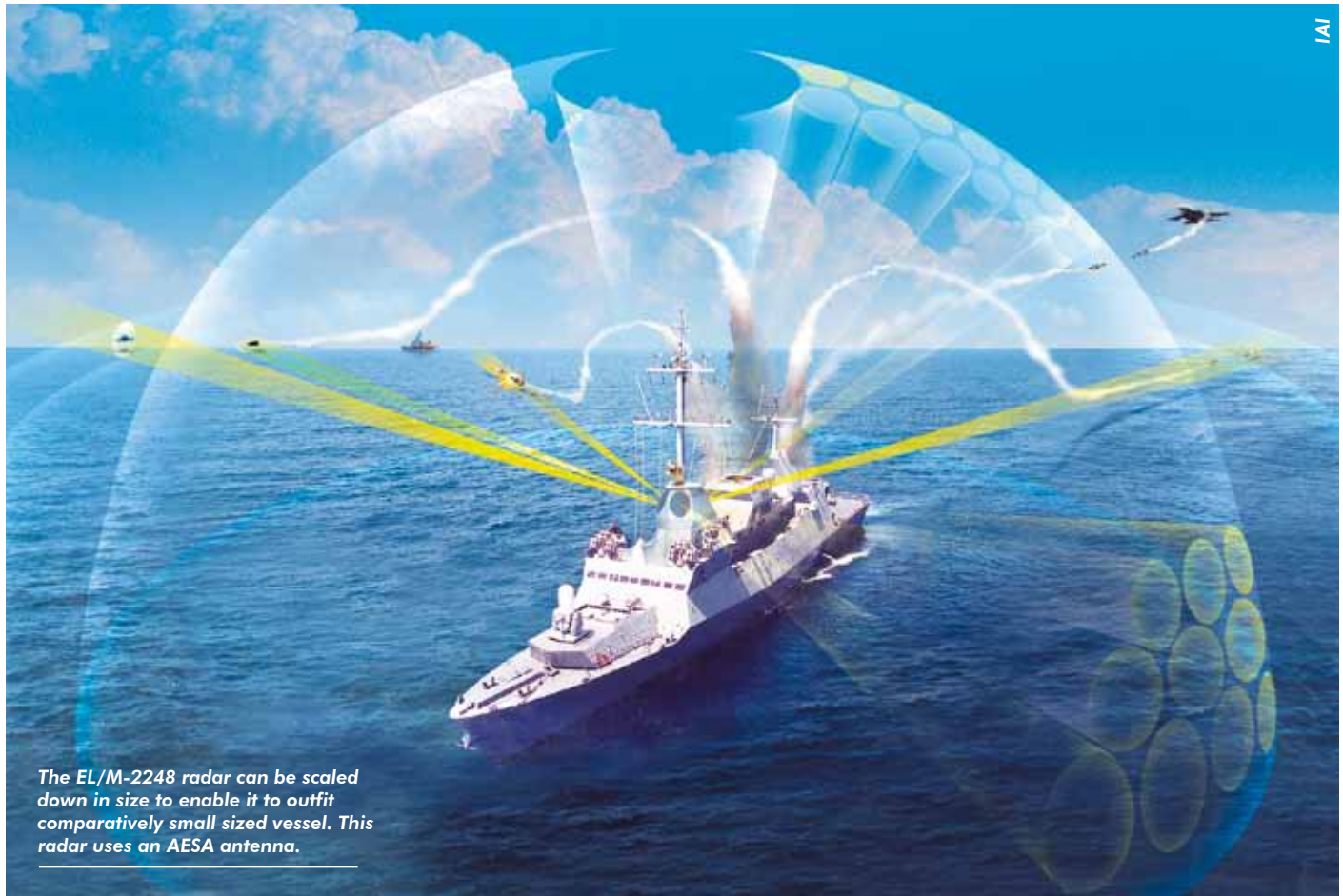
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The EL/M-2248 radar can be scaled down in size to enable it to outfit comparatively small sized vessel. This radar uses an AESA antenna.

3D family, is a C-band radar. Principle differences between the TRS-3D and TRS-4D include the longer detection range of the latter, which extends to 135nm (250km) and its ability to detect and track around 1000 air and surface targets.

An Active Electronically Scanned Array (AESA) radar outfits the TRS-4D, which encloses a multitude of Transmit/Receive (T/R) modules on the antenna. Each T/R module effectively acts as its own miniature radar generating, transmitting and processing its own RF (Radio Frequency) pulse. AESA technology allows the radar to be rapidly switched between tasks such as air and ground surveillance, which enables so-called 'graceful degradation' (the failure of one T/R module will not render the radar unserviceable). The flexibility inherent in the AESA design enables the TRS-4D to be used for tasks such as fire control for the vessel's armament, and for helicopter navigation. The TRS-4D is available with both a rotating antenna which equips the 'Freedom' class ships, and a flat panel design which outfits the 'Baden-Württemberg' class frigates for the *Deutsche Marine* (German) Navy, two of which

have been launched from a total class size of four vessels. Airbus told the author in 2015 that there are currently no US Navy plans to retrofit the TRS-4D onto the first eight ships of the 'Freedom' class which received the TRS-3D.

The US Navy LCS family includes the 'Independence' class design alongside the 'Freedom' class. Like its sibling, it is outfitted with a naval surveillance radar of European origin, in this instance Saab's Sea Giraffe AMB C-band product. Capable of providing 97nm (180km) of surveillance range, the radar can track up to 200 air, and 400 surface targets. Known in the US by its AN/SPS-77 nomenclature, ten of the radars have been delivered to Austral, the 'Independence' class shipbuilder. Additional deliveries of three radars are expected to follow for the same number of additional ships which were ordered by the US Navy as of April 2015. Also optimised for relatively small sized vessels is Saab's Sea Giraffe-1X radar. Launched in May 2014, this radar has a range of 54nm (100km) and can monitor up to 100 air and 200 surface targets. The Sea Giraffe-1X is thought to be awaiting customers.

Like its TRS-4D counterpart, Israel Aerospace Industries' ELTA Systems division has employed AESA architecture for its MF-STAR (Multi-Function Surveillance Track and Guidance Radar) comprising two family members, the S-band EL/M-2248 with a published range of 135nm (250km), and the EL/M-2258 ALPHA (Advanced Lightweight Phased Array) which has a range of 65nm (120.3km) and uses a phased array design as opposed to AESA architecture. In the latter, the radar's RF energy is generated at one source, as opposed to each T/R module as with an AESA, and is then fed into individual emitters mounted on the antenna. This enables the RF transmissions which fan out from the individual emitters to be 'steered' using a process of constructive interference. This process is akin to that by which two magnets of the same polarity repel each other; in that RF transmissions can be fed into the individual elements mounted on the antenna at different phases of oscillation which is sufficient to force the movement of the RF transmissions in particular directions. Phased array radars have advantages as when the antenna stops rotating, the RF



The EL/M-2258 has been designed to outfit comparatively small vessels, although it uses a phased array antenna, as opposed to the AESA antenna used by the EL/M-2248.

transmissions can still be steered to allow the radar to widen its field of view rather than only looking directly in front of the antenna's field-of-view. Moreover, as these radars do not require a large number of T/R modules, they can be comparatively less expensive than AESA radars to procure. That said, they can only transmit on a single frequency at any one time, unlike the T/R modules on an AESA radar which can transmit on different frequencies, which can render phased array radars more susceptible to jamming.

The EL/M-2258 equips the Israeli Navy's eight 'Sa'ar 4.5' class missile boats. Although the EL/M-2148 is typically designed for vessels which displace in excess of 2000 tonnes, Gil Roth, IAI ELTA's director of naval systems, says that the radar is scalable and can outfit ships displacing between 1600 and 2000 tonnes. This can be achieved using a smaller antenna or a flat panel design in which several panels can be combined together to provide 360 degrees of surveillance. Mr. Roth adds that while the radar's detection range may reduce with a smaller sized antenna, its processing power remains unchanged.

Finally, the IAI stable also includes the EL/M-2225S Nav-Guard radar launched in 2014. Employing four AESA antennae, the radar has a four nautical mile (seven kilometre) range and is primarily designed to provide short-range defence for a warship and can be teamed with self defence systems such as Rheinmetall's MASS (Multi-Ammunition Soft-Kill Sys-

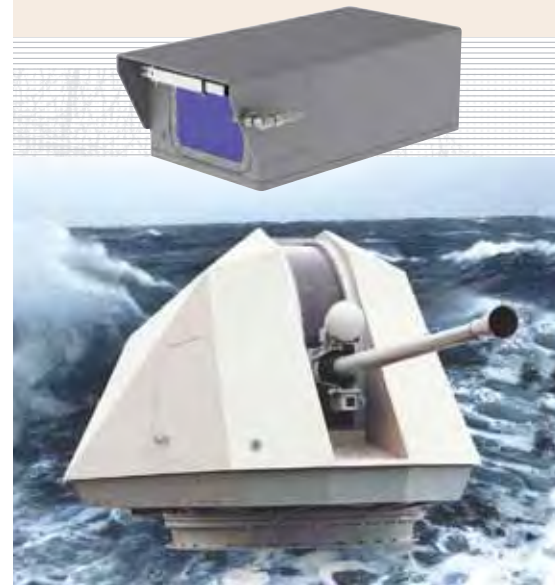
tem) which deploys chaff, flares and ultraviolet countermeasures against radar and infrared guided anti-ship missiles.

Sophistication

The technology for naval surveillance radars is in a condition of continual evolution. Mr. Hughes says that a major challenge for current radar designers is the ability to detect and track Unmanned Aerial Vehicles (UAVs). While naval surveillance radars are traditionally optimised for detecting conventional aircraft such as helicopters and fixed-wing aircraft, UAVs present their own challenges. Such aircraft can be small, may be constructed from radar-absorbent materials such as carbon fibre or plastic, and thus be comparatively harder to detect yet, at the same time, they are proliferating. Ensuring that naval surveillance radars will be able to remain abreast of emerging threats such as these in the future will be helped in no small part by the software-defined nature of their architecture. Instead of requiring the hardware of a radar to be changed to detect emerging threats, altering the algorithms that are used to process the radar's reflected transmissions will be sufficient. As the Thales statement notes, changing the software of a radar, alongside the use of modular components for hardware, allow physical elements of the radar to be changed using a 'building block' approach. This should make radars easier and less expensive for users to modify as and when new threats become apparent. **AMR**



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ISIS continue to operate mature armoured vehicles such as this T-55 MBT recaptured by Kurdish Peshmerga forces after ISIS had captured such vehicles from the Iraqi Army in 2014, thus greatly enhancing their capabilities.

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REACH OUT AND TOUCH SOMEONE

Contemporary operations are highlighting a resurgence in demand for flexible and accurate anti-armour support weapons as armed forces grow increasingly concerned about the military equipment available to insurgent organisations and so-called ‘near peer’ adversaries such as Russia.

by **Andrew White**

The Islamic State of Iraq and Syria (ISIS) insurgent group operating across Syria and northern Iraq, captured an impressive array of equipment from government forces in both countries as its advance swept across these nations in 2014. *Materiel* is now routinely used by ISIS to conduct armour and manoeuvre operations, for example, the group uses General Dynamics M1A1 Abrams Main Battle Tanks (MBTs), of which two may have been captured from the Iraqi Army, together with circa 52 BAE Systems/United Defence M-113 family tracked Armoured Personnel Carriers (APCs) from the same source. Additionally, the organisation is operating artillery such as the Kharkiv Tractor Plant 2SI *Gvozdika* self-propelled howitzer and Mytishchi Engineering Works ZSU-23-4 *Shilka* self-propelled anti-aircraft artillery. Despite

operating anti-armour munitions throughout ongoing counter-insurgency campaigns in Iraq and Afghanistan for over a decade in rather more limited capacities, current US-led operations to eradicate ISIS from the Middle East will depend heavily upon an ability to neutralise and destroy the organisation’s armoured columns.

Russian Revanchism

Elsewhere, a resurgent Russia continues to equip its growing expeditionary forces with a range of equipment including armoured platforms such as the Uralvagonzavod T-14 *Armata* MBTs and the *Armata* Universal Combat Platform family of armoured vehicles from the same company. The proliferation of such platforms in the Russian Army, which commenced in 2015, resulted in the government of the United Kingdom

highlighting such concerns in a July 2016 report entitled *Russia: Implications for UK Defence and Security*. According to this House of Commons’ (the UK’s lower house of parliament) Defence Committee report, Russia’s ability to conduct expeditionary operations represents a serious concern for NATO (North Atlantic Treaty Organisation) members and non-NATO members alike. In its report the Committee stated, “It is clear to us that Russia has harnessed a wide range of capabilities which can rapidly be deployed for use in conjunction with classic military power. NATO needs to respond in kind if it is to counter unconventional as well as conventional warfare. We therefore most strongly recommend that NATO, as part of its response to Russia, addresses its shortcomings in terms of the full range of unconventional warfare.” The report stated that “The Russian armed forces



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have shown impressive deployment abilities in Crimea (annexed by Russia in 2014) and Ukraine (through the country's involvement in Ukraine's civil war), the effectiveness of which was enhanced by the use of integrated, unconventional warfare techniques. It is likely that Russia will continue to use military means and unconventional warfare as ways of reasserting what it believes to be its rightful role on the international stage."

In response, NATO members across Europe and allied nations further afield are beginning to pay more attention to the fielding of anti-armour weapons, capable of defeating the growing arsenal of armoured platforms being deployed by Russia (*see above*). Earlier this year, Canada elected to reintroduce tripod-mounted anti-armour munitions to army infantry formations having mothballed or sold off most of its capability in this regard over recent years. In July 2017 the country's media reported that this reintroduction would concern the Canadian Army's Raytheon BGM-71 TOW (Tube-Launched, Optically-Tracked, Wire-Guided) Surface-to-Surface Missiles (SSMs). When speaking to the media following the announcement, Brigadier General Derek Macaulay, the Canadian Army's chief of staff for army strategy, disclosed that deliveries of BGM-71 weapons to the force would begin in 2017, although he held short of confirming whether the weapon's reintroduction was a direct response to Russian aggression in Europe, particularly in light of the country's involvement in Ukraine's civil war. Instead, Brig. Gen. Macaulay stated that the move represented a fulfilment of an existing capability gap: Canada currently has 450 personnel posted to the Baltic state and NATO member Latvia.

In 2005, Canada made its first order of the BGM-71 TOW, configured for launching from its fleet of General Dynamics Land Systems' (GDLS) LAV-III eight-wheel drive light armoured vehicles. The SSM equipping the BGM-71 missile has a maximum effective range of 3.7 kilometres (2.3 miles) against hard armour targets such as APCs and MBTs. This contract was followed in 2007 with a second Canadian order for 462 TOW-2A RF anti-bunker munitions. Raytheon's family of TOW systems now includes the 2A, 2B (to perform top-down attack using explosively formed penetrators) air-burst and bunker buster munitions (*see above*) providing "long range, heavy assault-



Raytheon and Lockheed Martin's FGM-148 Javelin ATGM, is in service with US and multiple NATO allies concerned about a resurgent Russia and its agendas in eastern Europe and the Baltic.

precision anti-armour, anti-fortification and anti-amphibious landing" capabilities, according to Raytheon's official literature. Variants of the BGM-71 are currently fielded with 40 armed forces worldwide and integrated on fixed infrastructure, vehicles and rotary platforms, Raytheon explained to AMR. "The TOW-2A, TOW-2B Aero and TOW Bunker Buster missiles can be fired from all BGM-71 launchers, including the Improved Target Acquisition System (ITAS, an improved version of the current BGM-71 family launcher), US Army GDLS M-1134 Stryker anti-tank guided missile vehicles and BAE Systems/United Defence M2 Bradley family Infantry Fighting Vehicles (IFVs)," stated Raytheon.

Javelin

Beyond the BGM-71, Raytheon and Lockheed Martin's joint venture FGM-148 Javelin ATGM (Anti-Tank Guided Missile) continues to enjoy popularity across NATO and allied partners with news published during the June Eurosatory defence exhibition in Paris regarding successful integration tests onboard US Army Stryker Infantry Fighting Vehicles achieving a maximum lethal range of four kilometres (2.4 miles) compared to the weapons' legacy 2.5km (1.5 mile) range.

Describing tests conducted earlier in the second quarter for the UK's Ministry of Defence on the Salisbury Plain Training Area, southwest England, Raytheon sources explained to AMR how the FGM-148 had already been qualified for use with the US Army as part of a Remote Weapon Station upgrade effort, which saw the weapon integrated on the Kongsberg CROWS-II remote weapons station used by US Army Stryker family vehicles. Mirroring the concern regarding potential Russian aggression in the Baltic, NATO member Lithuania officially implemented a request for additional FGM-148s via a

foreign military sale from the US on 18 December 2015. Having been the export launch customer for the weapon back in 2001, with approximately 74 munitions and associated launchers supplied during subsequent years, the Lithuanian armed forces are seeking an additional 200 munitions and 74 Command Launch Units (CLUs). Industry sources also suggested to AMR that Lithuania would be seeking to procure an undisclosed number of Rafael Advanced Defence Systems' Spike family ATGM systems for integration on board infantry fighting vehicles, possibly the 88 ARTEC Boxer eight-wheel drive armoured fighting vehicles that the country stated it will purchase in December 2015, which are expected to be furnished with the Spike-LR long-range SSM that has a range of four kilometres. Baltic neighbour Estonia has also been supplied with the FGM-148, obtaining 120 CLUs and 350 SSMs in an FMS contract signed back in October 2014. Finally, the Czech Republic agreed an FMS with the US DoD (Department of Defence) in December 2015 for the provision of FGM-148 SSMs and CLUs for \$10.5 million.

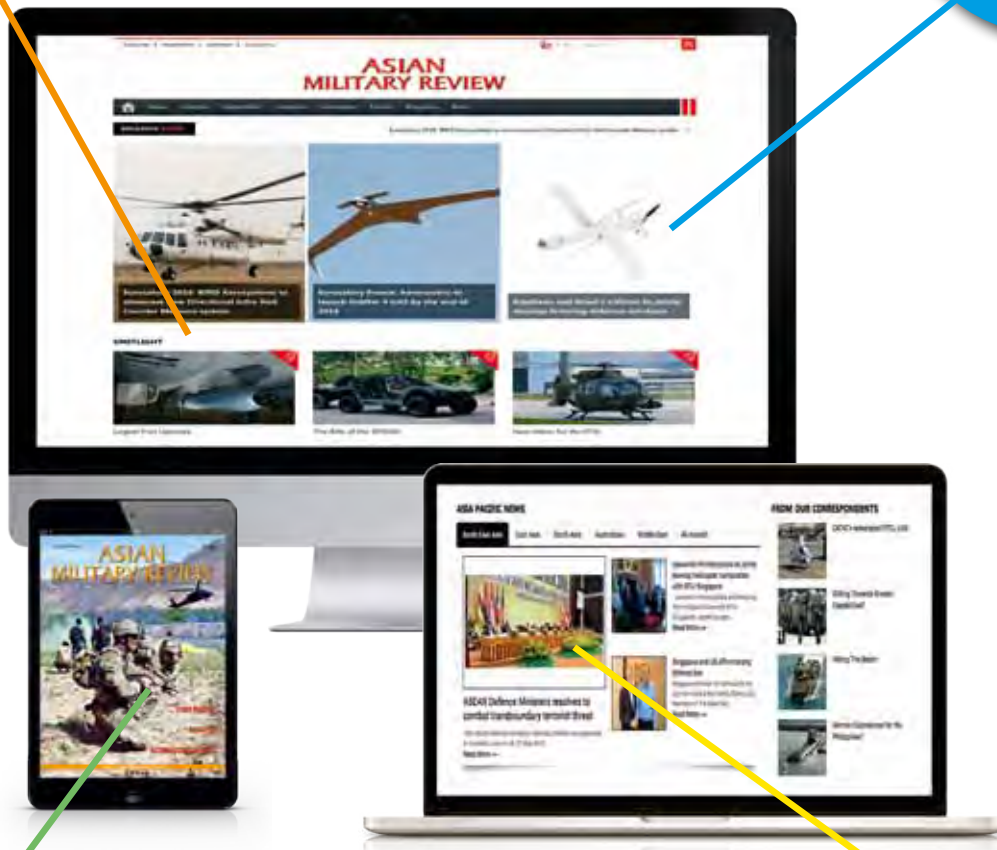
Meanwhile, prospective Asia-Pacific customers such as the Indian Army continue to pursue options to procure Spike ATGMs with a requirement to purchase launchers and missiles for \$1 billion. In May, the Indian government completed negotiations which could see the eventual supply of 275 launchers and 5500 SSMs, plus a technology transfer deal allowing Bharat Dynamics Limited to build an additional 1550 launchers and up to 30000 SSMs. Elsewhere, Azerbaijan's armed forces continue to rely on Spike ATGMs in its ostensibly frozen conflict with Armenia over the disputed Nagorno-Karabakh (an Armenian majority enclave of southwestern Azerbaijan) region with frequent clashes along the border between the two belligerents.

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Carl Gustav

The US DoD also continues to increase orders for Saab's Carl Gustaf 84mm recoilless rifle, the latest deal for which was received on 28 July. According to the Swedish company, a \$5.4 million contract has been agreed for ammunition to furnish the M3 MAAWS (Multi-Role, Anti-Armour, Anti-Personnel Weapon System) as the weapon is known in US service, where it is primarily used by that country's special forces community. According to Michael Andersson, president and chief executive officer at Saab's north American subsidiary, the Carl-Gustaf/M3 continues to provide a "versatile and powerful" solution for soldiers across "the most demanding environments."

Saab's latest M4 variant (known as the M3E1 for the North American market), has witnessed reductions in size and weight, with its all-up mass falling from ten kilograms (22 pounds/lbs) down to less than seven kilograms (15.4lbs), company officials explained to *AMR*. "Employing a wide range of ammunition types, the Carl-Gustaf allows dismounted soldiers to defeat multiple challenges, from neutralising armoured vehicles to clearing obstacles and engaging enemies in buildings," a company spokesperson for Saab explained, stating that the M4 had been designed as a man-portable, multi-role weapon system providing "high tactical flexibility through its wide range of ammunition types". In 2015, Slovakia became the first country to sign up for the M4 which features programmable ammunition allowing for flexible engagement of what can be rapidly evolving target sets during combat. "As technologies evolve, weaponry needs to keep pace and offer cutting-edge capabilities. Programmable ammunition is just one innovation that is set to revolutionise the battlefield for dismounted infantry. Built with future requirements in mind, the M4 is compatible with intelligent sighting systems and prepared for programmable ammunition," the spokesperson added. "Today's dismounted infantry face a broader range of battlefield challenges than ever before and speed can mean the difference between life and death for dismounted infantry ... Having a single weapon for all situations increases their tactical flexibility and reduces the amount of equipment that they carry."

Despite being a lighter solution, the M4 has been designed with enhanced



The Lithuanian armed forces are currently being equipped with Raytheon and Lockheed Martin's FGM-148 ATGM as they ramp up capabilities for rural and urban warfare, mindful of the threat from a resurgent Russia.

ergonomics in mind, including an adjustable shoulder rest and foregrip, as well as a reduced action time, allowing the weapon to be carried safely but quickly to destroy targets as and when required, in line with an ever-shortening kill chain which sees dismounted infantry and special forces often acting on real-time intelligence.

Germany's Rheinmetall has also revealed its Remote Control Lightweight Missile (RCLM) launcher. Weighing just 19kgs (41.8lbs), Rheinmetall officials explained to *AMR* that the project remained in a development phase with a Technology Demonstrator expected to be unveiled to the market within the next two years. Comprising significant weight savings for infantry and dismounted close combat users, the RLCM has been designed for integration on tactical ground vehicles, providing users with a surface-to-surface and surface-to-air weapon system. Unveiled during the Eurosatory exhibition in Paris, the RCLM includes an integrated Rheinmetall SAPHIR mission system comprising a third-generation infrared sensor, as well as a high-resolution television camera, and eye-safe laser rangefinder. The RLCM will be capable of hosting multiple legacy munitions ranging from Rafael's Spike-SR SSMs to MBDA's Mistral family of surface-to-air missiles.

Spike

Rafael is also keen on reducing the size and weight carried by infantry forces during expeditionary operations. During Eurosatory, the company showcased a Spike NLOS (Non-Line-of-Sight) SSM launcher integrated on board a scale model of Polaris Defence's MRZR-4 all-terrain vehicle, a popular internally transportable vehicle currently employed by NATO and allied special forces to enhance mobility, lethality and reach. In this particular

exhibit, Rafael illustrated how such a vehicle platform would be capable of housing a remote-controlled launcher which could be operated by soldiers positioned up to half a kilometre (0.3 miles) away. Earlier in the year, Rafael unveiled a new warhead design for its Spike-SR, extending the range of the legacy missile out to 1.5km (0.9 miles). Legacy models of the Spike-SR family previously had maximum effective ranges limited to just one kilometre (0.6 miles). However, the company will not continue with the development of its next-generation Mini-Spike anti-armour solution, company officials explained without divulging specific reasons as to why.

Eurosatory also saw the People's Republic of China's NORINCO (China North Industries Corporation) promoting its Red Arrow-12 multipurpose, fire-and-forget munition. With a weight of 22kgs (48.4lbs), the Red Arrow-12 boasts a maximum effective range of four kilometres (2.4 miles), according to company officials. Its associated CLU comprises a command and control system with daylight and infrared cameras, allowing missiles to lock onto targets ranging from armoured platforms through to soft-skinned vehicles and bunkers. Company officials speaking to *AMR* during Eurosatory claimed the warhead would be able to penetrate 11mm of armour and could be used for surface-to-air combat against slow-moving rotary wing aircraft and unmanned aerial vehicles, as well as small vessels in the maritime environment.

Conclusion

According to defence sources associated with NATO's Special Operations Headquarters (NSHQ) in Mons, Belgium, it is precisely these concerns relating to the enhanced capabilities of both state and non-state actors which remains a major worry for NATO members conducting counter-insurgency operations in Iraq, Syria and Afghanistan as well as homeland security and military assistance operations across the Alliance's eastern flank with Russia. "After more than a decade worrying about (counter-insurgency) operations globally, the same sort of adversaries are now forcing NATO to reconsider the employment of manoeuvre warfare and anti-tank operations which had failed, to differing extents, to be included in contingency planning," the NSHQ source explained to *AMR*. "This is a classic example of expecting the unexpected." **AMR**



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More than 100 Kawasaki-assembled P-3CIII Orion MPAs were delivered to the Japan Maritime Self Defence Force making the service one of the biggest operators of the aircraft globally.

David Oliver



THE HUNTSMAN STILL RULES THE WAVES

Once again tension over disputed island and territories in the South China Sea is the focus for Asia-Pacific nations to re-evaluate their maritime surveillance capabilities. Many of these countries are island nations with extensive coastal waters to patrol and protect.

by **David Oliver**

Few Asia-Pacific nations can afford to develop or acquire fleets of new-generation Maritime Patrol Aircraft (MPA), such as the Boeing P-8A/I Poseidon MPA, apart from Australia and India, so the MPA of choice in the region is the Lockheed Martin P-3 Orion family which is operated by no less than seven countries. Taking its name from the huntsman of Zeus, the king of the Greek deities, the P-3 first flew in 1958. The four-turboprop powered long-range P-3 series, which resulted in several variants, a list of which would be constrained by available space, was developed from the Lockheed L-188 Electra airliner, and has proved a

resilient and adaptable maritime platform with an excellent safety record.

Japan

The Japan Maritime Self Defence Force (JMSDF) has the largest MPA fleet in the region the core of which is the P-3C Orion. Not only is the JMSDF P-3C fleet the largest in the region (73 airframes) it is also the newest following Japan's decision in 1979 to build the P-3C under licence with the first Kawasaki assembled P-3C being delivered in March 1982. Kawasaki's assembly line switched to the P-3CIII production standard in 1988 and by February 1995 more than 100 P-3Cs had been delivered to the JMSDF. In November 2001 Ka-

wasaki was selected to develop an indigenous design to meet the Japan Defence Agency (JDA) P-X requirement to replace the P-3C. The first four-jet Kawasaki P-1 prototype flew in September 2007 and after a protracted development programme the first of 65 aircraft on order was delivered to the JMSDF in March 2013.

Australia

After Japan, the Royal Australian Air Force (RAAF) is the second largest P-3 family operator (15 aircraft) in the region. The first batch of ten P-3B aircraft, which replaced the Lockheed P-2H Neptunes of 11 Squadron in 1968, was replaced by 20 AP-3C (the Australian designation for the

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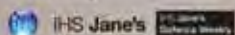
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David Oliver

The JMSDF P-3Cs are being replaced by the Kawasaki P-1 MPA which entered service in 2013. Thailand has expressed an interest in acquiring the P-1, and the Philippines has also contemplated acquiring the aircraft.

P-3C) aircraft a decade later. A contract for the RAAF's AIR 5276 project to replace the mission equipment on board 18 of the P-3Cs was signed in January 1995, and completed in 2004, outfitting the aircraft with new equipment racks, operator consoles and a FLIR Systems Star Safire II optronics system.

In February 2014, the Australian government announced the acquisition of eight P-8As under the AIR 7000 project and approved an option for a further four aircraft subject to the outcomes of future governmental defence spending reviews. The P-8A aircraft will replace the RAAF's AP-3Cs, with the first aircraft to be delivered in 2017 and all eight aircraft to be fully operational by 2021.

New Zealand

While not the largest P-3 operator in the region, the first regional operator was the Royal New Zealand Air Force (RNZAF) that received five P-3Bs in 1966 which were followed by the delivery of an ex-RAAF P-3B in 1985. Following an avionics and radio upgrade under the RNZAF's Project RIGEL in the early 1980s, the P-3K designation was applied to all six aircraft in the fleet. In October 2004 L3 Communications' integrated systems division was awarded a contract to upgrade all these aircraft. This will improve the P-

3K's mission systems, communications and navigation. All upgraded aircraft were returned to the RNZAF by August 2014, with a further software upgrade of the aircraft being performed in 2015 and local media reports quoting the total cost of the upgrade being \$332.3 million. The upgraded aircraft are designated as the

P-3K2. While the P-3K2s enable the New Zealand government to continue to offer a highly valued capability to international coalition operations (for example one P-3K2 deployed to the Middle East in July 2014 to assist anti-piracy operations there), they are scheduled for replacement in the mid-2020s.



David Oliver

The Australian Government announced the acquisition of eight P-8As in 2014 under the AIR 7000 project to replace the RAAF's surviving 15 AP-3C Orions. The aircraft is seen here showing its weapons bay and under-wing stations.

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The Pakistan Navy has a fleet of seven P-3C MPAs having lost one in an accident and two more during an insurgent attack at Mehran naval base in Karachi in 2011. This shortfall in aircraft may now be made up with new deliveries from the United States.

Republic of Korea

In September 1991, the Republic of Korea (RoK) ordered eight P-3CIII+ aircraft, the last to be built by Lockheed Martin. In addition the RoK Navy (RoKN) acquired eight ex-US Navy P-3B aircraft in 2005 for \$496 million. These were delivered to the RoKN by 2010 after undergoing an extensive modernisation. In late 2004 Korea Aerospace Industries (KAI) was awarded a contract for a structural refurbishment of all eight P-3Bs and an upgrade to be performed by L3 Communications to install a new maritime patrol radar, high-definition optronics and a magnetic anomaly detector, plus Rockwell Collins' Flight2 avionics system. All eight P-3Bs, now designated P-3CK, will be delivered back to the RoKN by 2017.

In May 2013 it was announced that the Defense Acquisition Programme Administration (DAPA), the RoK's defence procurement organisation, was commencing a \$889 million procurement programme to acquire up to 20 new MPAs to replace the existing fleet of 16 P-3C/CKs to strengthen its surveillance capabilities against the maritime activities of its rival Democratic People's Republic of Korea. Possible candidates include the Airbus C-295 MPA, the Lockheed Martin SC-130J Sea Hercules and the Boeing P-8A Poseidon. DAPA is also considering an interim plan to procure twelve ex-US Navy Lockheed Martin S-3B Viking anti-submarine/maritime surveillance aircraft for the RoKN, according to media reports.

Republic of China

The Republic of China Air Force (ROCAF)

obtained twelve P-3C aircraft under a US government \$1.9 billion Foreign Military Sales (FMS) programme in 2007 at a reported cost of \$80 million each. Upgraded prior to their delivery to Taiwan, the aircraft were completely overhauled and modernised by Lockheed Martin. Upgrades included new avionics and service life extension kits to extend the aircraft's life for an additional 15000 flight hours. Mission system upgrades include the installation of electronic support measures to determine the radio frequency electronic order of battle in the aircraft's locale, new acoustic detectors, improved communications and new optronics, data management software and hardware, controls, displays and mission computers. The first modernised RoCAF P-3C was delivered in August 2013. These P-3Cs are replacing the eleven surviving ROCAF Northrop Grumman S-2Ts Anti-Submarine Warfare (ASW) aircraft.

Pakistan

The Pakistan Navy operates a diverse fleet of MPAs that includes three P-3Cs which were ordered in 1988 and delivered between 1996 and 1997; one of which was lost in a crash in October 1999. In late 2004, the Portuguese aircraft refitter OGMA was chosen by Lockheed Martin to restore and refit the Pakistan Navy's two remaining aircraft to the P-3C Up-

date-2.5 (P-3CUP) level re-entering service in September 2006.

Seven ex-USN P-3Cs were rebuilt to P-3CUP standard and were ordered in 2005 through the FMS programme, being delivered between 2007 and 2012. Nonetheless an insurgent attack on the Mehran naval base in Karachi in 2011 destroyed two of the P-3CUP Orion aircraft after which the United States agreed to replace them at a later date.

Orion Options

The United States Navy is beginning the withdrawal of more than 100 P-3 family aircraft from its inventory as deliveries of the P-8A ramp up. As an alternative, Lockheed Martin is offering a certified P-3 Mid-Life Upgrade (MLU) programme. The latter could provide options for other Asia-Pacific countries looking for an arguably more affordable long-range MPA. The P-3 MLU programme consists of a life extension kit which can provide the aircraft with an additional 15000 flight hours. Following the decision of the administration of President Barack Obama to lift its arms embargo on Vietnam earlier this year, the country is expected to request formal pricing and availability data on four to six refurbished ex-US Navy P-3C aircraft in the next few months although such a request would have to be reviewed by the US government, according to Lockheed Martin officials.

Vietnam, which borders the PRC, is now a key part of Mr. Obama's efforts to rebalance US strategy toward the Asia-Pacific amid worries regarding Beijing's assertiveness and sovereignty claims in the East and South China Seas. Currently Vietnam has a small fleet of Viking Twin Otter Series-400 and three Airbus C212-400MP MPAs assigned to the Vietnam Marine Police, while the two or four (sources differ) Soviet-era Beriev Be-12 amphibious aircraft operated by the

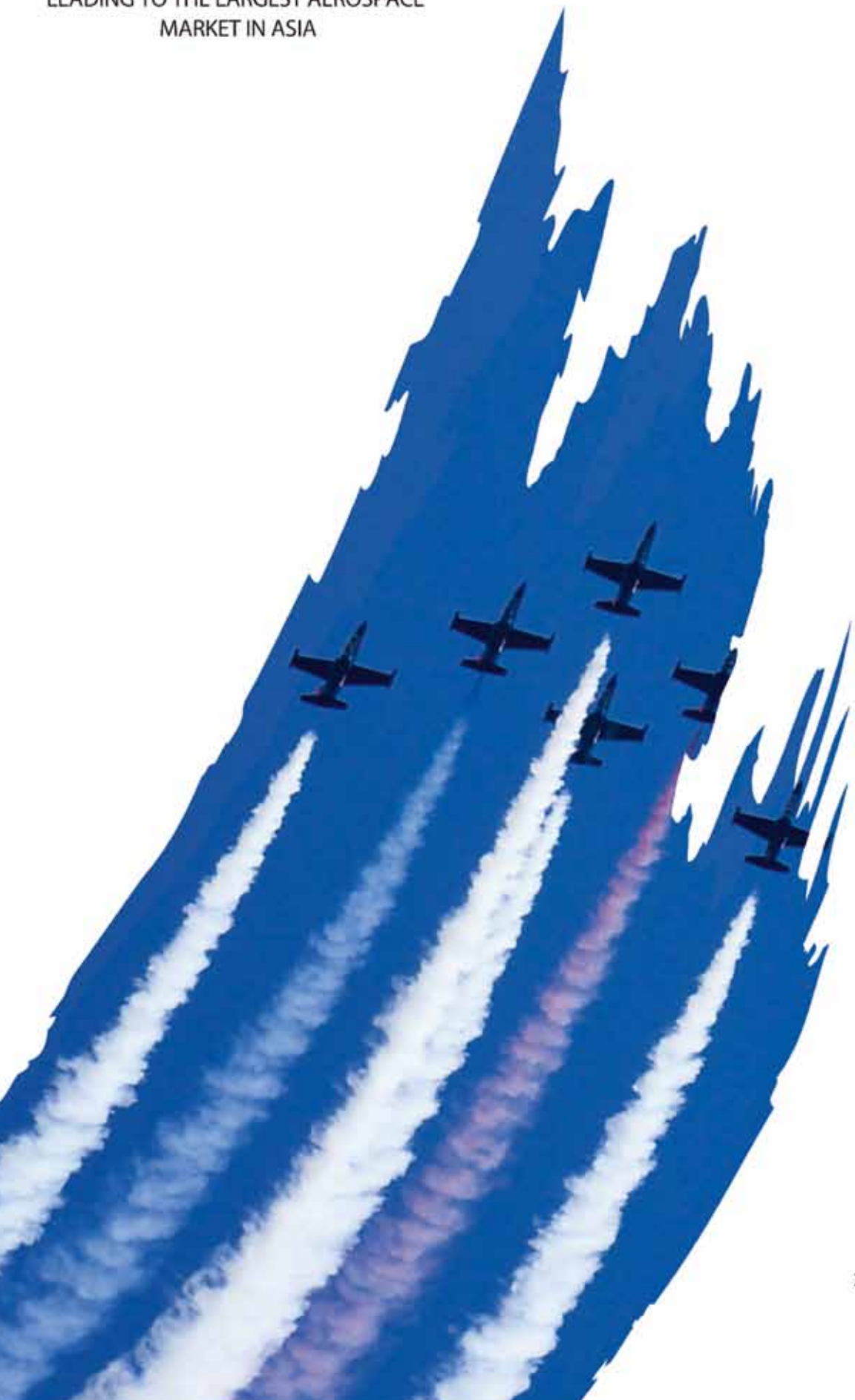


Vietnam's Marine Police operates three C212-400MP aircraft, and following the US' lifting of its arms embargo, Vietnam has requested the purchase of ex-US Navy P-3Cs under a Foreign Military Sales programme.

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Vietnam People's Air Force are unlikely to be airworthy.

Philippines

With an archipelago comprising over 7000 islands, some of which are claimed by the PRC, the Philippines has no long-range MPA capability. In 2014, the Philippines government announced plans to acquire two long-range MPAs and companies reported to have responded to these plans include Alenia Aermacchi/Leonardo, Airbus and Israel Aerospace Industries. In May 2015, the Philippines expressed interest in acquiring a number of P-3Cs from Japan (see above), and in February the Philippines and Japanese governments signed an agreement to allow Japan to transfer defence equipment to the Philippines. For more information regarding defence procurement in the Philippines, please see Alex Calvo's *Arming the Archipelago* article in this issue.

However, the time and complexity of acquiring the Japanese aircraft may force the Philippines government to look at other options including ex-US Navy P-3Cs hence the interest in the offerings discussed above. Likewise, Indonesia's archipelago comprises circa 17000 islands meaning that maritime surveillance and protection should be of paramount importance. However the roles are shared by the *Tentara Nasional Indonesia-Angkatan Laut* (TNI-AL) Airbus/CASA CN-212-200 and Airbus/CASA CN-235-200 MPAs, and *Tentara Nasional Indonesia-Angkatan Udara* (Indonesian Air Force) CN-235-220 and three Boeing 737-2X9 Surveiller aircraft. Indonesia is the only nation to operate the 737-2X9 Surveiller equipped with



Israel Aerospace Industries' (IAI) Elta Systems division is offering its EL/I-3360, a high performance long-range multi-role MPA based on the Bombardier Global-5000.

a Motorola side-looking airborne multi-mission radar capable of seeing small craft in heavy sea from a distance of 115 nautical miles/nm (212 kilometres/km). Having been in service for more than thirty years, their logical replacement would be the P-8A Poseidon.

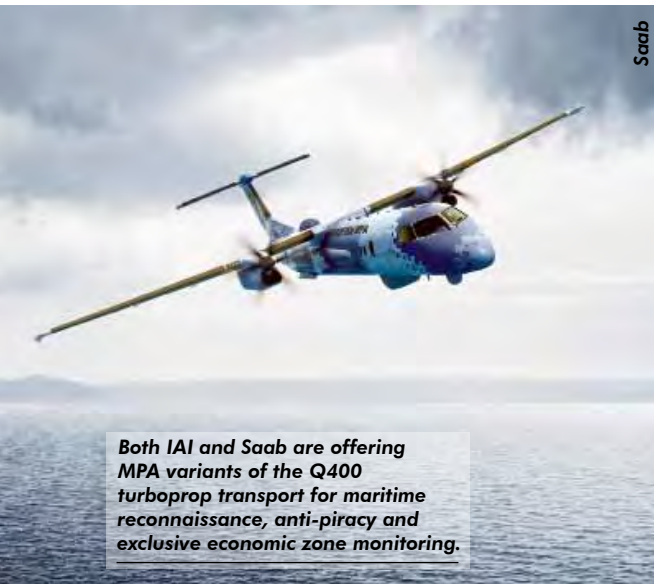
Business Jets

The Japan Coast Guard (JCG) has become the first customer for the Dassault Falcon 2000 Maritime Surveillance Aircraft (MSA) based on the firm's Falcon-2000LXS business jet, ordering the platform in April 2015. With a range of 4000nm (7408km), L-3 Communications will integrate Thales' Amascos mission system onboard the JCG aircraft and the type has been evaluated for the Indian Navy's existential Medium Range Maritime Reconnaissance requirement.

Israel Aerospace Industries' (IAI) Elta Systems division is offering the EL/I-3360, a high performance long-range multi-role MPA based on the Bombardier Global-5000 business jet. Capable of exclusive economic zone and maritime security, ASW, anti-surface warfare, environmental protection, and Search and Rescue (SAR) the EL/I-3360 has a range of over 6000nm (11000km). Equipped with IAI's EL/M-2022 multi-mission radar it can also receive radio signals from the Automatic Identification System internationally mandated for all vessels displacing over 300 tonnes and

IAI's MOSP 3000HD optronics payload. The same company is offering a second medium-range, multi-role MPA based on the De Havilland/Bombardier Q400 with a range of up to 2500nm (4630km). It may be no coincidence that Saab is marketing its Swordfish multi-role MPA capabilities also based on Bombardier airframes, in this instance the Global-6000, and the Q400. Having proposed MPA variants of its Saab 340 and SF2000 regional airliners, Saab revealed its Swordfish MPA at the Singapore air show in February. Joakim Mevius, head of special mission aircraft programmes at the firm, told AMR, "Most customers in the MPA field have a preference toward new-build, in-production aircraft and that is something we are addressing in this programme with Bombardier. Also, from a technical standpoint, we were looking for additional space and size of aircraft in order to fulfil all operational requirements."

Both the Q400 and Global-6000 will be equipped with a Selex/Leonardo 7500 Seaspray maritime patrol radar and optronics, with the Global-6000 capable of carrying under-wing lightweight torpedoes and pods for SAR equipment. The aircraft can patrol for 8.5 hours. Both IAI and Saab are targeting the Republic of Singapore Air Force's ageing Fokker F-50 Enforcers fleet replacement, while due to its close relations with Thailand, Saab is confident that the Swordfish could be adopted as the Royal Thai Navy's principal MPA. However, with the country discussing greater defence co-operation with Japan, it has expressed an interest in acquiring the P-1 (see above). **AMR**



Both IAI and Saab are offering MPA variants of the Q400 turboprop transport for maritime reconnaissance, anti-piracy and exclusive economic zone monitoring.



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The ScanEagle is a popular choice for naval operators looking for an organic ship-launched UAV, with the Republic of Singapore Navy becoming the first to operate the UAV in the Asia-Pacific region.

BROADENING HORIZONS

The benefit of operating Unmanned Aerial Vehicles (UAVs) in the maritime domain has been known to navies in the Asia-Pacific region for some time. As far back as 2007 the Indian Navy trialled the Schiebel S-100 Camcopter, with the Pakistan Navy following suit and trialling the same UAV in 2008.

by **Claire Apthorp**

Meanwhile, the People's Republic of China is understood to have acquired a number (possibly up to 18) of the same UAV in circa 2010, showing that there has been an appetite for this technology for around a decade. Despite these trials and demonstrations, the actual uptake of the technology in real numbers has been quite slow overall in the region, particularly compared to the proliferation witnessed in North American and European armed forces which are beginning to operate naval UAVs in significant numbers.

The Republic of Singapore Navy acquired the Boeing/Insitu ScanEagle in 2012, making it the first navy in the region to openly acquire a maritime UAV capability. The navy acquired the UAV as part of the upgrade programme for its fleet of 'Victory' class corvettes, to provide it with an organic surveillance capability. The ScanEagle is stowed in a canister positioned on the side of the ship, and sent aloft using a pneumatic launcher positioned on the deck. The UAV is flown by a single operator throughout the mission, controlling the onboard payload to conduct surveillance and inspect targets of interest. Once the mission is finished,

it is recovered via the Skyhook system, which uses GPS (Global Positioning System) satellite guidance to direct the UAV back to the ship and capture it via a rope/hook mechanism as the UAV glides by. Data from the UAV is transmitted to the ship's combat information centre and is processed on board.

This case study gives insight into the value that a UAV can bring to maritime operations. They give the crew a true tactical capability to extend the reach of the vessel's sensors, conduct surveillance over wide areas, thus enabling a single ship to monitor a large area, and to inspect targets at stand-off distances, keeping the

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Northrop Grumman

The MQ-4C Triton UAV is being built for the US Navy. Australia plans to purchase the aircraft to enhance its maritime reconnaissance.

crew and vessels out of harm's way. All of which can be conducted as part of shorter decision-making cycles and with lower manpower requirements, flight hour costs, deck footprints and maintenance needs compared to a naval support helicopter or Maritime Patrol Aircraft (MPA).

Market Uptick

Movement in the Asia-Pacific UAV market has seen an increase in the past couple of years, with formal programme requirements emerging, new contracts being announced and the promise of more appearing on the horizon. Leading the charge is the Australian Department of Defence (DoD), which in 2013 kicked off a programme to acquire an unmanned capability for maritime surveillance. The DoD set its sights almost immediately on the Northrop Grumman MQ-4C Triton UAV being developed for the US Navy. In May 2013 it was announced that the government would seek to purchase the system under the foreign military sales route with the US government via Phase 1 of its AIR 7000 initiative.

The UAV is being acquired as a complement to the incoming Boeing P-8A Poseidon MPA, eight of which are being purchased as part of the Phase 2B segment of AIR 7000. Seven more P-8As will be acquired under two additional tranches, bringing the total number of the fleet to 15 aircraft by the late 2020s. These aircraft, being acquired under a cooperative

programme with the US Navy and Boeing, are replacing the Royal Australian Air Force's Lockheed Martin AP-3C Orion MPA fleet. By 2014 it was acknowledged by senior government officials that the number of MQ-4Cs to be purchased would be seven, a fact confirmed in the 2016 *Defence White Paper* outlining Australian strategic and defence procurement priorities. "To complement the surveillance capabilities of the P-8A, the government will acquire seven MQ-4C Triton UAVs from the early 2020s as part of the intelligence, surveillance and reconnaissance capability stream,"

the paper stated. The MQ-4C is based on Northrop Grumman's RQ-4B Global Hawk UAV. It can fly missions of over 24 hours in duration at altitudes of 52000 feet/ft (16090 metres/m) and over operational ranges of 8200 nautical miles/nm (15186 km/kilometres). How closely the Australian aircraft will resemble those in development for the US Navy is unknown, but the sensor package is likely to be similar, potentially including the Northrop Grumman AN/ZPY-3 Multi-Function Active Sensor (MFAS) radar that provides a 360 degree view of a large geographic area while providing all-weather coverage to expedite detecting, classifying, tracking and identifying points of interest. The US Navy MQ-4C will also carry optronics to capture still imagery and video of potential threats, an electronic support measure to identify and geolocate radar threats, and an Automatic Identification System (AIS) that will detect and track vessels equipped with AIS radio frequency responders, internationally mandated for all vessels displacing over 300 tonnes. More information regarding maritime patrol aircraft in the Asia-Pacific can be found in David Oliver's *The Huntsman Still Rules the Waves* in this issue.

In February the US Navy's MQ-4C completed operational assessment. This saw the aircraft undertake 60 hours of flight time, with radar performance validated at different altitudes and ranges, showing that the onboard systems are able to classify targets and disseminate data. The 2016 *Defence White Paper* also confirmed that Australia would acquire a short-range maritime tactical UAV "to



Australian DoD

The Australian Army used the ScanEagle UAV for reconnaissance missions in Afghanistan. The Royal Australian Navy is now understood to be interested in the aircraft for maritime operations.

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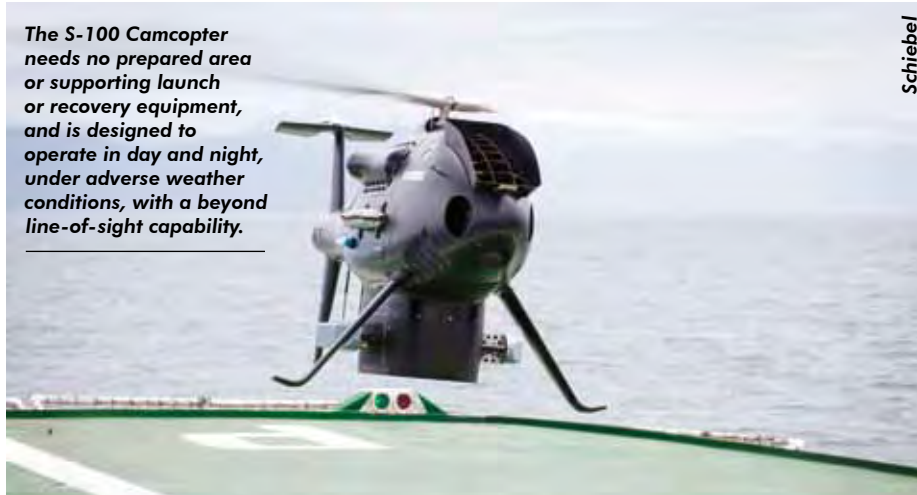


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Schiebel

improve the situational awareness” of naval vessels on operations. This requirement was refined in the DoD’s 2016 Integrated Investment Programme (released in February 2016), which stated that the RAN would acquire a maritime tactical unmanned reconnaissance platform “that will complement other sensors and systems by extending the area able to be held under surveillance.” These systems are to be progressively introduced over the decade until circa 2026, and “will be able to operate from a range of vessels of varying size, including future frigates and patrol vessels.” Ostensibly these vessels will include the three ‘Hobart’ class destroyers that will enter service by the early 2020s and will carry unmanned tactical intelligence, surveillance and reconnaissance systems.

The system likely to be figuring most strongly in the RAN’s (Royal Australian Navy) sights is the ScanEagle. The aircraft was deployed with the Australian Army during its deployment to support US counter-insurgency operations in Afghanistan, and at least one system is currently being trialled for shipborne operations with the RAN. In May the RAN announced that the ScanEagle had completed flight trial aboard HMAS *Choules*, a ‘Bay’ class amphibious assault ship.

An Insitu spokesperson confirmed that the company had supported the RAN in a “variety of RAN trials and testing” with the ScanEagle in 2015 for the development of maritime domain awareness with a comprehensive capability to monitor areas of interest. The company provided both equipment and personnel, and Insitu remains engaged with the DoD to assist in the development of maritime reconnaissance capabilities. “We have a strong mix of hardware and software solutions which

will provide the RAN with a comprehensive capability to monitor areas of interest,” the spokesperson said. “Additionally, through advanced collaboration with other current in-service system providers, Insitu is offering the RAN integrated (reconnaissance) solutions which enhance existing capabilities.”

Interim Capability

Until the short-range maritime tactical UAV capability is introduced, the RAN is seeking an interim capability. On 26 February a Request for Tender (RFT) was issued by the DoD for a Maritime Tactical Unmanned Aircraft System/Interim Capability (MTUAV/IC). This vertical take off and landing UAV’s primary role will be to extend and enhance the reconnaissance capabilities of the parent unit or ship and to increase situational awareness using a variety of sensors. This capability will support, according to the RFT, the RAN which is “in the process of developing experience

in the use of UAVs from ashore and from ships to further develop RAN UAV operations at sea,” according to the DoD.

There are a few stand-out possibilities for the programme. Schiebel has been chasing the Australian market for some time with the S-100, conducting a series of flights in June 2015 for the RAN. These focused on demonstrating the capabilities of the system’s sensor suite within the context of supporting maritime and littoral missions. Three payloads were used in the demonstrations: the Selex/Leonardo Sage electronic support measure and PicoSAR radar; providing radio frequency threat geolocation and all-weather and synthetic aperture radar imaging/ground moving target indication capabilities respectively; and the L-3 Wescam MX-10 for high resolution imaging. The combination of sensors is designed to extend the surveillance horizon of naval vessels and enhance situational awareness in the maritime environment. In 2013, the S-100 performed an integration on board the *Marine Nationale* (French Navy) ‘L’Adroit’ class corvette, proving that the UAV’s flight control software can be integrated with the vessel’s combat management system and that shipboard operations are a viable deployment option for the UAV. Schiebel told AMR that following the demonstration of the S-100 to the RAN in 2015 “negotiations are still ongoing.” The company spokesperson added that, “In general, we see a growing demand in naval applications. Especially on medium/small deck-sized ships/offshore patrol vessels and the need to operate in the littoral zone. Our ability to be part of bigger networks and to operate as a hub between assets is gaining more and more importance.” Other

The Skeldar UAV is designed for a wide range of applications such as reconnaissance, identification, target acquisition and electronic warfare. It can carry a number of high resolution optronics and electronic warfare sensors and provide real time information.



UMS Skeldar

options for the RAN could include the UMS Skeldar V-200, currently in service with the Spanish Navy, and the Northrop Grumman MQ-8B Fire Scout, although this is likely to be far larger than what the RAN is looking for.

Market Rumbblings

In April 2016 news emerged that Malaysia had acquired two S-100s at some point in 2015. When asked about the sale Schiebel declined to comment. Also in April Thales announced that Malaysia had taken a firm step toward updating its maritime surveillance capabilities, with the news that the Malaysian Maritime Enforcement Agency has selected its Fulmar UAV to equip six new generation patrol craft currently in construction with Destini Shipbuilding and Engineering. According to Thales the UAV will be deployed to extend the operational capabilities of the Malaysian maritime surveillance fleet for counter-piracy, anti-smuggling operations, fisheries policing and border surveillance. The Fulmar is a mini fixed-wing UAV can fly at altitudes of circa 9000ft (3000m) at 80 knots (150km/h)

for eight hours at a time, covering distances of 431.9nm (800km) without refuelling. The system has been designed to be easily integrated into a vessel's combat management system and can carry a payload of up to eight kilograms (17.6 pounds) integrating different types of optronics. The Malaysian payload has not been specified, but Thales has said it will include automatic detection and tracking and AIS capabilities. In its maritime version the Fulmar can take-off and land from a vessel while it is in motion.

Make in Asia?

If the appetite for naval UAVs grows strong enough it is likely that technological developments will take off in regional industry in the same way that it has for land-based UAVs over the past decade. The Australian MQ-4C programme is offering significant opportunities for Australian companies to enhance their knowledge and manufacturing capabilities in this area. A company executive from Ferra Engineering, the Australian company contracted to build and provide mechanical subassemblies to Northrop Grumman

for the aircraft, told AMR that not only has the contract enabled it to continue to create new jobs at its Australian facility, but that it is opening doors into new technology areas for the company. "This is a critical contract for Ferra," Aaron Thompson, director of Ferra Engineering, said. "The UAV sector is growing significantly and is a highly opportunistic sector within aerospace for the Ferra group. Ferra is expanding its internal capabilities in all our facilities as well as continuing to develop our local Australian supply chain to support new and existing opportunities ... We are constantly training and (increasing the skills of) our staff to ensure we can meet the evolving demands of our customers. We expect significant growth within the UAV sector with Northrop Grumman and other local and global customers." The increase in demand for UAV capabilities could see this model replicated across the region, fuelling industries ready to learn, innovate and excel at developing and manufacturing technology that presents a true game-changer for the naval operations they support. **AMR**



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ASIA-PACIFIC PROCUREMENT UPDATE

by Pierre Delrieu

PAKISTAN TURNS TO JORDAN FOR F-16S

■ Lieutenant General (retired) Alam Khattak, Pakistan's defence secretary, informed the Pakistan Senate's Standing Committees on Defence and Foreign Affairs on 13 June that the country's purchase of eight General Dynamics/Lockheed Martin F-16C/D Block-50/52 fighters from the United States was to be considered a "closed chapter." The deal, originally drafted with the US, was valued at \$699 million, but fell through after a US Congress vote refused to authorise the use of US government funds to finance the deal earlier this year.

According to local media reports, Lt. Gen. Khattak announced Pakistan would be seeking to acquire the aircraft from another country, telling a joint sitting of the Senate, "we are now going for a third-party transfer of F-16s and

have an offer from Jordan." Local media reports noted that Jordan had proposed to sell Pakistan 16 used F-16A/B Block-30/32 fighters, an older design compared to the one being offered by the United States. Pakistan has bought Jordanian F-16A/Bs in the past, procuring 13 aircraft in 2014. The batch now offered to Pakistan by the Royal Jordanian Air Force were reportedly manufactured in the late 1980's and upgraded earlier this century. Should Pakistan go forward with the deal and purchase the Jordanian aircraft, these F-16A/Bs would most probably need to be upgraded once more to ensure that they have sufficient airframe life and capabilities for the Pakistan Air Force.

In any case, Pakistan is due to decommission part of its F-16 fleet in 2017 and the government has argued it

needs new aircraft to pursue its fight against Islamist militants in the remote mountain region on its border with Afghanistan. The country's Ministry of Defence has never officially disclosed how many F-16A/B/C/Ds are currently in service within the Pakistan Air Force but the number of aircraft is believed to be about 70. A new fleet could also be a vital advantage in the event of any escalation in tension with Pakistan's rival India.

The difficulty over the F-16 deal is but one of the latest sign of increasingly difficult ties between the United States and Pakistan. US lawmakers had been stalling the financing for the eight F-16 fighters, after the possible sale had been approved by the State Department in February, following fierce congressional opposition. Without financing from the US, Pakistan would

have had to pay the full \$699 million for the aircraft, instead of the \$270 million with financial support. Among the arguments used by some members of the US Congress against the deal were accusations that Pakistan was harbouring militant groups such as the *Taliban* and the *Haqqani* Network, both known to be leading insurgencies against the US-backed government in Kabul. The Pakistan government objected, saying it was acting against the militants, pointing to its ongoing military operations in the ethnic Pashtun regions that border Afghanistan. Furthermore, on 21 May, a US Unmanned Combat Aerial Vehicle entered Pakistani airspace and killed Mullah Akhtar Mansour, the then chief of the *Taliban's* Afghanistan operations. Pakistan condemned the strike as a violation of its sovereignty.



INDIA TO SELL BRAHMOS MISSILE TO VIETNAM

■ India has reportedly boosted its efforts to sell the BrahMos Aerospace BrahMos Surface-to-Surface Missile (SSM), and plans to export this weapon to Vietnam and at least eleven other countries. According to local media reports, India's Ministry of Defence (MoD) demanded that BrahMos Aerospace, a joint venture between the Russian Federation's NPO Mashinostroyeniya and India's Defence Research and Development Organisation

increase production in view of answering potential orders from Indonesia, the Philippines, Malaysia, and Thailand.

Vijainder K Thakur, a former Indian Air Force (IAF) fighter pilot and military analyst, told *AMR* that, with the development of the BrahMos, "India aims to enhance its regional power status to ensure the People's Republic of China's rise as a world power is peaceful. India's ability to project itself as a net provider of security in the region is pivotal to its regional power aspirations."

With a 300 kilogram (661 pound) semi-armour piercing warhead, this SSM can be used as an anti-ship missile against small vessels and large warships. Mr. Thakur added that "the supersonic

missile is capable of varying flight profiles, is difficult to intercept and its tremendous kinetic energy at impact makes it potent. Meanwhile its ability to be deployed on ships, submarines, land vehicles and aircraft makes it extremely versatile."

India's list of possible BrahMos customers includes Vietnam, the Philippines, Malaysia, and Thailand. "The decision to allow exports of the BrahMos missile at this stage is more political than market driven ... The People's Republic of China (PRC) has not specifically opposed the sale of the BrahMos missile," explains Mr. Thakur, "but has officially advised India to stay out of the maritime and territorial disputes the PRC has with

several of its neighbours in the South China Sea."

For now, the missile is in operation only with the Indian Army and has still to be introduced into Russian Army service. "The Indian Army is currently equipped with three BrahMos regiments," Mr. Thakur added, "comprising the Block 1 (anti-ship) and Block 2 (land attack) variants." On 25 June, the IAF, in collaboration with India's state-owned Hindustan Aeronautics Limited (HAL), conducted the first test flight of a Sukhoi Su-30MKI fighter outfitted with a modified BrahMos-A (Air variant) SSM. The 45-minute flight was the first of a series of trials to determine if the missile could comfortably be equipped on the aircraft.

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INDONESIA'S FIRST SIGMA 10514 FRIGATE BEGINS TRIALS

Indonesia's state-owned shipbuilder PT PAL on 11 July began sea trials of the country's first 'SIGMA 10514' class frigate. The vessel, the first of two on order for the Indonesian Navy, performed trials, including a speed test, a crash stop test, and turning manoeuvres, according to PT PAL.

The vessel was built in collaboration with Damen Schelde Naval Shipbuilding (DSNS) under a contract signed with the Indonesian Ministry of Defence in June 2012. Considered to be the most complex indigenously assembled warship to date, the frigate was launched by DSNS and PT PAL on 18 January at the Indonesian company's shipyard in Surabaya and is due to be commissioned with the navy in January 2017, and will be named *KRI Raden Eddy Martadinata*.



According to the manufacturers, the vessels' primary role will be air defence, anti-surface warfare and anti-submarine warfare, plus search and rescue, maritime security and humanitarian support. With a standard displacement of approximately 2400 tonnes and a top speed of 28 knots (52 kilometres-per-hour), the frigate can accommodate a crew of up to

120, and carry a naval support helicopter on its flight deck. It has a maximum range of 5000 nautical miles/nm (9260 kilometres/km) at 14 knots (26km/h), and a standard range of 4000nm (7408km) at 18 knots (33km/h).

The Indonesian Ministry of Defence awarded the contract for the frigate in December 2010. Purnomo Yusgiantoro,

Indonesia's former minister of defence, cut the first steel for the first frigate in January 2014 and the keel was laid in April 2014 at PT PAL's shipyard in Surabaya. The contract for the construction of the second frigate was signed in February 2013, the first steel was cut in September 2014 and the keel laying ceremony held in December 2014.



AIRBUS LOOKING TO EXTEND C-295 EXPORTS TO THAILAND AND MALAYSIA

While Thailand has not officially announced the purchase, Airbus revealed in a list of secured orders and deliveries published on 30 June

that the country had placed an order for the company's C-295W turboprop freighter for the Royal Thai Army (RTA). Online pictures of the aircraft, and a test flight in Seville on 16 June bearing relevant markings, firmly identified the aircraft as belonging to

the RTA.

The RTA selected the C-295W and placed its order in September 2015. Valued at about \$36 million, Thailand's C-295W was formally delivered on 9 June.

The C-295W is, according to Airbus, a more efficient version of the 'vanilla' C-295M, especially in terms of payload, climbing, altitude and cruising performances, thanks to the aircraft's wing-

lets and upgraded engines which boosts the aircraft's capabilities, particularly in hot-and-high conditions. The C-295W will bring a welcome boost to the RTA's transport fleet, and Thailand has reportedly placed a requirement for a total of up to four C-295Ws,

but the additional orders will depend entirely on available funds over the years to come.

Airbus' C-295M is currently in service with various countries in the Asia-Pacific region, including Indonesia, which operates nine aircraft, with the Philippines recently receiving three units and Vietnam owning three. Malaysia's National News Agency, BERNAMA, announced on 2 August that Airbus was also looking to pitch the aircraft to the Royal Malaysian Air Force for maritime patrol use. Fernando Alonso, Airbus' head of military aircraft stated during a recent press conference that Airbus would soon "be approaching the Royal Malaysian Air Force to offer what we call a unique product and well-suited to what you need in the region."



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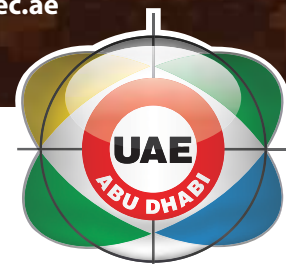
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JAPAN ISSUES TENDER FOR NEW FIGHTER PROGRAMME

■ The Japanese Ministry of Defence (MoD) in early July issued a Request for Information (RFI) and announced it expects to make a decision regarding the Japan's Air Self Defence Force's (JASDF) future fighter aircraft by April 2018, with an

initial deployment due at the end of the 2020s at the earliest.

As reported by the *Reuters* news agency the contract, which would be for about 100 aircraft, is expected to be worth at least \$40 billion, dwarfing in value most recent fighter jet deals. Both Boeing and Lockheed Martin have reportedly expressed interest in the tender,

along with other manufacturers, including the Eurofighter consortium which produces the Typhoon fighter jet and Saab, which may offer the JASDF's Gripen. While Lockheed Martin could follow suit with its F-35A Lightning-II fighter, Boeing could follow suit with its F-15SE Silent Eagle fighter. Japan's new fighter pro-

gramme, known as the F-3 initiative, aims to replace the country's existing Mitsubishi/Lockheed Martin F-2A/B fighters, which are to be retired from about 2027. Japan is looking to contract a foreign defence manufacturer for the development of a home-grown design, and has long expressed interest in acquiring a twin-engine aircraft with a low radar cross section capable of long-range missions with internally-stowed missiles.

The JASDF has a fleet of nearly 200 McDonnell Douglas/Boeing F-15J Eagle air superiority fighters, the second largest in number after the US Air Force. The JASDF also still operates some 40 McDonnell Douglas F-4EJ Phantom fighters, which are slowly being retired and are to be replaced with 42 F-35As. Faced with the increasingly muscular strategic posture of the People's Republic of China, Japan is looking to update its fighter fleet as soon as possible.

The country's MoD is due to make its final decision on the F-3 programme in 2018 and Mitsubishi has already been appointed as the prime contractor for the project.

ROKN RECEIVED FIRST FOUR OF EIGHT AW159 HELICOPTERS

■ On 13 June, the Republic of Korea Navy (RoKN) received its first batch of four AgustaWestland/Leonardo AW-159 Wildcat naval support helicopters.

The aircraft is part of an order of eight helicopters announced in January 2013 under the Republic of Korea's Maritime Operational Helicopter programme. The first batch was originally scheduled to be handed over to the RoKN in the third quarter of 2015 but was delayed by the aircraft's site acceptance tests. Delivery of the final batch of

four helicopters is expected by the fourth quarter of 2016, and local *Yonhap* news agency reports stated that the RoKN plans to operationally deploy the AW-159s from mid-2017.

The AW-159 will serve on board the RoKN's 'Incheon' class frigates as an anti-submarine warfare platform, although the aircraft is reportedly capable of a variety of missions, including reconnaissance, anti-surface warfare, and search and rescue.

The RoK's AW-159s are equipped with Thales' Compact FLASH Sonics low-frequency, long-range dipping sonar and Selex/Leonardo's Seaspray 7000E radar. The

Wildcat will also be armed with lightweight torpedoes, namely the Korea Agency for Defence Development K-745 Blue Shark, but also depth charges and Rafael Advanced Defence Systems' Spike-NLOS air-to-surface missile.

The RoKN currently operates a total of 39 anti-submarine warfare aircraft, including 16 Lockheed Martin P-3C Orion maritime patrol aircraft, eleven AgustaWestland/Leonardo Lynx Mk.99 and twelve Super Lynx Mk.99A naval support helicopters.

The addition of the country's eight new AW-159s will bring the number of the

RoKN's ASW aircraft to 47, in addition to the RoK's forthcoming 30 Korea Aerospace Industries KUH-1 Surion helicopters, some of which will be equipped with ASW capabilities.

The Republic of Korea is pursuing its long-standing ambitions to improve RoKN capabilities, particularly with the aim to counter the Democratic People's Republic of Korea's (DPRK) military efforts. In early June, the RoKN inaugurated its most advanced frigate yet, the *Daegu*, built by Hyundai capable of launching ground attacks and of striking targets located in DPRK.



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SECURITY



AUSTRALIA TO ACQUIRE 80 RIM-66 MISSILES FROM US

■ On 31 May, Australia received the United States' State Department's approval for the acquisition of as many

as 80 Raytheon RIM-66 SM-2 Block-III B Standard Surface-to-Air Missiles (SAMs) through the US Foreign Military Sales programme along with vertical launch canisters for the SAMs.

The US Defence Security Cooperation Agency (DSCA), which is in charge of managing the programme, announced the decision, adding that the possible deal represents a total value of \$302 million. The deal would include up to 80 RIM-66M SM-2 Block-III B SAMs, up to 15 Mk.97 RIM-66 SM-2 Block-III B guidance sections, and an undisclosed number of Mk.13 MOD-0 vertical launching system canisters, as well as contractor engineering, and technical and logistics support services.

In its notification to the US Congress, the agency stated "it is vital to US national interests that Australia develops and maintains a strong and ready self-defence capability," adding that the "sale is consistent with US regional objectives". The RIM-66M SM-2 Block-III B SAM is capable of intercepting targets at a distance of up to 90 nautical miles (166 kilometres) and an altitude of 65000 feet (19812 metres). According to the manufacturer, the missile is "lethal against subsonic, supersonic, low- and high- altitude, high-maneuvring, diving, sea-skimming, anti-ship mis-

siles, fighters, bombers and helicopters in an advanced electronic countermeasures environment."

In its request for the missiles, Australia had stated it would use them for anti-air warfare test firings during Combat Systems Ship Qualification Trials of the Royal Australian Navy's (RAN) three new 'Hobart' class destroyers, currently under construction to replace the existing 'Adelaide' class frigates. The ships were ordered in October 2007. Although original plans announced their commission into the RAN between 2014 and 2016, delays in the manufacturing process has pushed the commissioning dates by at least three years. The lead ship HMAS *Hobart* is now scheduled for completion by June 2017, while the second vessel, HMAS *Brisbane* planned for September 2018, and the third and final vessel, HMAS *Sydney* for March 2020.

Combined with the frigate's Lockheed Martin Aegis combat management system, the RIM-66M SM-2 Block-III B SAMs will provide advanced area defence capabilities to the RAN over Australia's critical maritime approaches.

NEW ZEALAND'S ICE-STRENGTHENED OPV

■ New Zealand's Defence Ministry on 8 June published its 2016 *White Paper*, articulating its forthcoming defence procurement priorities, announcing a 15-year modernisation plan worth nearly \$20 billion, which includes the long-awaited addition of an ice-strengthened oiler to the Royal New Zealand Navy's fleet. The ship will complement the country's current 'Otago' class OPVs, HMNZS *Otago* and HMNZS *Wellington*, for these operations, commissioned in February and May 2010 respectively.

The new ship, expected to be delivered by around 2020, will reportedly include features that will allow it to operate in the Southern Ocean and near Antarctica, a region where the RNZN is looking to increase its maritime presence, which explains why the ship will have an ice-strengthened double-hull, as low water temperatures in the region can chill liquids stored in the ship's hull to freezing point.

The RNZN's new ship would reportedly need an endurance of about 30 days, which would allow it to transit down to the Antarctic sea

and remain on station there for a substantial period of time. The international Antarctic Treaty, which regulates international relations with respect to the planet's only continent without a native human population, is due for renewal negotiations before 2050, and countries with territorial claims on the continent will seek to spend more time deployed in the area.

Besides the ice-strengthened features and a design allowing it to support operations including diving, mine and obstacle clearance, and hydrography, no further details on the RNZN's new

vessel were given in the 2016 *White Paper*. The vessel will undoubtedly increase the range of operations the OPVs currently used by the RNZN can undertake in the South Pacific, and add to the navy's existing maritime surveillance and long-range patrol missions, as well as logistics and support during international coalition operations.

New Zealand's Defence Ministry stated that additional information on the points raised concerning the new tanker in the country's 2016 *White Paper* will be contained in its next *Defence Capability Plan*, to be published later this year.



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