

VOLUME 29/ISSUE 2

APRIL/MAY 2021
US\$15

ASIAN MILITARY REVIEW

ASIA PACIFIC'S LARGEST CIRCULATED DEFENCE MAGAZINE



NAVAL SHIPBUILDING
SATELLITE V AIRBORNE ISR

SMALL ARMS
JOINT C2 COMMUNICATIONS
CHINA GROWS AMPHIBIOUS ASSAULT

www.asianmilitaryreview.com

P600 AEW&C

Protecting What Matters Most



Next Generation AEW&C Optimized to Meet the Latest Challenges

High-performance Force Multiplier for Multiple Defense and Security Missions including National Air Defense, Maritime and Homeland Security

- Innovative design integrated on the Praetor 600 Business Jet; higher operational availability and flexibility, at a fraction of the cost of other AEW&C systems
- Latest generation, cutting edge multi-mode GaN AESA digital Radar/IFF-I/ADSB - providing accurate and reliable long-range surveillance
- Comprehensive mission systems suite for complete situational awareness picture - AIS, ESM/ELINT, CSM/COMINT, and Self-Protection systems
- Advanced AI algorithms - providing superior performance and higher level of automation with reduced crew size and work load
- LOS & BLOS Voice & Data Communications Suite - enabling interoperability through network centric operation

ELTA Systems Ltd.
www.iai.co.il • market@elta.co.il



Contents

APRIL/MAY 2021
VOLUME 29 / ISSUE 2

ASIAN MILITARY REVIEW



HMAS *Parramatta* docked at the Henderson Shipyard in Western Australia in 2016. The Australian government has committed to spending \$183 billion in its Naval Shipbuilding Plan. (RAN)

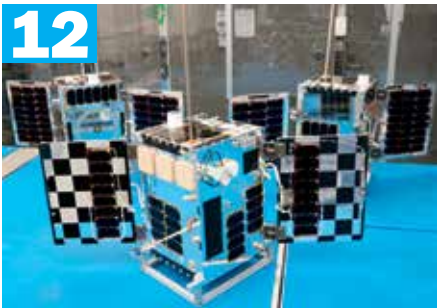
06



SHIPBUILDING - A NUMBERS GAME

Tim Fish reviews the growth of naval shipbuilding across the Indo-Pacific.

12



SPACE V AIRBORNE ISR - OR MIX AND MATCH

Satellites now provide excellent ISR coverage for those who can afford them. *Matrin Streetly* discusses the options for the have and have nots.

16



HIGHER CALIBRE

Steve Miller takes a look at some of the successful small arms designs emerging from Asian weapons manufacturers.

20



ALL SEEING, ALL KNOWING

Andrew White reports on the development work being done in the United States on Joint All-Domain Command and Control (JADC2).

24



CHINA'S AMPHIBIOUS ASSAULT FORCE

China's naval shipbuilding programme has no rivals, as *JR Ng* reports.

30



ANALYSTS COLUMN

Armada's new analyst *Andy Wong* discusses the implications of the rapid growth of the People's Liberation Army Navy.

Index of Advertisers

IAI	COVER 2
COLLINS AEROSPACE	5
NAVAL GROUP	9
NEXTER	11
HAWKEYE	13
RUAG AMMOTEC	17
DB CONTROL	21
SKYLOCK	25
IMDEX	27
ADEX	29
D&S THAILAND	COVER 3
ARQUUS	COVER 4

Advertising Offices

France/Spain

Stephane de Remusat, REM International
Tel: (33) 5 3427 0130
E-Mail: sremusat@rem-intl.com

Germany

Sam Baird, Whitehill Media
Tel: (44-1883) 715 697 Mobile: (44-7770) 237 646
E-Mail: sam@whitehillmedia.com

UK

Zena Coupé
Tel: +44 1923 852537
E-Mail: zena@expomedia.biz

Nordic Countries/Italy/ Switzerland

Emanuela Castagnetti-Gillberg
Tel: (46) 31 799 9028
E-Mail: emanuela.armada@gmail.com

Russia

Alla Butova, NOVO-Media Ltd,
Tel/Fax: (7 3832) 180 885 Mobile: (7 960) 783 6653
Email: alla@mediatransasia.com

USA /Canada

Margie Brown, Blessall Media, LLC.
Tel: (+1 540) 341 7581
Email: margiespub@rcn.com

India

Sanjay Seth, Global Exposures
Tel: +91 11 466 96566 Mob: +91 9818 697279
Email: sseth.globex@gmail.com

Turkey

Zeynep Özlem Baş
Mob: +90 532 375 0046
Email: media@oz-ist.com

All Other Countries

Jakhongir Djalmatov, Media Transasia Limited
Tel: +66 2204 2370, Mobile: +66 81 6455654
Email: joha@mediatransasia.com

Roman Durksen, Media Transasia Limited
Tel: +66 2204 2370, Mobile +66 83 6037989
E-Mail: roman@mediatransasia.com

Editorial



SUBMARINE SINKING MUST BE INVESTIGATED

The loss of the Indonesian Navy (Tentara Nasional Indonesia-Angkatan Laut - TNI-AL) Cakra-class (Type 209/1300)-class diesel-electric submarine (SSK), KRI *Nanggala* 402, in the waters to the north of Bali will be especially marked by all submariners worldwide who understand the risks of operating underneath the waves.

The TNI-AL confirmed that wreckage had been found after oil had been detected on the surface of the sea together with other items the crew would have had. The navy was able to take images of site where the body of the submarine was revealed to be lying on the seabed in three main parts at a depth of 850 metres, well beyond the pressure capabilities of the 40 year old submarine.

During a torpedo exercise a request was made to dive, shortly after which contact was lost.

The KRI *Nanggala-402* was carrying a total of 53 crew, more than the 34 sailors and six officers that was more usual, at the time of her sinking. Why were so many crew onboard the vessel when the acknowledged compliment is stated in several sources to be between 30-40 personnel?

Until the accident, the TNI-AL operated a total of five diesel-electric submarines, two older German built Cakra-class Type 209/1300 constructed by Howaldtswerke-Deutsche Werft around 1977 and three Nagapasa-class Type 209/1400 submarines constructed in South Korea made by Daewoo Shipbuilding and Marine Engineering (DSME). Daewoo Shipbuilding was provided both of the Cakra-class boats with a refit in 2012.

The TNI-AL is no stranger to submarine management and operations. During the 1960s and 1970s the force was operating 12 Russian made Whisky Class submarines.

Accidents of this nature can usually be attributed to one of two causes, either equipment failure or an error by the crew. According to a report from Nikkei Asia, "Muhammad Ali, assistant to the navy chief of staff, said the submarine had undergone regular checks, including its last 'docking last year, when the vessel was deemed seaworthy through September 2022."

With the TNI-AL has initially stated that the loss was not due to either factor, and could even be attributed to a natural phenomenon called an 'internal solitary wave', but without evidence this seems to be the least likely cause of the accident and potentially made to deflect blame early.

Maintenance records will have to be examined and checks made to find any repairs that had been made recently that might have compromised the safe sailing of the vessel. Submariner crew training will also have to be revised, particularly emergency drills.

The TNI-AL has at least three additional submarines on order and awaiting commission, with longer term plans to buy more. The TNI-AL owes its current and future submariners a detailed investigation into what actually happened, perhaps bringing in international experts to examine the wreckage once it is recovered.

Andrew Drwiega, Editor-in-Chief

Editor-in-Chief: Andrew Drwiega

Tel: +44 1494 765245, E-mail: andrew@mediatransasia.com

Publishing Office:

Chairman: J.S. Uberoi

Media Transasia Limited, 1603, 16/F,

Island Place Tower, 510 King's Road, Hong Kong

Operations Office:

President: Egasith Chotpakditrakul

Chief Financial Officer: Gaurav Kumar

General Manager: Jakhongir Djalmatov

International Marketing Manager: Roman Durksen

Digital Manager: David Siriphonphutakun

Art Director: Rachata Sharma

Media Transasia Ltd. 75/8, 14th Floor, Ocean Tower II, Soi Sukhumvit 19,

Sukhumvit Road, Bangkok 10110, Thailand.

Tel: 66 (0)-2204 2370, Fax: 66 (0)-2204 2390 -1



Circulation Audit Board

Controlled circulation: 22,183 (average per issue) for the period 1st January 2019 to 31st December 2019.

Subscription Information

ASIAN MILITARY REVIEW can be obtained by subscription. Subscription rate for one year (8 issues) is U.S.\$ 100.00 Readers should contact the following address:

Subscription Department,

Media Transasia Limited.

75/8, 14th Floor, Ocean Tower II, Soi Sukhumvit 19, Sukhumvit Rd., Bangkok 10110, Thailand

Tel: 66 (0)-2204 2370, Fax: 66 (0)-2204 2387

Email: accounts@mediatransasia.com

DELIVERING ON TARGET



New technology for more capable, high-performance weapons guidance

Our Atlantic Inertial Systems' ultra-reliable Micro-Electro Mechanical Systems (MEMS) inertial measurement units extend the range and performance of many weapons types. And now, they deliver fibre-optic gyro levels of performance without the added size, weight and cost.



collinsaerospace.com/gnc



SHIPBUILDING - A NUMBERS GAME

While experience grows among Indo-Pacific naval designers, order numbers remain crucial to keeping costs down and yards in business.

by Tim Fish

The Indo-Pacific region has a significant number of shipyards that have the capability to undertake naval shipbuilding. However, depending on the sub-region and the country, the extent to which that capability has developed enough to build more complex warships varies greatly.

Most of the highly developed naval shipyards in the Indo-Pacific region are clustered in North East Asia where China, Japan and South Korea have been building large and complex warships for some time and have a long history of naval construction. These three countries have the largest commercial shipbuilding enterprises in the world and contribute to the relatively small but important naval shipbuilding. However, it is only China's shipyards that can build the full range of vessels for the People's Liberation Army Navy (PLAN) from nuclear-powered attack and ballistic missile submarines, conventional submarines, large hull aircraft carriers and amphibious ships, as well as surface combatants like frigates and destroyers. The industrial might of China means that it has been able to increase the size of the PLAN fleet by orders of magnitude over the past two decades and is the only country in the region that is close to the capability of the United States.

According to figures from the International Institute for Strategic



The Shandong, China's first home-built aircraft carrier was constructed by the Dalian Shipbuilding Industry, part of the China Shipbuilding Industry, in Dalian, Liaoning province, China.

Studies (IISS) in the four years from 2014-18 China launched more tonnage for its navy (678,000t) than the total of tonnage of in-service ships for the French (428,000t) or Indian (529,000t) navies and almost as much as the Japan Maritime Self-Defence Force (681,000t) or UK Royal Navy (692,000t).

China's naval shipbuilding capabilities lie within two large conglomerates: China State Shipbuilding Corporation (CSSC) the China Shipbuilding Industry Corporation (CSIC). These were amalgamated in November 2019 but there is a geographical division whereby CSSC operates yards in the southern part of China, whilst CSIC yards are located mainly in the North. CSSC shipyards build a large portion of the PLAN's surface combatants that include the Jiangnan Shipyard and Hudong-Zhonghua Shipbuilding both based in Shanghai and Huangpu Shipyard in Guangzhou. Jiangnan builds the Type 052D (Luyang III class/Kunming class)

destroyer, Type 055 destroyer (Renhai-class cruiser), the PLAN's second new aircraft carrier and amphibious floating dock. Hudong-Zhonghua manufactures the new Type 056/056A corvettes, Type 071 (Yuzhao-class) Amphibious Transport Docks and Type 075 Landing Helicopter Dock as well as Pakistan's Zulfiqar-class (F-22P or Sword-class) frigates. Huangpu Shipbuilding builds smaller surface combatants such as the Type 054A (Jiangkai II) frigate and Type 056 corvettes.

Meanwhile CSIC's leading shipyards focus mainly on aircraft carriers and submarines. This includes Dalian Shipbuilding that built the PLAN's first new carriers and Type 055 and Type 052D destroyers. Wuchang Shipyard in Wuhan province builds the Type 039/041 SSK submarines and has secured exports to the Nigerian and Bangladesh Navy for the Type 056 frigates. Bohai Shipbuilding Heavy Industry Company builds nuclear submarines including the Type 094 Jin-class SSBN, Type 093 Shang-class SSN



Malaysia's Boustead Naval Shipbuilding is building the Maharaja Lela-class frigates based on Naval Group's Gowind 2500 design.

and the new Type 095 Sui class SSN. A new Type 096 SSBN is expected to follow.

According to Richard Bitzinger, visiting senior fellow at the S. Rajaratnam School of International Studies in Singapore, China's shipyards are becoming much better at producing all types of vessels in higher quality and in larger numbers.

He said that this has been possible due to the expansion of the national shipbuilding industrial base, the growth of its commercial shipbuilding output and government investment in military research and development (R&D). However, he added that although China's naval shipbuilding industry has reduced reliance on overseas technology for some key components such as gas turbines, radar, fire-control, weapons and helicopters, it still needs to source items such as underwater production systems and dynamic positioning systems.

Tom Waldwyn, research associate for Defence Procurement at the International Institute for Strategic Studies (IISS), told AMR: "China's modernisation will continue to be based around the replacement of legacy platforms by larger and more capable ships as well as the production of large power-projection vessels like aircraft carriers, LHDs [landing helicopter dock], LPDs [landing platform dock] and fleet replenishment tankers."

NUCLEAR POWERED

The only other country in the region that can build nuclear-powered submarines is India, which saw its first nuclear-powered submarine enter service in 2016. India's naval shipyards have

been developing their capabilities since the 1960s and are also building aircraft carriers, destroyers, frigates, corvettes and conventionally powered submarines for the Indian Navy (IN).

India's main capabilities are centred around a few state-owned shipyards. These include Mazagon Docks (MDL) in Mumbai, which builds the Project 75 Kalvari-class SSKs [hunter killer submarines], and the majority of the major surface combatants including the Kolkata-class (Project 15A) destroyers, Visakhapatnam class (Project 15B) destroyers, Project 17A frigates, Godaravi-class (Project 16) frigates, and Shivalik-class (Project 17) frigates. Garden Reach Shipbuilding and Engineering (GRSE) in Kolkata also builds Project 17A frigates, Bhramaputra-class (Project 16A) guided missile frigates, Project 28 Kamorta-class corvettes, and is working on the new Anti-Submarine Warfare Shallow Water Craft (ASWSWC) project. Goa Shipyard is building Talwar-class (Project 11356) frigates and Sankalp-class offshore patrol vessels (OPVs) for the coast guard. Elsewhere the Naval Dockyard at Visakhapatnam is India's centre for nuclear expertise and the facility has produced the Arihant-class SSBN. Cochin Shipyard is building the IN's first domestically produced aircraft carrier and is also involved in the ASWSWC programme. Other notable yards include the publicly owned Hindustan Shipyards in Visakhapatnam which is building fleet support vessels for Turkey, and private shipyards such as Reliance Naval and Engineering (RNEL) and the Larsen & Toubro (L&T) shipyard in Gujarat that are building Offshore Patrol Vessels for the IN and ABG Shipyard Ltd in Mumbai.

However, despite these headline

capabilities almost all of its major shipbuilding programmes have faced considerable delays and cost overruns that are severely limiting its ability to provide the IN with modern platforms on time. Budgetary shortfalls have not helped this situation, but the problems of excessive bureaucratic interference, changes in design and construction, adapting to modular build strategies, insufficient logistical support and testing are systemic and require significant investment and reform to fix.

Before the rise of China it was the Japan Maritime Self-Defense Force (JMSDF) that had Asia's largest and strongest fleet. Japan has shipyards that can construct powerful air defence destroyers, modern SSKs and more recently the Hyuga- and Izumo-class helicopter carriers.

The main Japanese yards include Mitsubishi Heavy Industries (MHI), Kawasaki Heavy Industries (KHI), and Japan Marine United (JMU). MHI in Nagasaki is responsible for building the Soryu-class (16SS) SSKs, the new Asahi-class destroyers, and the new 30DX frigate. Mitsui Shipyards in Tamano also has a share of construction 30DX and KHI also builds Soryu-class SSKs. JMU in Yokohama - created in 2013 following a merger between Universal Shipbuilding and IHI Marine has been building the new Maya-class (improved Atago-class 27DDG) destroyers and was responsible for the construction of the helicopter carriers.

Bitzinger told AMR that Japan has the most advanced defence industrial base in the region and is largely self-reliant. However, he said that this comes at a cost. Japan's constitution prevents it from exporting military equipment therefore its platforms are



Hyundai Heavy Industries (HHI) in Ulsan, South Korea.



Daewoo Shipbuilding and Marine Engineering's (DSME) shipyard in Okpo Bay, South Korea.

some of the most expensive to produce. It is also supporting a broader industrial infrastructure than is required by sharing out its major platform contracts between its main shipyards. As a result it is not clear how long the Japanese industrial model can continue to operate. Bitzinger added that despite its self-reliance, it still has some dependency on overseas suppliers for some components such as the Aegis CMS, Stirling AIP systems for submarines and weapons like Harpoon anti-ship missiles and SeaRAM self-defence system.

DESIGNED IN SOUTH KOREA

Like Japan, neighbouring South Korea, has been building modern destroyers and frigates for some time as well as its own amphibious ships. It has also been developing its capability to design and build SSKs with its range of KSS-I, -II and -III boats. Meanwhile in South Korea's recent Defense Mid-Term Plan for 2021-25 the Ministry of National Defense outlined plans for the construction of a new 40,000t aircraft carrier that will further enhance industrial capabilities. Over the past decade Daewoo Shipbuilding and Marine Engineering (DSME) shipyard in Okpo Bay has built two batches of European-designed boats - the German Type 209 (KSS-I) and Type 214 (KSS-II) - but has now progressed to build its own designs for its KSS-3 fleet. It is already exporting three boats to the KSS-I design to Indonesia.

DSME is also responsible for the construction of the new Daegu-class (FFX-II) frigates, the Aegis-capable King Sejong the Great (KDX-III) destroyers

and Thailand's DW3000F frigate. The naval construction effort is shared between DSME and Hyundai Heavy Industries (HHI) in Ulsan, which also builds the KSS-III, Daegu- and Sejong-class and completed two Jose Rizal-class (HDF-3000) frigates for the Philippines.

Bitzinger said that despite South Korean strengths based on its commercial shipbuilding power, successful exports and the ability to build sophisticated and complex warships, there are still significant weaknesses. He explained that there is still a reliance on imports of key components such as propulsion systems and sensors but more seriously the commercial shipbuilding sector has come under pressure as a result of overcapacity and competition from India and Vietnam. This pressure almost caused South Korea's shipbuilders to collapse in recent years after orders dropped away. DSME required a rescue effort from the state-owned Korean Development Bank (KDB) and other investors. HHI is buying the shares owned by KDB and this acquisition, due to be completed in 2021, will consolidate the main naval shipbuilders in the country.

Elsewhere Hanjin Heavy Industries has built the Dokdo-class amphibious assault ship and Cheon Wang Bong-class landing tank ships and is currently building the Mulgae-class landing craft utility vessels and Gundoksori-class patrol boats. STX Offshore and Shipbuilding has smaller facilities but has been involved in the production of the Gundoksori-class PBs and the earlier FFX-I Incheon-class frigates.

Another yard, Daesun Shipbuilding and Engineering, has exported an LPD to Indonesia and the Philippines.

These countries have the advantage of possessing long-established naval shipyards and a large commercial shipbuilding industry providing a level of expertise, facilities and skilled engineers to build the most high-end platforms. Most other countries have to develop alternative solutions.

Waldwyn said that a number of countries are locally building foreign designs with technology transfer agreements in order to further develop naval shipbuilding capability. "Australia does this on the largest scale with large amphibious vessels and destroyers in service and submarines and frigates to come over the next couple of decades," he said, "Indonesia, Malaysia and Pakistan have also built foreign-design warships. Most countries in the region are able to build small patrol vessels, however a desire for greater blue water presence requires larger vessels. The design capability, as well as the more complex subsystems, typically need to be imported."

As Australia cannot rely on a large commercial shipbuilding industry it is trying to develop its naval shipbuilding industry independently, in a similar fashion to most Western European countries. To achieve this Canberra is investing record sums of money through to the 2050s in a Continuous Naval Shipbuilding programme. This will give Australia the shipyards to build complex warships and the facilities to train the engineers, project managers and other personnel. In the long term, Australia wants to achieve a steady construction drumbeat of new frigates and submarines for its navy through a sovereign naval shipbuilding capability.

On 21 January 2021, Australia's Defence Minister Linda Reynolds stated that as a result of the government's \$183 billion Naval Shipbuilding Plan, both Henderson and Osborne shipyard in South Australia would substantially benefit.

Australia's naval shipbuilding centre is built around two new shipyards that are being established at Osborne, near Adelaide in the state of South Australia. A new shipyard at ASC South is endowed with all the facilities needed to turn steel into major surface combatants up to the size of a 10,000t destroyer. The yard has been handed over to BAE Systems

**MAKING
NAVAL HISTORY**



**NAVAL GROUP DESIGNS, BUILDS AND MAINTAINS
SUBMARINES AND SURFACE SHIPS ALL AROUND THE
WORLD.**

**Leveraging this unique expertise and our proven
track-record in international cooperation, we are
ready to build and foster partnerships with navies,
industry and knowledge partners.**

**Sovereignty, Innovation, Operational excellence :
our common future will be made of challenges,
passion & engagement.**

for the design and construction of nine new Hunter-class frigates built to the company's Type 26 design. Meanwhile at ASC North a new submarine yard is still under construction that is specifically designed by French shipbuilder Naval Group for the build of the new class of 12 Attack-class submarines to the company's new Shortfin Barracuda design.

However, Australia has significant challenges ahead. Bitzinger said that the cost of shipbuilding is putting increased pressure on the affordability of the programmes and because the frigate and submarine builds are concentrated on the two new yards there are not enough shipbuilding projects to support the rest of Australia's industry. Although companies like Lurssen Australia have secured a contract to build 12 new Offshore Patrol Vessels others like Austal or BAE's facility in Williamstown have no major shipbuilding contracts.

"Certainly naval shipbuilding is expensive to maintain and even more expensive to establish. However, for a country to have a naval shipbuilding sector depends mostly on the consistency of local demand for its products," Waldwyn said. "It is all well and good to have a local shipyard license-build a couple of submarines, frigates or OPVs as part of a wider order, but the key question is what will the yard be working on in the years and decades after? How will those jobs and those skills be maintained? Local demand



The JS Kumano (FFM2) is the second ship of the 30DX frigate series and was built by Mitsui Engineering and Shipbuilding, Tamano, Japan.

will be of increasing importance going forward if more countries seek to also gain the capability to build these types of platforms thus decreasing the opportunity for exports."

Technology transfer

Both Malaysia and Indonesia are gradually building more sophisticated warships through technology transfer with overseas companies thus enhancing their shipyard capabilities. Malaysia has based its naval shipbuilding around Boustead Naval Shipbuilding, which is building the Maharaja Lela-class frigates based on Naval Group's Gowind 2500 design and the Littoral Mission Ship corvette with China's CSIC. Indonesia uses PT Pal as the focus for its naval programmes and its latest project is the construction of modules for its new Martadinata-class (PKR) frigates built to the SIGMA 10514 design from Dutch shipbuilder Damen Schelde Naval Shipbuilding. However, neither government in Kuala Lumpur or Jakarta can generate enough orders for warships

to sustain an expanded industrial base long term. But what they do have is cheaper manufacturing costs and they could be successful in the export market for smaller warships in the region and beyond.

Neighbouring Singapore has the most advanced capabilities in the SE Asia sub-region. ST Engineering Marine has gained valuable experience building the French-designed Formidable-class frigates, Swedish-designed Littoral Mission Vessel and Endurance-class landing ship tanks for the Republic of Singapore Navy (RSN). It is now building a Joint Multi-Mission Ship and Multi-Role Combat Vessel for the RSN and has design proposals for a larger 160m-long LHD variant of the Endurance-class.

Meanwhile Thailand is building new OPVs at its Bangkok Dock facility to a 90m design from BAE Systems and intends to develop the design further. Myanmar has built two Kyansitthar-class frigates at its Thanlyin Naval Dockyard with plans for a further six based on the two Jianghu-class frigates it had bought from China in 2012. It also built its own Anawratha-class missile corvettes and Fast Attack Craft as it moves away from reliance on second hand overseas vessels. This is largely a response to the expansion of the naval forces of neighbouring Bangladesh and Thailand.

Elsewhere Taiwan has a well-developed naval shipbuilding sector centred around CSBC Shipbuilding that has built multipurpose frigates and LPDs and Lung The that has manufactured the Tuo Chiang-class stealth multi-mission corvette.

Looking ahead, Waldwyn expects the capability of navies and coast guards will continue to grow. "Tension between countries, particularly between China and its neighbours in the East and South China Seas, will likely drive investment into maritime surveillance platforms such as OPVs, frigates and fixed-wing ISR and/or ASW aircraft," he said. **AMR**

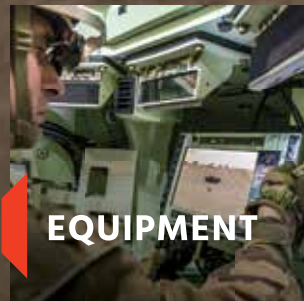


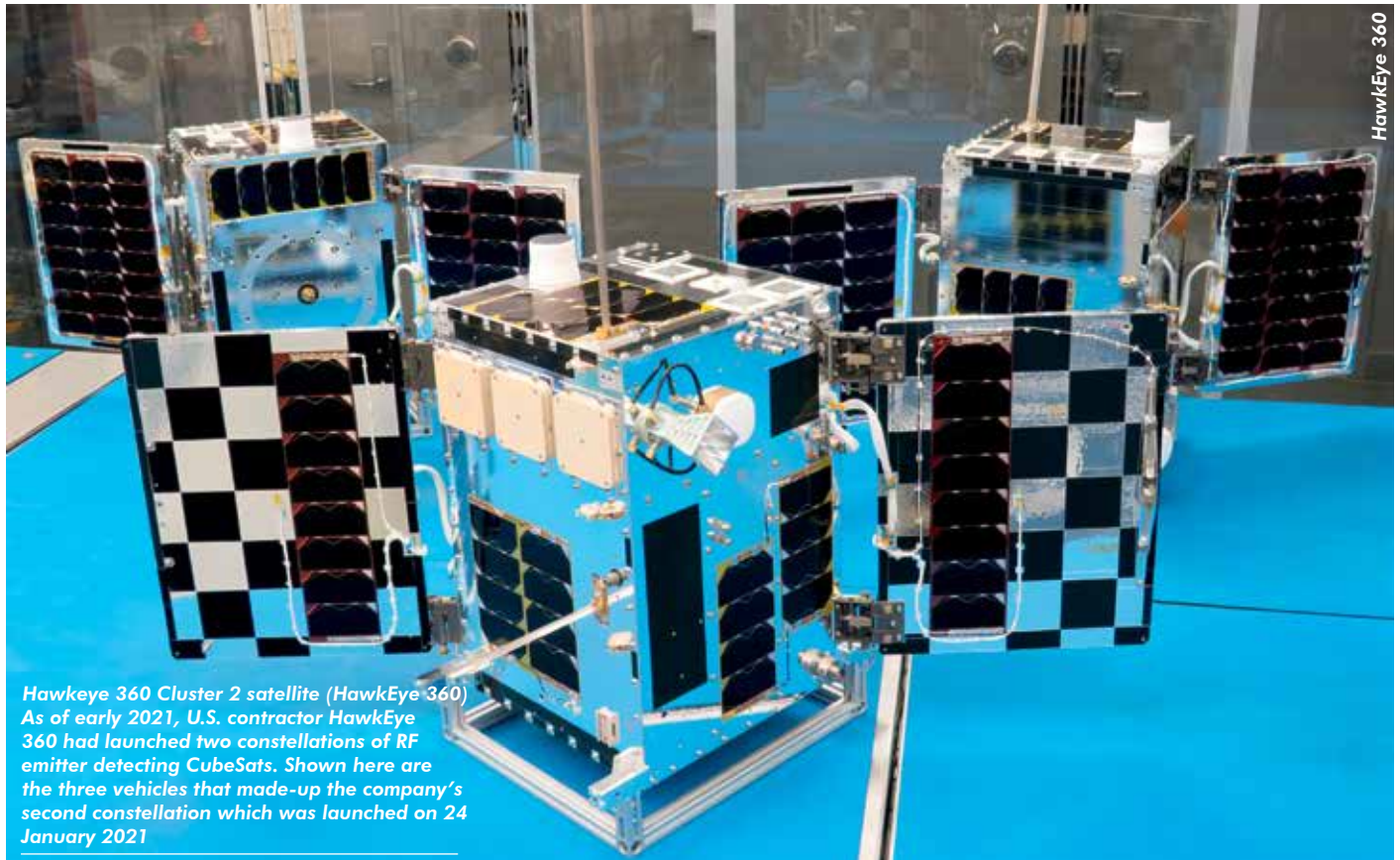
India's Mazagon Docks (MDL) in Mumbai, which builds the Project 75 Kalvari-class hunter killer submarines (SSKs).



ARMORED VEHICLES

Nexter, land defense architect and system integrator in France, is a major reference in armored combat systems, artillery, and in the ammunition field. Nexter designs innovative solutions for land, air, sea and security forces, in order to bring French and foreign armed forces a decisive operational advantage.





*Hawkeye 360 Cluster 2 satellite (HawkEye 360)
As of early 2021, U.S. contractor HawkEye 360 had launched two constellations of RF emitter detecting CubeSats. Shown here are the three vehicles that made-up the company's second constellation which was launched on 24 January 2021*

SPACE V AIRBORNE ISR - OR MIX AND MATCH

Owning satellite based ISR for military use is still an exclusive 'club', but airborne ISR still provides that most countries need.

by Martin Streetly

Until relatively recently, satellite-based intelligence, surveillance and reconnaissance (ISR) was restricted to an exclusive club that was made-up of the world's technological and military 'superpowers'. Here, security considerations, enormous cost and the sheer difficulty in placing something like a 19.5 metre long KH series imaging satellite in orbit ensured the exclusivity of the 'club'. For those able to capitalise on the technology, the rewards were (and are) enormous, with an American Lockheed KH-11 Kennen/

Crystal system being postulated as having a six centimetre ground sampling distance from an altitude of 155 miles (250 kilometres). Again, orbiting satellites have been relatively invulnerable to attack (although America, China and Russia have all looked at anti-satellite technology over time), offer global coverage and total persistence until orbital decay sets in when their power and fuel supplies are exhausted. In this latter context, it is interesting that America's Space Shuttle was developed partly as a re-usable 'service station' to keep the country's in-orbit

fleet of imaging and signals intelligence (SIGINT) satellites operational for as long as possible.

For those countries outside this 'charmed circle', air vehicles offer a much more affordable means of collecting ISR data. As much as anything, this has been driven by developments in sensor and business aircraft technology that today enable aircraft such as Textron Aviation's King Air turboprops or Gulfstream 'bisjets' to carry sensor suites that can include surveillance radar, electro-optical (EO) and infra-red (IR) imagers and signals collection equipment in



USGS/NASA Landsat

A screen shot of a Landsat image of the American city of Boston that was captured from a personal computer application and which shows something of the detail such images can show

a unified whole. Again, advances in communications technology allow such platforms to deliver real-time data to remote control/analysis/dissemination centres using high capacity line-of-sight and/or satellite links. To such manned platforms, we can now add unmanned aerial vehicles (UAV) that can range in size from hand-launched to behemoths such as the Northrop Grumman Global Hawk. Not only do these provide the whole gamut of sensor types (with carriage being dependent only on available space and power) but also at the highest end of the scale, persistence measured in days. However, those behind the technology seem to be on the cusp of creating operationally viable high altitude pseudo satellites (HAPS) that are capable of lifting a variety of payloads (including imagers) to very high altitudes for very long periods of time. By way of example (and because it is one of the few HAPS that have been described in other than general details), the Prismatic/BAE PHASA-35 vehicle is designed for surveillance, communications, remote sensing and environmental science applications and is specified for operations at altitudes of between 55,000 feet - 70,000 feet (16,700m-21,300m) for up to a year at a time at latitudes of up to 35 degrees. Power is provided by a configurable GaAs solar array and Li-ion battery packs and the air vehicle can accommodate a 15kg (33lb) mass payload. Here, 300-1,000 Watts of continuous DC power is offered. Again, PHASA-35 requires no dedicated launch and recovery facilities, with launch being 'automatic assisted' and recovery being 'automatic glide'. PHASA-35 made its first flight on 17 February 2020 and as of late January 2021, flight trials in the US were planned. Overall, co-developer BAE bills that type as being a "persistent and affordable alternative to satellites" that is "combined with the flexibility of an aircraft".

Vehicles such as PHASA-35 are not

the only alternative to dedicated ISR satellites, with commercial imaging satellites such as NASA's Landsat series and the European Space Agency's (ESA) Satellite pour l'Observation de la Terre (SPOT) family providing 'entry level' experience of satellite surveillance. The first generation SPOT 1 satellite was launched during 1972, with (by way of example) the 1998 vintage SPOT 4 vehicle (which reached the end of its useful life in June 2013) orbiting the Earth every 101 minutes at a height of 516 miles (832km) along a near-polar, sun-synchronous path. Again, the satellite re-visited the same spot on the Earth's surface every 26 days, offered high-resolution visible and IR resolution of between 32-65ft (10-20m) and over a swath of 60x60km (37x37 miles). In the latest SPOT 6 and 7 vehicles, the ESA claims a resolution of between 5-19ft (1.5-6m) over a 60km (37 mile) swath from an altitude of 431 miles (694km).

For its part, the NASA/US Geological Survey Landsat programme began during 1972 and in its Landsat 9 incarnation, is equipped with the multispectral Operational Land Imager 2 and Thermal Infra-red Sensor 2 instruments, orbits at an altitude of 438 miles (705km), covers the Earth every 16 days, generates more than 700 images per day, has a 114 mile (185km) swath and a pixel resolution of 98ft (30m). While neither SPOT or Landsat were intended for anything other than environmental surveillance, both deliver high-quality imagery and accurate geolocation, with Landsat in particular contributing to a portal that is available to anyone with a laptop or personal computer and which offers a level of resolution that is good enough to identify the types of aircraft on airfields that have been imaged. This said, such imagery, while interesting as background open-source material, in no way meets requirements for, say, real-time, targeting grade material. This said, the market for commercially generated 'pay

for view' satellite derived data is said by one contractor to already stand at about \$5 billion per year, with a customer base that includes defence agencies, shipping companies, environmental groups and the World Health Organisation (WHO) amongst others.

SIGNALS COLLECTION

A most interesting aspect of this 'pay for service' concept is its evolution into radio frequency (RF) signals collection based on constellations of CubeSats. Defined as vehicles that range in size from less than 0.1kg (0.2lb) (Femtosats) to 1,000kg (2,204lb) (Minisats), CubeSats can easily be packaged in multiples aboard a single launch vehicle, can be 'piggybacked' on the launches of larger payloads and are cheap (when compared with traditional



Uncertainty Doesn't Belong in Missions

Is that new activity along the border worth investigating? Or just a blip on the radar? When lives are on the line, there's no room for uncertainty. Back up your intuition with space-based commercial radio frequency intelligence from HawkEye 360.



Explore How HawkEye 360
Can Advance Your Missions.

info.he360.com/missions



An artist's impression of the Prismatic/BAE Systems PHASA-35.

satellite technology) and quick to build. Exemplars in the field are American contractor HawkEye 360 and the Luxembourg-based Kleos Space, with the former having gained U.S. Federal Communications Commission authority to launch up to 80 satellites over a 15 year period in order to maintain a constellation of 15 operational spacecraft.

To date, HawkEye 360 has launched six satellites, with the second constellation of three being deployed from a SpaceX Falcon 9 launcher (via a Spaceflight Sherpa-FX orbital transfer vehicle) on 24 January 2021. Functionally, the current generation of HawkEye 360 satellites incorporate software defined radios that cover the 144 MHz to 15 GHz frequency band and employ the time and frequency difference-of-arrival techniques to geo-locate emitters with 95 percent probability of success. Again, potential targets are listed as including very high frequency (VHF) marine communications, ultra high frequency (UHF) push-to-talk radios, L-band mobile satellite devices, X- and S-band marine radars, Automatic Identification System (AIS) transponder and emergency radio beacons. Alongside the satellites themselves, HawkEye 360 has also created a portfolio of data analytics products that include RF emitter identification and geolocation (RFGeo), the identification and tracking

of maritime emitters of interest (SEAKER) and signal density mapping of selected frequency bands in a specified region (RFMosaic). HawkEye 360 also released a commercial RF analysis platform (Mission Space) that aggregates the portfolio of data products into an intuitive application to better visualise and interpret RF data to achieve actionable insights.

According to HawkEye 360 CEO John Serafini: "Our growing constellation is a breakthrough for space-based commercial ISR. Customers have shown an insatiable appetite for more RF data and insights, and the launch of Cluster 2 allows us to meet that demand. As we continue with our three additional planned launches this year, our collection capacity and speed of delivery will scale rapidly." For its part, Kleos Space launched its first cluster of four satellites aboard India's Polar Satellite Launch Vehicle C49 which lifted off from that country's Satish Dhawan Space Centre on 7 November 2020. Placed in a 37 degree inclined orbit, the constellation had been successfully commissioned by the end of the month and was so positioned as to be able to collect data from areas such as the Strait of Hormuz, the South China Sea, East and West Africa, the Sea of Japan and along Australia's northern coast. Designed to provide 'RF reconnaissance data as a service', the Kleos constellation

(like its HawkEye 360 counterpart) uses software defined radio technology that are initially targeted at emitters in the VHF band, with geolocation being by means of the time difference-of-arrival process. The emergence of contractors such as HawkEye 360 and Kleos Space means that potential customers now have access to both commercially-based 'pay to view' imaging and RF collection satellites with which to meet some or all of their surveillance requirements.

AIRBORNE ISR

While space-based ISR may becoming more accessible, the provision of ISR capabilities for most countries remains vested in air vehicles (be they manned, unmanned or of the aerostat type) and SIGINT equipment deployed by army/para-military units and aboard ships. Airborne ISR remains a very popular choice as it increases line-of-sight coverage, is flexible in terms of deployment, employs (for the most part) man-in-the-loop modes of operation, is difficult for an enemy to predict when surveillance is likely to take place (the predictability of orbital mechanics being a particular Achilles Heel of ISR satellites), is not weather dependent (visible light satellite imaging cannot see through or avoid cloud cover) and is much more affordable. Again, pre-wiring a number of aircraft to take cross-decked



Textron Aviation's King Air 350 business aircraft is one of the world's most popular airframes for conversion into specialised airborne ISR platforms. Shown here is a King Air 350ER ISR aircraft that was produced by Swiss contractor Corporate Aircraft for an un-named North African customer. As such, F-WTAI has been fitted with an X-band Gabbiano T200 surveillance radar, an EO imager, an AIS application and Leonardo ATOS control system application

equipment keeps costs down even more (fewer expensive sensors to procure) while ensuring that the capability is rarely 'grounded' due to airframe failure. Further benefit can be obtained from the use of the newest generation of corporate aircraft where intercontinental range is possible with the latest 'bizjets', pre-used airframes are widely available for cost effective conversion, a sufficiently

large power/space envelope is provided to accommodate suites of sensors and their operators and the use of basically civil airframes means that it is possible to outsource airframe and engine maintenance to existing, type-rated civil contractors.

By way of illustration, the widely-used King Air 350 turboprop business aircraft is a good example. At the time of writing, ISR King Airs were probably one of the most widely used military/para military airborne ISR platforms in the world, with a typical high-end sensor suite carried by such aircraft being illustrated by the French Customs Service's (Douane Française) fleet of six King Air 350ERs. Here, each aircraft is fitted with an AIS application, a tactical datalink, a 30-410MHz DF-430 direction-finder, an IR/ultra-violet scanner, an 8-10GHz Ocean Master 400 maritime surveillance radar, a 9,375MHz centre frequency side-looking airborne radar, a SAFIRE III HD EO/IR imager and a SAMSARA 200 mission management system. Again, many such fits add some form of SIGINT capability, with the whole offering a unified package that can be used for a wide variety of tasks including border patrol, anti-piracy patrol, counter insurgency operations, illegal immigration monitoring, anti-drugs patrol and environmental monitoring. While not wholly military in nature, paramilitary capabilities of the kinds described are becoming increasingly important in an increasingly unstable world.

While air vehicles are a good fit for

the ISR collection role, their biggest downside is their vulnerability in contested airspace which, in large part, restricts them to benign environments and/or stand-off operations if opposition is likely. The potential cost (financial and political) of losing manned ISR aircraft has obviously been a major driver in the rise of UAVs for surveillance. If a UAV is lost, it is not catastrophic and the 'throw away' (used advisedly!) nature of the technology means that it can penetrate areas that would be otherwise closed off. As hinted at earlier, UAVs can range from hand-launched examples that are fitted with a simple EO imager and a downlink to increasingly more sophisticated platforms that can (like their manned counterparts) carry suites of sensors. An example here is Israel Aerospace Industry's (IAI) widely used Heron medium altitude long endurance (MALE) that can be outfitted with up to six payloads drawn from a range that includes high frequency/VHF/UHF communications intelligence receivers (including an anti-GSM telephone capability), electronic support measures equipment, laser range-finders/designators, EO/IR imagers and synthetic aperture/moving target indication radar, with the whole being backed-up by line-of-sight and satellite communications links. Again, Heron is advertised as having a beyond line-of-sight range of better than a 621 miles (1,000km), a service ceiling of better than 35,000ft (10,668m) and an endurance of up to 45 hours.

What then (if anything) does the foregoing tell us about the relationship and relative merits of airborne and space-based ISR? The main take-aways would seem to be that the two are complementary, that the use of high-end satellite surveillance will remain a very exclusive club and that the new generation of 'pay for view' satellite capabilities will find increasing niche acceptance. Perhaps the paradigm for the increasingly vital field of ISR is that the future is 'mix and match', with end users defining their needs and taking advantage of a range of options with which to meet them. Such a future might see a judicious mix of 'pay for view' satellite services, manned ISR aircraft and surveillance UAVs, with the mix having the facility to be reasonably rapidly re-configured to meet specific objectives as the arise. **AMIR**



Looking for all the world like a model aeroplane, the 1.02m wingspan AeroVironment Wasp UAV is hand-launched, is equipped with a Mantis i22 EO/IR payload and has a range of over three miles (5km). Overall UAVs (as opposed to commercially available hobby drones) can range in size and capability from nano-drones through Wasp-sized vehicles to multi-sensor platforms such as the Global Hawk which has a wingspan that is similar to that of a Boeing 737 airliner



ST Kinetics

The BM18 is the latest assault rifle development by ST Engineering designed in collaboration with the Singapore military. In addition to the AR for general soldier use, a MCR automatic squad weapon, and longer barrel Sharp Shooter versions are also provided.

Singapore

The Singapore Armed Forces (SAF) enjoy the continued support of ST Engineering in addressing many of its needs. This has been particularly the case with its small arms. The company began with license production of the M16, referred to as the M16S1, as well as the SAR80 which was licensed for export. However, around 1995 the company began its own development. The resulting SAR-21 (Singapore Assault Rifle - 21st Century) was fielded by its army in 1999 and remains in service. The SAR-21 is a bullpup design utilising 5.56x45 caliber with a Stoner operating system, a high impact polymer body, and translucent magazine. It is compact at 805mm (31.7 inch) length in the assault rifle version and 640mm (25.2in) in the carbine facilitating its handling in tight situations such as urban areas, jungles and inside vehicles. The original design incorporated an integral 1.5 power optical sight (or 3x) and battery powered laser aiming device, but it has subsequently been provided with a Picatinny mounting rail. A lighter 3.2 kilogram (7lb) SAR-21A model was introduced in 2006. In addition to the SAF, the SAR21 has been adopted by seven militaries especially special forces units.

In 2018 ST Engineering debuted the production design of its BMCR (Bull-pup Multirole Combat Rifle) subsequently designated the BR18, developed to replace the SAR21. A company spokesperson shared, "BM18 builds off the SAR21 incorporating lessons learned and user inputs on the earlier weapon." The receiver incorporates both an upper and lower Picatinny Rail, with the later able to mount a forward grip while the transparent magazine is retained. Overall, the weapon is an even more compact package with the assault model having a length of only 640mm (25in) and 2.9kg (6lb) weight. These characteristics make the BR18 a suitable choice for infantry, mechanised troops, paratroopers, or Special Forces without need for significant modifications.

Indonesia

PT Pindad (Perindustrian Tentara Nasional Indonesia-Angkatan Darat (Indonesian Army Industries) has been manufacturing weapons since 1808 and began the licensed production of the FN FNC rifle which was adopted by the Indonesian military in 1994 as the SS1. A number of variants of the 5.56mm rifle have been designed and fielded including

HIGHER CALIBRE

Western manufacturers are now seeing increasingly successful small arms designs emerging from Asia.

by Stephen W. Miller

The weapon carried by every soldier not only impacts on their effectiveness in combat but also makes a statement becoming a part of the overall identity of a country's military. The selection of that weapon can also be a matter of national pride with the development, production and fielding of an indigenous design to equip one's military. There is also a constant push to stay current with the latest technology and weapon design trends. In addition, the level of modernisation of a country's individual weapons can be viewed as a reflection of the efficiency and indication of the combat capabilities of its military. As a result, a significant attention can be given to the arming of the soldier, as well as to the procurement or local development of state-of-the-art modern weapons. This trend has been equally true by nations in the Asian-Pacific region with a number of these designing and fielding their own world class weapons. The region is today

not only a market for advanced weapons but an exporter of individual arms in their own right.

Given the national prestige associated with having local small arms and the specific requirements of military it is not surprising that some facilities are government supported and even government owned or affiliated. Yet, many of their designs have come to reflect state-of-the art designs utilising current material technologies. Their configurations reflect and draw upon the latest trends and design approaches including the bullpup, AR, AK, SCAR, as well as combinations of various proven features. Rather than replicating other weapon designs these are often incorporated into their own well-thought-out innovative features. The ability of these facilities to manufacture and offer their weapons at highly competitive prices has positioned them as an attractive weapon source for many world armies.

the SS1-V5 with a 252mm barrel, 3.37kg (7.4lb) weight and foldable butt for use by artillery, rear-echelon troops and special forces. The M Versions are used by the Indonesian Marine Corps with a special coating process to protect against salt water corrosion. In 2005 the company introduced its SS2 which improves on the SS1 design. It includes a folding stock and Picatinny Rail and like the SS1 is offered in a number of variants.

Australia

The Australian Army adopted the Steyr Mannlicher bullpup style F88 Austeyr assault rifle manufactured under license by Thales Australia. Their rifles, as well as those of the New Zealand Army which also use the F88, have a 1:7 twist rifling optimised for firing the NATO 5.56mm SS109 round. The last variant, the F88SA2, can be fitted with different sights including the standard 1.5x ring-sight, the Advanced Combat Optic Gunsight (ACOG) or night weapon sights, as well as laser aiming devices and other accessories that attach to a Picatinny rail.

The assault rifle version weights 4.8kg (10.5lb) with a full 30 round magazine and has an overall length of 790mm (31.6in) but is also available in a shorter close-quarters battle (CQB) carbine, longer barrel marksman, and heavy barrel automatic weapon versions.

In 2015 the Ministry of Defence awarded a contract to Thales for the Enhanced F88 (EF88) also offered for export as the F90. EF88 incorporates a number of improvements including a folding cocking handle, modified hammer to improve reliability, extended ejection port and improved port covers, upgraded gas plug adjustment, bolt release catch and a modified trigger guard grip access. Of immediate notice is the elimination of the integrated optic sight from the original F88. Instead, extended Picatinny rails allowing for the use of various optics, laser aimers, and the mounting of a grenade launcher. The EF88 is being fielded by the Australian Army in both the standard assault rifle and CQB versions. The F88 is used by 30 militaries including Malaysia, Papua New Guinea,

and elements in the Philippines,

Japan

Japan has been manufacturing its own individual weapons since the formation of the Japanese Self Defense Forces. Following the U.S. move from 7.62mm to 5.56mm the Defense Agency followed suit and selected Howa, which had the license for the Armlite AR-18, to design a new rifle to replace the Type 64. This was the Type 89 assault rifle which uses standard magazines and has a selector for semi-auto, three-shot burst, and full automatic firing. In 2015 the Defense Agency began evaluating rifles to replace the Type 89 and in August 2020 announced its selection of the Howa Type 20. It is 780mm (30.7in) long and weighs 3.5kg (7.7lbs). It is ambidextrous with controls on both sides of the rifle and the charging handle can be swapped. The weapon has a full-length Picatinny top rail and an MLOK fore-end, with MLOCK slots. Special coatings have been applied to counter salt and corrosion. The Type 20 has been viewed with a DECON 1x8

SWISS 

The Sniper's Choice



**Ammunition for Professionals.
Premium, Precision, Power.**

Reliability is the key. From trigger to terminal effect, this is the sniper's choice for outstanding accuracy. Made in Switzerland.

RUAG Ammotec AG sales.ammotec@ruag.com www.swiss-p.com



SWISS P® is a registered trademark of RUAG Ammotec AG, a RUAG Group Company



Australian DoD

The Australian forces chose to improve its existing bullpup style F88 Austeyr assault rifle manufactured by Thales Australia. The EF88 has higher reliability, better ergonomic and the elimination of the integrated optic sight for a extended Picatinny rails.

The helical ammunition magazines were first seen in 2010. Much larger than the standard 30-round 'banana' magazines, it is estimated that these hold between 100 and 150 rounds. Their use increases the loaded weapon weight from 3kg (6.6lb) to around 5kg (11lb), a significant load to carry. However, this large capacity magazine might well have a particular application by allowing sustained fires without having to change magazines. Thus, a single soldier using the AK-74 with a helical magazine could by himself provide suppressive fires in support of a unit's manoeuvre. Given the scale of North Korea's previous rifle production - as high as 150,000 annually - the country is a major player in the small arms.

Taiwan

The Combined Logistics Command of the Republic of China Armed Forces has developed individual weapons since 1976. The first in the 5.56 caliber was the T65 patterned after the Armalite AR-18. However, the design sought to improve the AR by utilising a short stroke gas piston thereby improving the rifle's reliability. T65 resembles the U.S. M16 with a sight block instead of a carrying handle although the carrying handle returned in the T65K2 improved model. A carbine version like the M4 is also fielded. The T65 has proved popular in Central America and is fielded in seven countries.

In 1998 the development of the T86 Combat Rifle was completed as a replacement for the T65. The T86 further improves on the T65K2 and features

power variable scope optic and has metal back-up iron sights. There is a forward grip and an adjustable telescoping stock. The rifle can mount the Beretta GLX-160 grenade launcher. It is understood that the Type 20 will be issued first to those in the Amphibious Rapid Deployment Brigade on the Nansei Islands.

Republic of Korea

Taking a path similar to other countries in the region the Republic of Korea chose to develop and manufacture its own combat rifle drawing from a proven operating system, in this case that of the Stoner AR-18. The resulting K2 is manufactured by S&T Motiv (formerly Daewoo) and was introduced in 1984. Its gas operation was slightly modified based on the AKM to increase reliability while the weapon also employs a stamped and welded sheet steel construction thereby simplifying manufacturing. The weapons 970mm (38.8in) length is reduced to 780 mm (31.5 in) with its folding. It is designed for selective fire and is chambered for NATO 5.56x45mm ammunition using the standard 30 round magazine. Over the years the K2 has been updated and improved with the K2A having a different foregrip and a full-length Picatinny rail that accepts various optics and accessories without blocking its iron sights. There is also a shorten carbine version, the K2C. The K2 has been accepted by Bangladesh, Fiji, Indonesia, Lebanon, Nigeria, Peru and Senegal.

Early in 2020 S&T Motiv and Poongsan, the largest ammunition producer, announced that they are together developing a new generation assault rifle using a new 6.8mm ammunition.

According to Hong Hui-beom, of the Korean magazine Platoon, the objective is to achieve increased accuracy, longer 500m plus range and better penetration than the current 5.56mm. S&T have suggested their intent is to have a prototype within 24 months although the Korean Army has yet to layout its plans for a new rifle.

Democratic People's Republic of Korea

In line with many other countries that were within the sphere of the former Soviet Union, North Korea adopted the AK-47, the AKM and finally the AK-74 which they began to manufacture. These models were given a local Type designation with the later renamed the Type 88. They further introduced their own modifications to the weapons.



Australian DoD

A soldier from the 3rd Brigade carrying out a demonstration of the Australian Army F88 Steyr Rifle for visiting Chinese General Chi Haotian. Picture shows: General Chi (left) receives a briefing on the Australian Army.

an M4 carbine style polymer telescopic stock and buffer mechanism and polymer handguard. However, the T86 has seen only limited fielding and has been largely superseded by the T91 which entered production in 2002. The T91 is even shorter at 800mm (32in) with the stock collapsed. It also incorporates multiple Picatinny rails with the standard carrying handle able to be removed allowing optics to be mounted.

In 2009 the Ministry of National Defense displayed its XT97 5.56 assault rifle as advanced a new multipurpose rifle development. It departed from previous designs by utilising the AK bolt. The weapon also features a stock that is both retractable and foldable. This allows the weapon length to change from 850mm (34in) stock extended, to 770mm (30.8in) stock retracted, to only 580mm (23.2in) stock folded. This characteristic clearly enhances the utility of the weapon for use in a range of soldier applications. The rifle also incorporates Picatinny rails for mounting various optical scopes. In 2015, a version was added that could be provided with three different barrel lengths.

Peoples Republic of China

In 1995 Norinco began series production of its Type 95 (also referred to as QBZ-95), an entirely new local bullpup design that would replace the Type56, an AK-47 copy, that had previously been used. Chambered for the 5.8x42mm DBP87 intermediate cartridge it is designed as a family of weapons including the assault rifle, a carbine, and a light support weapon (LSW) or Squad Automatic Rifle (SAR). The rifle weight is 3.25kg (7.2 lb) with overall length of

745mm (29.3in). Its integrated carrying handle has mounting fixtures to accept a Y/MA95-002 telescopic sight. With selective fire, including full automatic, the weapon was designed around and to optimise the accuracy and performance of the 5.8x42mm caliber. The PRC claims its choice is superior to both the NATO 5.56x345mm and the Russian 5.45x39mm with a flatter trajectory that retains its energy to greater ranges. However, the military has introduced a new heavier DBP10 round in the same caliber that further enhances performance and increasing the effective range. This new ammunition necessitated modifications to the QBZ-95 which is designated the QBZ-95-1 as a heavier, longer barrel and a redesigned muzzle brake. The rifle is widely issued including to security forces and militia.

As early as 2017 reports surfaced of a newly developed assault rifle reflecting a return to previous magazine forward configuration. In late 2019 this rifle appeared with troops in the 70th anniversary parade. It appears to be 5.8x42mm using the DBP10 round. It is designated the QBZ-191 (Qingwuqi Buqiang Zidong - light weapon, rifle automatic). The layout includes a top full Picatinny-type rail that has been seen mounting the QMK-152 3X light-gathering fibre optic sight. It further incorporates a four-position adjustable buttstock, removable forward grip and can add a bipod. The 30-round curved magazine appears to be modified for secure hold and easier installation. Several barrel lengths have been seen including a 267mm (10.5in) carbine and 368mm (14in) infantry rifle, while an even longer heavier barrel QBU-191



Japan's Defense Agency in August 2020 selected the Type 20 from Howa for fielding to its Self Defense Forces. Type 20's design incorporates many of the features that are becoming standard in current weapons such as ambidextrous controls, the Picatinny rail, and optical sights.

with a digital variable scope 'precision marksman' version was revealed in May 2020. The QBZ is part of a broader PLA program toward introducing an Integrated Soldier System.

United States

The very size of the US military's small arms requirements assures that its fielding decisions can have worldwide impact. Its adoption of the 5.56 caliber influenced the move by NATO and other militaries. Currently, the U.S. Army is in the process of evaluating three candidates for its Next Generation Squad Weapon. A new 6.8 caliber projectile is directed; however, competitors can match this with any ammunition approach. Three competitors are being considered: Sig Sauer, General Dynamics - Ordnance and Tactical Systems, who use polymer case but conventional round configuration, while Textron Systems employs its cased telescope round design. The later round design allows for an entirely new receiver and forward ejection approach. With a 2023 initial fielding objective the influence of this caliber shift and the introduction of new ammunition designs as well as weapons will be a development to watch.

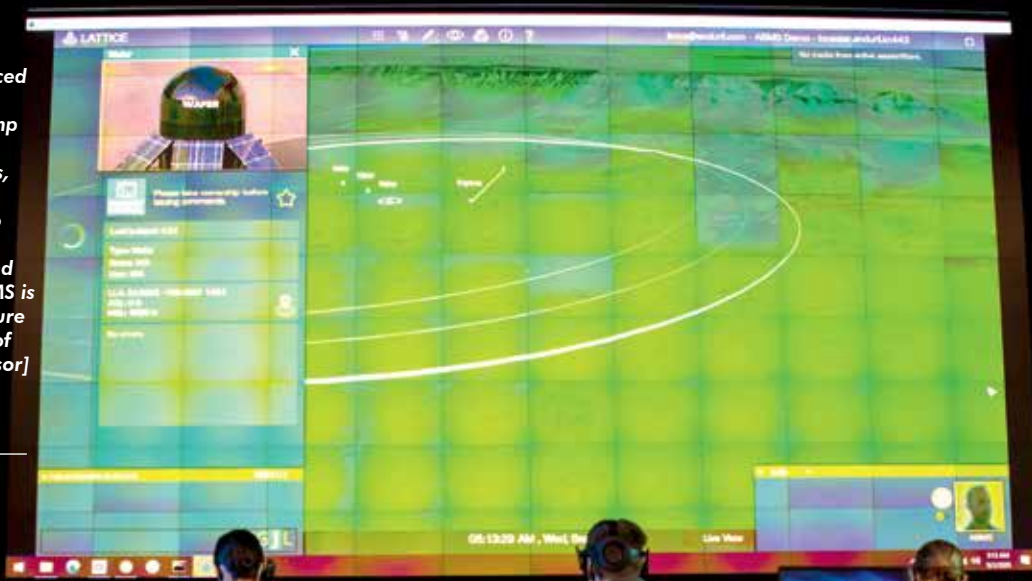
New World Class Small Arms

The Asian-Pacific small arms industry which had established its credentials as a manufacturer some years ago is now displaying its expertise as a world class designer and developer as well. The implications of this, particularly with the increasing incorporation of electronics and processing into weapons, technologies in which these countries lead, may well set the stage in arming future soldiers. **AMR**



China's Peoples Liberation Army soldiers armed with a classic Norinco QBZ-191 assault rifle.

U.S. Air Force airmen monitor computers in support of the Advanced Battle Management System (ABMS) Onramp 2, 2 September, 2020 at Joint Base Andrews, Maryland. The effect ABMS is attempting to achieve is Joint All-Domain Command and Control (JADC2). ABMS is the digital infrastructure which allows a level of connectivity and [sensor] compatibility for the military.



USAF

ALL SEEING, ALL KNOWING

Extensive research is being undertaken by the U.S. Department of Defense to turn the desire for All Joint Domain Command and Control (JADC2) into reality.

by Andrew White

As the character of warfare shifts away from countering violent extremist organisations towards engaging with high capability peer adversaries, the U.S. Department of Defense (DoD) is implementing a programme to update existing Command and Control (C2) structures.

As stipulated in the 2018 National Defense Strategy, the US DoD faces potential adversaries who have developed 'sophisticated anti-access/area denial (A2/AD) capabilities', including electronic warfare systems,

cyber weapons, long-range missiles and advanced air defences.

As described in a Congressional Research Service report on Joint All-Domain Command and Control (JADC2), published on 16 November 2020, adversaries continue to pursue A2/AD capabilities as a means of 'countering traditional U.S. military advantages,' including the projection of power and ability to win quickly and decisively.

According to the report, JADC2 comprises the DoD's concept to 'connect sensors from all of the military services into a single network'.

"DOD officials have argued that

future conflicts may require decisions to be made within hours, minutes, or potentially seconds compared with the current multi-day process to analyse the operating environment and issue commands. They have also stated that the Department's existing command and control architecture is insufficient to meet the demands of the NDS," the CRS report suggested.

JADC2 concepts

In response, the DoD envisions JADC2 as providing a 'cloud-like' environment for joint forces to 'share intelligence, surveillance, and

reconnaissance data, transmitting across many communications networks, to enable faster decision making,' the CRS report described.

According to the report, 'JADC2 intends to enable commanders to make better decisions by collecting data from numerous sensors, processing the data using artificial intelligence algorithms to identify targets, then recommending the optimal weapon—both kinetic and non-kinetic (e.g., cyber or electronic weapons)—to engage the target.'

To date, the DoD has commissioned a Joint Cross-Functional Team to consider multiple JADC2 concepts, one of which includes the integration of 5G networks. This covers concepts, policy, doctrine and emerging operational requirements, all of which will be aligned with the Joint Warfighting Concept.

As part of the effort, the USAF continues to develop the Air Battle Management System (ABMS), a next-generation network tasked with the sharing of critical mission data across every domain of the battlefield in near real-time.

Concurrently, US Army efforts in the area of JADC2 and multi-domain operations are being led by the Futures Command and Project Convergence. As Asian Military Review went to press, the army disclosed it had already conducted multiple exercises demonstrating similar concepts to encourage greater access to joint and coalition networks.

Finally, the navy's Project Overmatch supports JADC2 requirement following its launch in October 2020. Overmatch will develop fleet architecture, supported by machine learning (ML) and artificial intelligence (AI) and autonomous technologies to enable 'Distributed Maritime Operations' at sea.

However, it is the US Air Force which has been designated the 'executive agency' for JADC2 technology development in coordination with support from industry. Over the course of 2019/2020, the USAF conducted three ABMS demonstrations with partner forces in the U.S. Army and Navy.

In December 2019, the DoD held its first major JADC2-related exercise at Eglin Air Force Base, Florida, which focused on a simulated cruise missile threat. Comprising the first demonstration of ABMS, USAF and U.S. Navy F-22 and F-35 jets collaborate with a surface vessel; U.S. Army Sentinel radar system; mobile artillery system

and space assets to collect, analyse, and share data in real-time to provide a fuller picture of the operating environment.

Another evaluation was completed in July 2020, which saw air force, army and navy force components using ABMS to support a joint force operation in the collection, analysis and sharing of data in real time across a simulated battlefield environment against a 'potential Russian threat'.

This was followed by an 'onramp' exercise conducted by the U.S. Northern

and Space Commands at Joint Base Andrews in Maryland between 31 August and 3 September 2020 to further innovate and evolve ABMS in support of JADC2.

A USAF spokesperson described to AMR how operators used ABMS to "detect and defeat efforts to disrupt U.S. operations in space in addition to countering attacks against the U.S. homeland, including shooting down a cruise missile 'surrogate' with a hypervelocity weapon."

Millimeter-Wave HPAs: Higher Bandwidth to Combat New Threats at 70,000 ft Above Sea Level

High-power amplifiers designed and tested for harsh environments and high altitudes

- **26.5-40.0 GHz**, 125W MPM dB-3201
- **27.5-31.0 GHz**, 200W MPM dB-3202
- **30.0-38.0 GHz**, 125W MPM dB-3201H
- **32.0-36.0 GHz**, 400W TWT Amplifier dB-3861
- **34.5-35.5 GHz**, 700W TWT Amplifier dB-3860
- **34.5-35.5 GHz**, 700W TWT Amplifier dB-3709i
- **43.5-45.5 GHz**, 80W MPM dB-3205



dB Control
a HEICO company
Reliability by Design®

For specs and customization info, call 510-656-2325
or email info@dBControl.com



USAF

An small UAS flies near a Sentinel Radar during a Combined Joint All-Domain Command and Control demonstration at Sembach Kaserne, Germany, 25 Feb, 2021. U.S. Air Forces in Europe conducted a CJADC2 demonstration to highlight the force’s ability to integrate network solutions and connect multiple sensors to a common operating network, presenting warfighters with an information advantage across all warfighting domains.

Illustrating how AMBS allowed the joint force to use “cutting-edge methods and technologies to rapidly collect, analyse and share information and make decisions in real time”, exercise officials explained how the exercise had “compelled commanders and operators to trust data analytics and artificial intelligence to understand the battle”.

“ABMS collected and fused information in new ways by also making the information available instantaneously across geographically-separated forces spanning the operational to tactical levels of combat.

“The week long onramp further tested and refined technologies necessary for ABMS, which is building the ‘internet of things’ of the military that collects and makes sense of vast amounts of data supported by artificial intelligence,” officials concluded.

The exercise itself featured 70 industry teams, 65 government participants and 35 military platforms across 30 geographic locations in what the USAF described as the largest “joint experiment in recent history”.

“When fully realised, senior leaders say JADC2 will allow US forces from all services as well as allies, to receive, fuse

and act upon a vast array of data and information in all domains at the speed of relevance. Aside from the system’s embrace of a different warfighting philosophy and practice, ABMS is utilising an approach to developing the complex system that breaks with traditional defence approaches and practices,” exercise sources added.

Cooperation is being conducted with the ABMS Program Office out of AFWERX.

Northrop Grumman officials described how the DoD was moving towards a more “inter-connected and network-centric force to deter increasingly sophisticated threats”. Roshan Roeder, vice president and general manager, communications, airborne multifunction sensors division and Colin Phan, director of strategy, networked information solutions division, described to AMR how the DoD is facing “new and increasingly sophisticated threats from near-peer adversaries, underscoring the importance of innovation in order to maintain an advantage in an age of technology-driven warfare”.

Specifically highlighting JADC2 efforts, Roeder and Phan summarised

the concept as comprising an effort to “integrate sensors with shooters across all domains, commands and services”.

“With its focus on integration, it is clear that communications and networking capabilities will be essential to help DoD realise its vision for JADC2,” the pair offered.

“We are conducting a lot of air-to-air and air-to-ground demonstrations, where airborne assets push information down the ground and vice versa. Exercises feature F-35 Joint Strike Fighters talking to the U.S. Army Integrated Air and Missile Defense Battle Command System (IBCS). We are focused on air, land and maritime integration for maximum levels in interoperability,” Roeder added.

“Exercises are designed to identify capability gaps and quickly offer an agile solution to customers. Northrop Grumman’s role is to take sensor data and push it down to other networks on the ground, looking for specific mission gaps and quickly filling them with innovative technology,” she continued before discussing how acquisition processes would also need to be sped up to demonstrate capability at the forward edge of the battlespace. “It’s OK to fail and move forward faster,” Roeder said.

BACN soars ahead

Northrop Grumman solutions include ‘gateway’ communications systems such as the Battlefield Airborne Communications Node (BACN) which in December 2020, successfully reached 200,000 combat operational flight hours since its first deployment with the U.S. Air Force in 2008.

On 26 January, 2021, the U.S. Air Force awarded Northrop Grumman a \$3.6 billion contract for continued BACN operations, sustainment and support. Hosted on high-altitude aircraft such as the Global Hawk, it enhances the situation awareness of forces facing the most advanced of threats across the modern battlespace.

“The open architecture design and cyber-secure processing of the BACN gateway system, coupled with its ability to easily integrate advanced technologies and proven track record of success, make this system well suited to meet the needs of JADC2,” Roeder explained.

BACN’s Airborne Executive Processor (AEP) enables a ‘persistent gateway’ in the sky that ‘receives, bridges, and distributes communication among all participants in a battle’, according to the company.

“In theatre operations, mountainous terrain inhibited line-of-sight communications and diverse weapon systems are unable to communicate with each other; each operating unit can see only a limited set of the complete picture. BACN bridges the gaps between those systems, enabling essential situation awareness from small ground units in contact up to the highest command levels,” according to Northrop Grumman materials.

BACN is a data translator and platform agnostic solution, capable of being integrated on board almost any platform, including fixed infrastructure ground stations to translate tactical data link networks; enable joint range extension; facilitate beyond line of sight connectivity for disadvantaged users and IP-based data exchange among dissimilar users.

Seeking to future proof its JADC2 capabilities, Northrop Grumman is also planning to bring to market a new family of gateway systems to ‘enable communications and cross domain translations between multiple beyond line-of-sight and line-of-sight networks and datalinks—inclusive of 5th-to-4th generation capabilities’.



The Battlefield Airborne Communications Node (BACN) system is hosted on high-altitude aircraft such as the Global Hawk to provide persistent connectivity and operational support as part of the BACN programme.

Systems, which have yet to be unveiled by Northrop Grumman, will focus on cyber-secure and integrated capabilities including cloud computing, machine learning and secure, ethical artificial intelligence, Roshan confirmed.

Additional products being offered up for JADC2 by Northrop Grumman include Freedom Radio systems which are already integrated on board F-22 and F-35 air frame integrated avionics suites.

“The signature design and open architecture functionality of the Freedom Radio supporting gatewayONE will enable 5th and 4th Generation platforms to communicate and extend capabilities to enable multiple 5th generation platform types to share and integrate data, helping make network-centric operations and JADC2 a reality for the DOD,” Roshan described.

Elsewhere, Northrop Grumman is looking at how to increase levels in resilience, security, software definition and advances in waveform technologies in order to stay ahead of the evolving battlefield. Roshan also described efforts to explore open architectures which would allow the company, industry partners and customers to insert new capabilities into platforms in a more rapid fashion.

Waveforms including IFDL and MADL are designed to maintain the stealthy nature of aircraft in addition to ensuring communications in a contested environment and bridging back to 4th Generation data links, Link 16, Common

Data Link and Beyond Line of Sight components.

“It’s all about bringing forward new capabilities in a new warfighting domain,” she concluded.

Additional waveform technologies being explored include counter-communications waveforms to defeat improvised explosive devices and electronic warfare threats, Northrop Grumman officials added.

Finally, Roshan described how Northrop Grumman was seeking to exploit 5G communications networks in the future to support interoperability between joint forces and coalitions operating legacy and next-generation platforms in a secure combat environment.

As the modern battle space becomes more and more complicated, the U.S. DoD and its partner forces around the world will be forced to adopt JADC or similar concepts in order to establish and maintain operational advantage over peer adversaries. However, much will depend upon how easy and quick it is to set up systems and capabilities in addition to providing end user with sufficient levels of training to run such a concept.

In addition, they must also be aware of raising cognitive burden of end users operating or relying upon JADC2 - an area which, as typified by USSOCOM’s General Clarke - will see heavy reliance upon ML and AI to speed up decision making processes and make them even more efficient and at pace. [AMIR](#)



PLAN Type 071 amphibious transport dock Kunlun Shan

CHINA'S AMPHIBIOUS ASSAULT FORCE

To what extent has the Chinese Navy (PLAN) extended its capacity to conduct offensive amphibious operations?

by JR Ng

Once largely aimed at constraining an adversary's ability to approach and operate off the Chinese mainland's coastal waters, the modernisation priorities of the People's Liberation Army (PLA) have evidently shifted to power projection in recent years.

This intent has been telegraphed by China's latest defence white paper released in July 2019, which described how the PLA Navy (PLAN) is expanding its mission from "defence on the near seas" to "protection missions on the far seas."

According to the 2020 China Military Power Report published by the U.S. Department of Defense (DoD), the PLAN is now the numerically largest navy in the world with approximately 350 surface and underwater platforms, including 130 major surface combatants. This enables the service to operate at much greater distances from the mainland than previously possible.

The PLA Marine Corps (PLAMC) is widely seen to hold a privileged position within the vast Chinese armed forces because of its prominent role in asserting dominance in the South China Sea

(SCS). As a result of this unique remit, the service has in recent years received greater attention in terms of funding, equipment, and higher-quality recruits than many of the other PLA forces.

The DoD also notes that the PLAN is responsible for organising, manning, training, and equipping the PLA's naval and naval aviation forces as well as the PLA Marine Corps (PLAMC), which is subordinate to the Navy. Currently, the PLAN is believed to be capable of landing division-sized formations through amphibious operations.

A significant expansion of the PLAMC was initiated around 2017 following the transfer of four brigades from the PLA Ground Force (PLAGF) to supplement the two existing brigades at that time, which increased the size of the PLAMC from around 13,000 to an estimated 36,000 personnel.

Amphibious aims

In particular, the DoD pointed out that China's sustained investment in amphibious warfare platforms such as helicopter and troop-carrying assault ships is a clear indication of its resolve to boost its expeditionary capabilities. The latest example of this would be the

PLAN's new Type 075 landing helicopter dock (LHD) - also known by its NATO reporting name of Yushen-class - which displaces an estimated 36,000 tonnes and measures approximately 236 metres in length with a 36m wide flight deck. This new class of amphibious assault ships represent the second largest platforms operated by the PLAN in terms of displacement and size after its aircraft carriers.

The vessel is believed to be capable of supporting up to 30 helicopters, with six landing spots on its deck dedicated to helicopter launch and recover operations. It also features a floodable well deck that enables air-cushion landing craft and amphibious armoured vehicles to deploy directly from the ship during landing assault operations.

The rate at which it is building these large vessels is astounding. On 29 January, state-owned shipbuilder China State Shipbuilding Corporation (CSSC) launched the third Yushen LHD at its Hudong-Zhonghua shipyard in Shanghai. The completed hull was manoeuvred out of its dry dock to a pierside berth in the Huangpu River where it will undergo fitting out and further testing before being commissioned into service.

"THIS IS NOT AN EMERGING THREAT. THIS WAS EMERGING FIVE YEARS AGO. THIS IS HERE. IT IS NOW"

-CISA ASSISTANT DIRECTOR FOR INFRASTRUCTURE SECURITY BRIAN HARRELL.

The counter-drone market report assessed that the global counter-drone market would grow from around 1.2 billion USD in 2019 to 6.6 billion USD in 2024, at 41.4% CAGR.

In fact, drone incursions have risen rapidly over the last several years. Major airports, such as the Gatwick Airport case, left police and authorities scrambling to no avail for an effective solution for three days to prevent the recurring drone incursion. The drone attacks against the Abqaiq and Khurais oil fields on September 14, 2019, in Saudi Arabia sent the global economy into turmoil; aside from the financial aftermath, it was a clear warning sign that drones are a threat to national security. Without authorities imposing new regulatory restrictions and more airports investing in counter-drone solutions, drone incursions and malicious drone threats will continue to plague our skies.

BRINGING THE DRONE DOWN

SKYLOCK's has become synonymous to anti-drone solutions designing and producing comprehensive, modular anti-drone technologies and counter-measures to detect, verify, and neutralise unauthorised drones. Their flexible approach has put them at the forefront of anti-drone technology, with over 20 systems already deployed and operational in strategic sites.

With a large R&D center SKYLOCK has developed a new strategic weapon to counter drones and swarms. The revolutionary non-jamming mitigation technology: Dronelock is a high speed, manoeuvrable "Drone vs Drone" system. DRONELOCK is deployed once an unauthorised drone is detected by radar, the intercepting UAV is deployed towards the moving target. Using



proprietary onboard AI and advanced machine vision processing on approach, the drone against drone system tracks the moving target, locking onto it and disabling it by collision.

Asaf Lebovitz SKYLOCK's VP Sales, says, "In today's world, advanced technology is available to anyone, new, versatile threats that are unique to each field are created. That's why SKYLOCK's systems are based on a main guiding principle: a customised concept that allows us to adjust the configuration and, hence, each solution's capabilities according to the type of threat the customer is facing. Flexibility is an integral part of our DNA. Working under the assumption that drone threats vary from market to market, the Thessaloniki airport does not face the same threat that JFK faces.

Our modular systems enable us to develop a customised, integrated solution that provides both classic "Soft-Kill" solutions and "Drone vs Drone" technologies, to meet autonomous threats. Alternatively, we have Geo-location solutions if the customer prefers not to use mitigation. Taking land conditions into consideration, SKYLOCK systems are fully adaptable for both super-dense urban areas and open military and civilian areas."

Fuelled by increasing demands for UAS traffic management, SKYLOCK is also currently developing a unique Unmanned Traffic Management platform, based on RF technology, delivering authorities with an advanced non-jamming solution for managing drone activities in urban environments.



Yushen Class Type 075 landing helicopter dock Hainan

The lead ship was launched in September 2019, while the second was launched in April 2020. It is worth noting that all three Type 075 LHDs have entered the water within a timeframe of just 16 months.

The lead ship suffered an internal fire on 11 April during its fit out, although the extent of damage caused is not known. It eventually resumed sea trials in the SCS and appears to be close to its commissioning after it left the Hudong-Zhonghua shipyard and arrived at the PLAN's new naval base on Hainan Island. The second Type 075 returned to the shipyard following the first phase of its sea trials, which commenced in December, and is likely to undergo further testing.

It is believed that the ships will eventually embark a new rotary wing unmanned aerial vehicle (UAV) that could provide organic tactical intelligence, surveillance, and reconnaissance (ISR) support to boost amphibious assault operations. Images posted on Chinese social media clearly showed a UAV mockup on the flight deck of one of the ships.

Design cues observed on the mockup are visually comparable with the Z-series vertical take-off and landing (VTOL) UAVs manufactured by the Nanjing Research Institute on Simulation Technique (NRIST), although it appears to be considerably larger than known VTOL UAVs currently offered by the institute such as the maritime-optimised Z-5B/H.

Until the Type 075 LHDs are commissioned and fully operationalised, however, the PLAN's core amphibious warfare capabilities currently reside in its eight in-service Type 071 (Yuzhao)-class amphibious transport docks (LPDs).

The Type 071 LPD displaces approximately 18,500 tonnes and has an estimated length of 210m featuring a stern well deck that can accommodate

up to four Type 726 (Yuyi)-class assault hovercraft, each capable of carrying up to 60 tonnes of cargo or even a main battle tank (MBT) such as the PLAGF's ZTZ-96 and ZTZ-99. Up to 60 armoured vehicles can also be transported and deployed via the same deck in lieu of the hovercraft.

Up to four Z-8 or Z-18 transport helicopters can be fitted into its hangar, although PLA Army Aviation Z-10 attack helicopters have also used the ship for exercises in recent years.

"The Yuzhao class LPDs and Yushen class [LHDs] provide the PLA with greater capacity, endurance, and more flexibility for long-range operations than the PLAN's older landing ships, which it has reduced in number over the last decade with obsolete units being decommissioned," the DoD observed.

While the Type 075 LHD has yet to be fully operationalised, the PLAN has already commenced studies into its next-generation amphibious assault ship commonly referred to as the Type 076. Details that have emerged to date include the possibility of an electromagnetic catapult for launching fixed-wing UAVs following reports that the CSSC's 708 Research Institute - also known as the

Marine Design and Research Institute of China (MARIC) - has requested proposals via the official Chinese military website run by the General Armament Department (GAD). Other requirements include an integrated electric propulsion system (IEPS) that comprise both diesel and gas turbine powerplants.

Amphibious combat vehicles

At the forefront of any ship-to-shore landing operation would be the Type 05 family of tracked amphibious vehicles, which comprise the ZBD-05 infantry fighting vehicle (IFV) armed with the ZPT-99 30mm autocannon and HJ-73B anti-tank guided missile (ATGM), the ZTD-05 assault vehicle armed with a 105mm low recoil gun, and complemented by armoured command and control (C2) and recovery vehicle variants.

The Type 05 IFVs are intended to be deployed at sea and swim under their own power to contested landing sites at speeds of up to 16 knots (30km), delivering up to eight fully equipped PLAMC dismounts under armour protection and providing supporting fires following disembarkation.

Ship-to-shore operations is supported by the ZTD-05 assault vehicle, which shares the same hull as the IFV variant but is instead equipped with a 105mm low recoil rifled gun. According to official specifications, the ZTD-05 is claimed to be capable of employing its main armament against stationary targets while swimming in conditions of up to Sea State 4. Armour piercing and high-explosive ordnance enables the vehicle to engage armoured vehicles and fortifications.



The Type 05 infantry fighting vehicle can swim ashore at speeds of up to 16 knots (30km).

THE **FUTURE** OF THE AEROSPACE INDUSTRY

 **DUBAI
AIRSHOW**

14-18 NOVEMBER 2021
DWC, DUBAI AIRSHOW SITE

www.dubaiairshow.aero

Book your space today: sales@dubai.aero

Join us as we launch a range of new features including new content streams, emerging technologies showcase, intelligent matchmaking platform, enhanced networking and much more in a live format.

Follow us on: [f](#) | [in](#) | [@](#) | [t](#) | [#DubaiAirshow](#)

COMMERCIAL AVIATION | AIRCRAFT INTERIORS | MRO | BUSINESS AVIATION | AIR TRAFFIC MANAGEMENT
SPACE | DEFENCE & MILITARY | AIR CARGO | EMERGING TECHNOLOGIES **NEW**

Supported by:





The final vehicular element in landing operations is PLZ-07B, which also uses a derivative of the Type 05 hull and the PLZ-07 self-propelled artillery system. The PLZ-07B is armed with a 122mm howitzer that can perform direct and indirect-fire missions.

Once it secures a beachhead, PLAMC units would seek to establish an anti-access/area-denial (A2/AD) bubble in anticipation of follow-on forces, deploying anti-ship and air defence assets in addition to their organic armour and artillery capabilities to stymie any intervention by defending forces or their reinforcements.

Consistent with the PLA's desire to enhance its command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) capabilities, the PLAGF has fielded a new amphibious armoured reconnaissance vehicle that appears to be derived from the Type 05 platform.

This unique variant, which was showcased in a September 2020 news clip by the state-owned China Central Television 7 (CCTV 7), is seen fitted with a telescopic mast mounting a sensor suite comprising an electro-optical and infrared (EO/IR) turret, a laser rangefinder, and a compact radar. The vehicle has also been fitted with a roof-mounted retractable catapult that can deploy a small UAV to boost beyond-line-of-sight situational awareness.

The CCTV 7 footage also highlighted how the imagery and video captured by the UAV is exploited to detect and identify potential threats. The data is then shared with other friendly units, which then perform targeting and combined fires to support a beach landing.

Emerging unmanned capabilities

As the PLA continues to focus on growing its ability to fight and win modern

engagements, it will likely implement emerging technologies such as big data, the internet, artificial intelligence (AI), and cloud computing to make reliable automated platforms a reality. The DoD noted that this process has already begun with the PLA embracing big data analytics that fuse a variety of data to improve automation and to create a comprehensive, real-time picture.

Such capabilities are being manifested in new unmanned platforms are being developed for amphibious operations. Wuchang Shipbuilding Industry Group, a Wuhan-based subsidiary of the state-owned China Shipbuilding Industry Company (CSIC), is producing the Marine Lizard unmanned surface vehicle (USV) in collaboration with private enterprises.

The 13m long USV displaces around 14 tonnes and features a unique hybrid propulsion system that uses water jets while in the water, as well as four electrically powered tracks installed under each corner of the hull that enables it to transition onto land at travel at speeds around 10 knots (20 km/h).

According to the developers, the USV has been designed to be fully autonomous and can function as an armed ISR platform to support landing operations, although it can be configured to perform troop transport and logistical resupply missions if desired. AI-powered decision-making systems enables it to perform its missions autonomously, as well as manoeuvre around obstacles and difficult terrain without operator supervision.

The Marine Lizard has a stated payload capacity of five tonnes and can be equipped with a diverse range mission equipment, including EO/IR and radar sensors. A possible weapons configuration could include two forward-mounted remote weapon

stations armed with machine guns, and a vertical launch system carrying very short-range air-defence or surface attack missiles.

One or more of these vehicles can be forward-deployed and hidden on uninhabited islands or remote facilities for as long as eight months on battery power, activating from their dormant states automatically or at pre-determined intervals to recharge its batteries using its main diesel generators or to conduct on-demand surveillance or reconnaissance missions.

There is no indication that the PLAMC has taken delivery of this USV, although imagery suggests that Wuchang Shipbuilding has constructed multiple pre-production vehicles - likely in anticipation of an impending order.

Short-to-medium term challenges

Dr Wu Shang-Su, a research fellow specialising in regional security at the S.Rajaratnam School of International Studies, told AMR that the commissioning of new ships such as the Type 071 LPD, Type-075 LHD, various amphibious fighting vehicles, and new helicopters such as Z-18 do not necessarily translate into immediate combat power.

"From the operational perspective, the modernised surface combatants and airpower to cover landing operations would be more important, because such capabilities for sea control are indispensable," Dr Wu said, noting that the rate at which the PLAN acquires new assets will likely decrease in order to enable its forces to fully operationalise these capabilities by addressing integration and training imperatives.

"Further expansion of amphibious capacity may not be meaningful due to the limitation of escort capacity," he added. "Furthermore, most amphibious platforms are vulnerable to countermeasures such as anti-ship missiles, sea mines, torpedoes and other munitions."

Moreover, the Type 075 and future Type 076 assault ships require the PLAMC to operate a sizeable organic airlift capability to be truly effective. This in turn requires the acquisition of a considerable number of marinised helicopters capable of transporting troops. It was anticipated that an aviation brigade would also be formed, but there is no conclusive evidence that such a force been established. **AMR**

Seoul ADEX 2021

Seoul International Aerospace & Defense Exhibition

October 19 - 24, 2021

Seoul Airport



MODERNISATION AND UNITY TO COUNTER PLAN'S NAVAL GROWTH

By Andy Wong



The recent accelerated growth of the Chinese People's Liberation Army Navy (PLAN) has been nothing short of astronomical, amidst its much-publicised shift in strategic ambition to become a blue-water naval power. Although the PLAN's future force structure is largely still a state secret, open intelligence sources have already documented up to 275 ships of both ocean-going and littoral types being completed and commissioned into the PLAN in the past 15 years.

The PLAN's explosive growth has become a source of major alarm for regional countries in the Indo-Pacific theatre. Chinese claims on the South China Sea (SCS), which it contests as a whole entity more so than individual territories within it, have intensified with provocative actions conducted not just by Chinese naval units but also by its paramilitarised Coast Guard and commercial fishing fleets. With the increase in blue-water fleet strength, China stands to gain a much bigger continuous and assertive presence in Indo-Pacific waters and with it the ability to coerce and overwhelm regional navies from conducting their own maritime patrols.

So a change of strategy is required. Gone are the days when deterrent took the form of the forward positioning of a U.S. carrier strike group in Japan, coupled with the occasional Freedom of Navigation Operations (FONOPS) exercise designed to reassure regional countries of a U.S. naval constabulary presence. The PLAN and the Chinese military establishment as a whole has formulated a strategy that allows it to increasingly ratchet up its pressure on contested maritime regions such as the SCS, by massively increasing

and modernising its fleet with large blue-water units armed with ever more sophisticated long-range anti-ship missile weaponry. China's aim is to 'overmatch' any and all navies that block its ambitions, regardless of whether they combine together in any coherent operational form. Simultaneously, the PLAN's strategy is moving towards keeping any potential U.S. naval intervention at bay by removing the erstwhile-guaranteed supremacy and survivability of its carrier strike groups. With combined PLAN and Coast Guard fleets numerically overtaking the U.S. Navy as the largest in the world (according to the U.S. Department of Defense's 2020 annual report to Congress on Chinese military power), China has both raw numbers and geographical proximity on its side to becoming the largest naval player in the Indo-Pacific theatre with the potential to mass naval power at relatively short notice.

The increasing distress and concerns of Indo-Pacific maritime countries, particularly of those bordering the SCS and along the First Island Chain are well-founded. While the PLAN does not currently have the logistical capability to sustain true long-range blue-water operations far beyond Chinese or regional waters, its immediate naval and political focus is on the South and East China Seas, and particularly on the Taiwan Strait. This represents a major disruption to the balance of naval power in the region. The militarisation of the Chinese Coast Guard has complicated confrontations in disputed waters and is looking to provide China with a convenient tripwire for escalation into naval actions by the PLAN if required.

In response, there has been a marked

increase in regional and international cooperation for navies to operate on a combined basis in the Indo-Pacific, to provide for collective power where individual naval strengths would not suffice. The end of 2020 saw the resurgence of the 'Quad' naval exercises, with Australia rejoining the Quad's centrepiece Exercise *Malabar* 2020, operating alongside U.S., Japanese and Indian naval units for the first time since 2007 in a demonstration of naval interoperability. Even the United Kingdom is making a naval presence return to the region not seen since its East of Suez policy in 1968, with the maiden deployment of its flagship aircraft carrier HMS *Queen Elizabeth* and its escort group to the Pacific slated for sometime in 2021. It is very likely that such a deployment will see interoperability exercises conducted with fellow naval partners in the region such as Singapore, Malaysia, Australia and New Zealand, under the auspices of the Five-Power-Defence-Agreement.

The modernisation of Indo-Pacific navies has also intensified, in a belated recognition of the need to bolster individual naval strengths and capabilities and to reduce reliance on U.S. naval power. Japan has expressed strong interest in assisting the Vietnam People's Navy to modernise its Cold-War era littoral fleet to provide more of a blue-water naval presence; six ex-Japanese naval ships were given to Vietnam for SCS patrols in 2014, with more military exports promised. Australia has also embarked on upgrading its naval capabilities through various programmes, including BAE systems built Hunter-class frigates and Attack-class submarines adding potency to its recently commissioned Canberra-class landing helicopter docks. [AMR](#)



Power of Partnership

Tri-Service Asian Defense & Security Exhibition, Conference and Networking Event



1 - 4 November 2021

IMPACT Exhibition and Convention Center,
Muang Thong Thani, **Thailand**

10th
EDITION



Organised by:



For more information please contact:

Ms. Yaowalak Chuvichien, Project Manager

+66 (0) 2036 0500 ext 212

Yaowalak@asiandefense.com

www.asiandefense.com

Officially Support by:



Strategic Partner:



Official Publication and Official Show-Daily Publisher:



Official Online Show daily:



Official Bilingual Show daily:



Official News Online and Web TV:



Supporting Publication:



+66 (0) 2036 0500

info@asiandefense.com

@DefenseThailand

Defense Security Thailand

#DefenseThailand

SCARABEE

The first hybrid light armoured vehicle.



HYBRID DRIVE



MOBILITY



FIREPOWER

SCARABEE is the first protected hybrid vehicle in its category. A true technological powerhouse, this light armoured vehicle is designed for tackling every type of mission. Its hybrid drive combined with its exceptional mobility enables stealthy and silent movement. Thanks to its rear-wheel independent steering and its two levels of ground clearance, it shows a high level of agility in every situation. **SCARABEE** is ready for high-intensity operations.



ARQUUS